A1 Birtley to Coal House

Scheme Number: TR010031

Applicant's Responses to ExA's Second Written Questions - Appendix 2.0C - Structure Options Report 1 - Kingsway Viaduct Underbridge

Planning Act 2008

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A1 Birtley to Coal House Development Consent Order 20[xx]

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Birtley to Coal House

Structure Options Report 1

Kingsway Viaduct Underbridge

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Highways England Company Limited registered in England and Wales number 09346363

March 2018

A1 BIRTLEY TO COAL HOUSE

PCF STAGE 3 (PRELIMINARY DESIGN)

STRUCTURE OPTIONS REPORT 1

KINGSWAY VIADUCT UNDERBRIDGE

Highways England

Date: March 2018

Project no:

HE PIN: 551462
WSP Ref: 70015226

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PRODUCTION TEAM

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APPENDICES

EXECUTIVE SUMMARY

In December 2014, the government issued its Road Investment Strategy, which included a commitment to upgrade the stretch of the A1 between J65 Birtley and J67 Coalhouse. The improvement will take the form of a dual three lane rural all-purpose road between J65 (Birtley) and J67 (Coal House) with a lane gain / lane drop between each junction (both northbound and southbound).

The existing Allerdene Railway Bridge has a number of inherent design/construction deficiencies which cannot be easily resolved due to the complex structural form (half joints) and site constraints. The intention is the existing Allerdene Bridge shall be replaced as part of the A1 Birtley to Coalhouse Improvement scheme.

Two alignment options are currently being assessed for the replacement of Allerdene Bridge. These are:

- Option 1A (previously referred to as Option 2) Replacement of Allerdene Railway Bridge as close as possible to the existing structure to enable the retention of Coal House interchange.

- Option 1B (previously referred to as Option 1) Widening/Replacement of Allerdene Railway Bridge with a wider structure in its existing location and retention of Coal House Interchange and the existing alignment as far as is possible.

Studies and analysis to date shows Option 1A to be the preferred option to be progressed onto the next stage and beyond.

The existing Kingsway Viaduct, located at the Coal House Junction 67, would need to be widened to accommodate the new improved highway alignment for option 1A. Kingsway Viaduct is the largest bridge structure on the scheme (total span circa 150m). This Structures Option Report has been prepared to assess the constraints/challenges associated with the structural widening of Kingsway Viaduct. This report has been brought forward from Stage 3 to Stage 2 to provide more assurance about the scheme and ensure awareness of any potential issues are identified/addressed before they have a significant impact.

The study has shown the overall cross section of the deck at Kingsway Viaduct would need to be increased from circa 23m to 30m to accommodate the new highway alignment (increase from 2 lanes to 3 lanes in both directions) for the improvement works.

The existing bridge deck has sufficient capacity to sustain general traffic and abnormal loading up to 150 tonnes without restrictions. No significant defects/structural complexities were identified to suggest extensive improvement/modification works are required to the existing deck for the new alignment. Therefore options requiring complete deck replacement have not been considered in detail. It is anticipated that the benefits associated with complete deck replacement would be disproportionate to the cost and buildablity/programme complexities encountered.

Conventional widening of the existing deck (extending sub structure elements and the deck) would provide a cost effective robust solution for accommodating the new widened highway alignment.

Two configurations have been considered for the structural widening including;

- Option A: Symmetrical Structural Widening of the Deck- Estimated Cost £12million

- Option B: Asymmetrical Structural Widening of the Deck (Southern End) - Estimate Cost £9million

The comparison shows both options to be very similar. However by limiting the structural widening to only one side would reduce the complexity/duration and subsequent cost associated with the works required to Kingsway viaduct for the improvement works.

It is recommended that Asymmetrical Structural Widening of Kingsway Viaduct (southern end, northbound deck) to be undertaken to increase the lane capacity over the bridge. The structural widening shall comprise a steel composite deck extension that shall be stitched to the existing deck.

The structure would be future proofed for the routing of the onerous SV196/ SOV250 & 350 loading onto the widened section of the northbound carriageway. In the southbound direction the abnormal loads would need to be re-routed to avoid crossing the existing deck section.

A feasible solution (subject to swept path analysis/HE Abnormal load team approval) is the routing of the SV196/ SOV250 & 350 off/on the southbound diverge/merge slip roads. This would enable the abnormal loads to continue its journey on the A1 northbound without impacting the bridge. A structural assessment of the existing River Team culverts (carries the roundabout over the River Team) would be required to confirm the load capacity for the re-routed abnormal loads around the roundabout.

It is recommended the following works to be progressed to verify the findings of this report:

- Swept Path Analysis: Confirm the SOV350 can be routed off/on the diverge/merge slip roads without any major complications

- Assessment of the River Team culverts for the desired abnormal loads.

1. INTRODUCTION

1.1 SCHEME OVERVIEW

The scheme forms part of the Newcastle Gateshead Western Bypass (NGWB) which is located on the A1 between J65 (Birtley) and J80 (Seaton Burn). It is part of Highways England's strategic road network serving the metropolitan area of Tyne and Wear.

The scheme is located between J65 (Birtley) and J67 (Coal House) and is approximately 4.2km in length. The existing carriageways comprise:

- Southbound: Two lanes between J67 (Coal House) and J66 (Eighton Lodge) with an additional climbing lane between Smithy Lane Overbridge and J66 (Eighton Lodge) and three lanes between J66 (Eighton Lodge) and J65 (Birtley). The existing speed limit is 50 mph between J67 (Coal House) and Smithy Lane Overbridge and 70 mph thereafter.

- Northbound: Two lanes with a lane gain/lane drop between J65 (Birtley) and J66 (Eighton Lodge) and two lanes between J66 (Eighton Lodge) and J67 (Coal House). The existing speed limit is 50 mph throughout.

Figure 1 - Scheme Location Plan

A Feasibility Study was undertaken in 2014 to determine the existing issues on the route and prioritise the sections which most urgently need attention. A Strategic Outline Business Case (SOBC) was produced for the options which performed well at the Options Assessment Stage, as follows:

- J65 (Birtley) - J67 (Coal House) A1 Birtley to Coal House (including Allerdene Railway Bridge)
- J74 (Scotswood) - J79 (North Brunton) A1 Scotswood to North Brunton

Both schemes were announced in the Autumn Statement in December 2014 as schemes that should be taken forward into the Roads Investment Strategy (RIS), for delivery in the current roads period. The completion of the Feasibility Study concluded PCF Stage 0 (Strategy, Shaping and Prioritisation) for both schemes.

1.2 PROGRESS TO DATE – PCF STAGES

PCF Stage 1 (Option Identification) concluded in April 2016 and the A1 Birtley to Coal House scheme has now progressed to PCF Stage 2 (Option Selection).

Based on the current traffic data, the improvement will take the form of a dual three lane rural all-purpose road between J65 (Birtley) and J67 (Coal House) with a lane gain / lane drop between each junction (both northbound and southbound). The carriageway cross section will be to standard in accordance with TD 27/05.

Three options were identified at PCF Stage 1 (Option Identification) with the same alignment and cross section between J66 (Eighton Lodge) and J65 (Birtley), where widening of existing structures is possible. However, it has been determined that online widening is not possible at Allerdene Railway Bridge. Existing maintenance issues dictate that the existing structure has to be replaced. The three proposed options were:

- Option 1a (previously referred to as Option 2) Replacement of Allerdene Railway Bridge as close as possible to the existing structure to enable the retention of Coal House interchange.
- Option 1b (previously referred to as Option 1) Widening/Replacement of Allerdene Railway Bridge with a wider structure in its existing location and retention of Coal House Interchange and the existing alignment as far as is possible.
- Option 3 Replacement of Allerdene Railway Bridge approximately 150m south of the existing location with an improved mainline alignment and new interchange at Coal House.

PCF Stage 1 (Option Identification) concluded that Option 3 should be omitted from further assessment as the scheme is deemed unaffordable after an Order of Magnitude was calculated for the option in PCF Stage 1 (Option Identification).

The costs for Option 3 were significantly higher than option 1a and 1b, in addition more land would be required and there would be a greater impact on the surrounding environment, however the benefits achieved on all the options would be very similar. Therefore option 3 was deemed to not offer good value for money and so was discounted.

1.3 REPORT OBJECTIVES

Studies and analysis to date during PCF Stage 2 (Option Selection) shows that Option 1A is the preferred option to be progressed onto the next stage and beyond. (See Appendix A for Schematic Plans of the Preferred Route).

The existing Kingsway Viaduct, located at the Coal House Junction 67, would need to be widened to accommodate the new improved highway alignment. Kingsway Viaduct is the largest bridge structure on the scheme (total span circa 150m).

This Structures Option Report has been prepared to assess the constraints/challenges associated with the structural widening of Kingsway Viaduct. This report has been brought forward from Stage 3 to Stage 2 to provide more assurance about the scheme and ensure awareness of any potential issues are identified/addressed before they have a significant impact.

The report shall provide a recommendation on the preferred structural solution to be further developed at PCF Stage 3-5 (Preliminary/Detailed Design).

Upon completion and sign off, this report shall provide Highways England with sufficient information/justification for seeking approval/funding to progress the works structure as the scheme progresses.

2. EXISTING STRUCTURE

2.1 GENERAL DESCRIPTION

Kingsway viaduct is defined in SMIS with the following:

- A1/443.30 Kingsway Viaduct, STKEY 16271

Kingsway Viaduct carries the A1 dual 2 lane carriageway with central reserve over the non-navigable River Team and Lamesley roundabout at Junction 67 Coal House. The viaduct is located at OS Grid Reference 424900E, 558550N.

Record drawings indicate the viaduct was constructed circa. 1985.

The viaduct is a 6 span continuous composite steel/concrete structure. The total length is approximately 146m with equal spans of 24.33m. Skew angle on the structure is 0°.

The northbound and southbound carriageway are each 7.3m wide with a 3m wide central reservation. There is a 1m wide hard strip and 1m wide verge to each carriageway. Overall deck width is 23.1m.

The deck constitutes a 220mm thick reinforced concrete slab acting compositely with 9no. steel I beams (914x419x343 UB sections) at 2.75m c/c. The main beams are transversely braced together at the bottom flanges via 120x120x10 EA sections bolted onto gusset plates 5m from each support. At the midspan, the top flanges are braced together with 2no. back to back 76x38 channel sections which are bolted onto a 150x75x12 angle cleat which is welded onto the top flange. The channel/cleat bracing sections are encased within the deck slab.

The deck is supported by piers consisting of 4 tapered reinforced concrete columns connected by a common reinforced concrete crosshead. The end supports comprise reinforced concrete abutments. The intermediate piers and abutments are supported on 750mm diameter reinforced concrete bored piled foundations and pilecaps.

The deck surfacing is 100mm thick (60mm BC & 40mm WC) and the waterproofing consists of a 3mm thick servidek servipak membrane together with a layer of tinted red sand asphalt. There is a 600mm wide asphaltic plug joint at the eastern end of the deck.

The deck is supported on pot bearings – one under each beam. The deck articulation is fixed on the west abutment and free sliding over the intermediate piers and east abutment.

The vehicle parapet on the deck currently comprises a 1m high galvanised steel parapet with N2 containment level (formerly P2, 113). The piers adjacent to the carriageway are currently not protected from vehicle impact by VRS.

There are currently 2 no. 50mm diameter ducts within each carriageway verge and a total of 4 within the central reservation. The carriageway verge ducts currently do not carry any services and the central reserve ducts carry street lighting.

Critical headroom above Lamesley roundabout are 6.05m & 5.56m for span 1 and 6 respectively (last checked on 18 January 2011 by Gateshead Council).

Carriageway drainage constitutes a gully grate with spigot outlet connected to a vertical 150mm diameter UPVC drainpipe cast within each of the edge pier columns. The pipe discharges at the bottom of the pier into a precast concrete channel.

No load restrictions are known to currently exist on the structure.

Refer to location plan and general arrangement drawings attached in Appendix B.

2.2 STATUTORY UNDERTAKERS INFORMATION

Details of existing services within the scheme boundary are shown on the following drawings:

- HE551462-WSP-VUT-BCH-DR-D-00001
- HE551462-WSP-VUT-BCH-DR-D-00002
- HE551462-WSP-VUT-BCH-DR-D-00003

On Kingsway Viaduct, there are currently no services known to be carried through the existing deck. Although record drawings are unclear, street lighting and CCTV are believed to be running within the central reservation.

No services are proposed to be carried within the structure as part of the scheme (TBC).

There are buried services located within the verge in the outer ring of Lamesley roundabout at the western end of the structure underneath span 1. These include:

- Virgin Media Cable (T),
- Northern Power Grid Cable (E),
- Northern Gas Low Pressure (G),
- Northumbrian Water Treated (W).

The following buried services are located within Lamesley roundabout at the eastern end of the structure underneath span 5:

- Northern Power Grid Cable (E).

Regardless of structural option chosen, the aforementioned services may require temporary diversions during construction of substructure extensions.

Refer to statutory undertakers drawings attached in Appendix C.

2.3 INSPECTION SUMMARY

The structures management information system (SMIS) database shows record of the following inspections for the existing structure:

INSPECTION TYPE	INSPECTION DATE	AGENT	INSPECTION REASON
General Inspection	14.07.2014	A-One+ - Area 14	-
Special Inspection	16.03.2013	A-One+ - Area 14	Road traffic accident

Inspection Type	Inspection Date	Agent	Inspection Reason
Special Inspection	11.05.2012	A-One+ - Area 14	Bridge strike due to road traffic collision
General Inspection	02.05.2012	A-One+ - Area 14	-
Special Inspection	11.06.2011	A-One+ - Area 14	Bridge strike to span 1 pier
Principal Inspection	14.12.2010	A-One+ - Area 14	-
Special Inspection	22.05.2009	A-One+ - Area 14	Bridge strike
General Inspection	25.06.2008	A-One+ - Area 14	-
General Inspection	17.01.2007	A-One+ - Area 14	-
Principal Inspection	28.06.2004	A-One+ - Area 14	-
Principal Inspection	23.12.1997	Northumbria Trunk Road Agency Partnership	-
Special Inspection	16.02.1996	Gateshead Council	-
General Inspection	16.10.1995	Gateshead Council	-
Special Inspection	09.12.1994	Gateshead Council	-
General Inspection	20.09.1993	Gateshead Council	-
General Inspection	20.10.1992	Northumbria Trunk Road Agency Partnership	-
Special Inspection	11.06.1992	Gateshead Council	-

Table 1 Kingsway Viaduct Inspection Summary

2.4 PREVIOUS MAINTENANCE WORK UNDERTAKEN

Record information shows the following maintenance work has been carried out on the structure:

- 2011 – Both northbound carriageway joints replaced. Southbound expansion joint nosing replaced.
- 2010 – Drainage repairs carried out. Vegetation cut back. Both southbound carriageway joints replaced.
- 2004 – Patch repairs carried out to the carriageways on the structure approaches. Two sections measuring 30m and 15m in length to the northbound carriageway on the eastern end and a single 30m length to both carriageways on the western end. The repairs were carried out due to the presence of road surface cracks. The deck joint on the western end of the structure was repaired. The asphaltic plug joint at the eastern end of the deck was replaced. New drainage pipes were installed on the north abutment shelf 1m from the edge of the deck on each side. The pipes were installed by coring a 125mm hole within the verge and deck slab that enabled the pipe to be routed.

- 1996 – The structure was resurfaced by planning off 10mm of the existing wearing course and resurfacing with 20mm of ULM thin wearing course system. The west end fixed joint was 'topped up' 10mm by Prismo with Zebraflex joint material.

- 1994 – The deck parapets were painted.

- 1993 – The deck joint at the western end of the structure was replaced by Britflex Ltd. with a zebra joint.

- 1992 – Silane was applied to the exposed faces of the edge beams, abutments, soffits over the road and piers adjacent to the road.

2.5 OUTSTANDING MAINTENANCE WORK

The latest 2014 general inspection report by A-One+ identified the following maintenance actions:

- Parapet rails to be painted – rusted areas treated and repainted,

- Deck expansion joints – to be replaced at both ends,

- Settlement to abutment revetments & embankments – regrade and reset masonry blocks followed by monitoring. Areas of settlement and missing blocks to hard standing area below structure – investigate and repair as necessary,

- Erosion of River Team banks – repair and install fencing,

- Drainage system – minor damage to drainage blocks adjacent to pier 1 to be repaired,

- Structural Bearings – edge girder bearings at both ends of the deck to be painted and those on piers to be touched up as necessary,

- Substructure and parapet edge beams – general concrete crack repairs to be carried out,

- General replacement of any de-bonded sealant on structure,

- Vegetation – general clearance of overgrown plants.

2.6 STRUCTURAL ASSESSMENT

A structural assessment of the existing structure was carried out by WSP as part of the PCF stage 1 exercise. The assessment was carried out in accordance with the Approval In Principle (AIP) dated 27 September 2015.

The assessment concluded the existing structure achieved a load rating of 40T ALL and 45 units HB.

The structure was also assessed for Special Type General Order vehicles (STGO) in accordance with cl.3.10 of BD86/11. SV80, SV100, SV150 vehicles were all checked in the assessment and confirmed to be satisfactory.

Subsequent to the above assessment, Highways England confirmed their requirement for abnormal loads up to and including an SOV350 vehicle to be carried on the structure. A further assessment was carried out which concluded the existing structure to be incapable of carrying the SOV350/ SOV 250 & SV196 Vehicles.

For full details of the structural assessment refer to the Assessment Summary Report No.HE551462-WSP-SBR-BCH-RP-S-1700-005.

2.7 DISCUSSION

From the review of the maintenance work carried out to date, and the information contained within the latest inspection reports, the condition of the existing structure is considered to be fair condition with no significant structural defects.

The table below provides details of the outstanding maintenance work to be incorporated as part of the A1B2CH Kingsway widening works. This has been agreed with the HE SES during the development of the report.

WORK ELEMENT	WORK TO BE UNDERTAKEN AS PART OF THE A1B2CH WIDENING SCHEME	WORKS CONSIDERED AS MAINTENANCE	ESTIMATED COST
Parapet Rails To Be Repainted	YES Note: one side is to be replace for widening – consideration to upgrade parapet both sides during detailed design	NA	£25, 000
Replace Joints	YES	NA	£50, 000
Settlement to Abutment Revetments	No	YES – Suggest to be investigated/rectified now and determine further movement or if its ceased	-
Erosion of River Team Banks Install Fencing	No	Yes	-
Structural Bearing Painting	YES – complete when access is in place.	NA	Price included within maintenance programme
Concrete Repairs to Cracks Parapet Edge Beam	YES – include as part of the VRS upgrade	NA	£7,500
General Replacement of De-bonded Sealant	YES	NA	£1,000
Vegetation Clearance	No	YES – part of the routine maintenance	£3, 000
Maintenance Painting of Beams And Connections	Yes	NA	£200, 000
Note costing information is based on previous similar type works. The HE Cost Estimating Team has not been consulted for any costing information.			

Table 2 Kingsway Viaduct Outstanding Maintenance

If the existing deck is to be re-used then it will be necessary to restrict travel of the SV196/SOV-250/350 abnormal vehicles only within the proposed widened section of the structure to prevent overstress to any of the existing beams. The proposed widened deck section will be designed to sustain the SV196/SOV250&350 vehicles.

Subject to agreement with Highways England would be the proposal to route the SV196/ SOV250 & 350 vehicle along the off/on slip roads at junction 67 to avoid carrying the vehicle over the structure itself. This option would require a swept path analysis to be carried out to determine if the vehicles could navigate around the roundabout at the junction. In addition a structural assessment of the existing River Team culverts (carries the roundabout over the River Team) would be required to confirm the load capacity for the re-routed abnormal loads.

3. GROUND INVESTIGATION

3.1 EXISTING GROUND CONDITIONS

A Geotechnical Design Report is not yet available for the project and will be prepared, defining suitable parameters for the design and acceptable foundations, following completion of a ground investigation at the site. The preliminary choice of foundation solution has been considered appropriate based on the records and findings at the site location, taken from the Preliminary Sources Study Report (PSSR) for the wider Birtley to Coalhouse Scheme (HA544664-WSP-HGT-S01-RP-GE-0600-P-01).

Historical ground investigation data from the British Geological Survey (BGS) and Highways Agency Geotechnical Data Management System (HAGDMS) is available within the vicinity of Kingsway Viaduct, and is presented within the PSSR. With reference to the PSSR, the following ground conditions are anticipated at the viaduct location:

- Made ground: up to 8.40 m thick (associated with the existing highway embankments/abutments), primarily consisting of clay, silt and gravel with occasional boulders; over,
- Alluvium: approximately 1.20 to 7.10 m thick and comprising layers of silty clay interbedded with bands of sand and gravel;
- Glaciolacustrine deposits: base not proven (maximum thickness recorded of 47 m) and primarily consisting of laminated silty clays with localised bands of silt and sand; over,
- Pennine Middle Coal Measures bedrock, although the depth to this stratum has not been proven in the historical borehole records obtained.

Shallow coal seams are recorded as having been worked beneath the site. The shallowest coal seams are the Harvey, Tilley and Top Busty seams, which are expected to be encountered at approximately 65 to 70, 85 to 90 and 95 to 100 m below ground level (m bgl) respectively.

Groundwater strikes were recorded on the available historical borehole records in the vicinity of the Kingsway Viaduct; although no historical groundwater monitoring results have been obtained. Groundwater bodies are indicated in the following strata:

- Perched water bodies encountered within made ground.
- At shallow depths within the alluvium, likely associated with the adjacent River Team; and,
- At a greater depth within the glaciolacustrine deposits.

It is anticipated that groundwater will also be present with the underlying Pennine Middle Coal Measures.

3.2 RISKS ASSOCIATED WITH FOUNDATION WORKS

The geotechnical risks for the wider site are presented within the PSSR. These risks have been reviewed and further assessed in the ‘Live’ Project Risk Registers. Pertinent geotechnical risks in relation to the proposed viaduct foundations are summarised in Table 3.

Risk Cause	Risk Event	Primary Risk Impact	Risk Rating*
Engineering Properties of the Ground	There is a risk that the ground model, and the behaviour of such, is different (worse) from that assumed at this stage.	**Construction** delays and remedial design requirements, and potential cost and programme implications.	**Medium**
Instability of Existing Viaduct	There is a risk that the proposed works may undermine/destabilise the existing viaduct structure. However, this risk is currently considered low, given the existing structure is founded on piles.		**Low**
Instability of Existing Earthworks	There is a risk that the existing earthworks at the site are not as stable as assumed at this stage.		**Medium**
Instability caused by shallow mine workings	There is a risk that the structure will be adversely impacted by collapse of shallow coal mine workings, which may require grouting during construction		**Medium**
Groundwater	There is a risk that the groundwater model is different (worse) from that assumed at this stage.		**Medium**
Contaminated Soils	There is a risk that the assessment of contaminated soils undertaken at this stage is not accurate.		**Medium**
Unexploded Ordnance (UXO)	The site is located within an area of moderate bomb risk; there is a risk that UXO might be encountered beneath the site.	**Construction** delays and requirement for safe deactivation / disposal.	**High**
Buried Services	There is a risk that buried services might be encountered during excavation of proposed foundations.	**Construction** delays and potential cost and programme implications.	**Medium**
** Current assessed level based on Highways England PID and Risk Matrix (v12, August 2015).*			

Table 3 - Geotechnical risks of proposed Kingsway Viaduct foundations

3.3 DETAILS OF ADDITIONAL GROUND INVESTIGATION REQUIRED TO INFORM THE DETAILED DESIGN PROCESS

The PSSR and accompanying Annex A document (HA544664-WSP-HGT-S01-RP-GE-0600-A-02) provides description of proposed ground investigation required to inform the detailed design of an entirely off-line road alignment option. This alignment option is no longer being considered; however the principals of the investigation remain the same. The proposed ground investigation is currently being scoped up and is anticipated to include the following:

- Cable percussion boreholes to rock head to identity ground conditions within the superficial deposits and confirm rockhead levels;
- Rotary cored boreholes to circa 12m below rockhead to determine rock quality and strength;

- Rotary open hole boreholes to circa 30m below rockhead to confirm the presence of coal seams and historical mining; and,

- Additional rotary open hole boreholes to circa 80m bgl to further assess the potential for shallow historical mining beneath the site.

Each of the above ground investigation methodologies may be undertaken at the same location / exploratory hole through follow-on methods, i.e. cable percussion to rockhead; follow-on with rotary core from rockhead to 12m below rockhead; and follow-on with open hole to proposed borehole depth. The current proposed ground investigation includes 17 (seventeen) exploratory hole locations.

The ground investigation shall be reported in a Ground Investigation Report (in line with HD 22/08 once completed.

3.4 ANTICIPATED FOUNDATION REQUIREMENTS FOR STRUCTURAL WIDENING

The final viaduct foundations shall be determined through assessment of the bearing capacity of the founding materials (influenced by the ultimate limit state), settlement analysis of the foundations (influenced by serviceability limit state) and interaction with the existing structure.

Detailed design of any piled solution shall be undertaken by a specialist piling contractor (and reported within a Geotechnical Design Report in line with HA22/08). Whilst this shall be certified accordingly, we note the overall responsibility of the design will remain with the Principal Designer.

Given the potential for loose/soft made ground/near surface natural deposits (alluvium and glaciolacustrine deposits), and the sensitivity of the existing viaduct to ground movements, it is considered likely that a reinforced concrete bored pile solution will be most suitable for the site.

The substructure foundations of the widened structure are proposed to match the existing foundations as closely as possible. The existing foundations comprise 750 mm diameter concrete bored piles and reinforced concrete pile caps. However, given the additional live loading to be accommodated by the proposed extensions, and dependent on the ground conditions encountered during the proposed ground investigation, the new piles may have to be increased in diameter, length and/or number.

The use of other piling techniques may also be appropriate for the scheme and may be proposed by the Contractor.

Given the anticipated shallow coal mine workings beneath the site, it is considered that grouting of these workings may be required during construction. No records have yet been obtained to suggest that the workings were treated as part of the original construction of the viaduct. The extent of such workings (and possibly previous grouting works) will be assessed as part the proposed ground investigation.

4. STRUCTURAL OPTIONS

4.1 GENERAL

The existing deck configuration on Kingsway Viaduct includes 7.3m wide carriageways and 1m wide verges in each direction together with a 3m wide central reservation. The chosen route alignment option will require widening of the deck to accommodate an additional lane in each direction. This will increase each carriageway to 11m wide, the verges will increase to 2.5m wide and the central reservation will be reduced to 1.8m wide (D3UAP in accordance with TD27).

Based on the above the overall cross section of the deck would increase from circa 23m to 30m. There is scope to refine the layout to reduce the overall width however this would require further review at preliminary design. The assessment for four lanes in each direction has not been reviewed for this study. However there appears to be a scope to increase the number of lanes to four based on the provision of reduced lane widths and verges. If required this would be subject to further review of the highway alignment and load bearing capacity of the structure.

As highlighted in section 2 of the report, the existing bridge deck has sufficient capacity to sustain general traffic and abnormal loading up to 150 tonnes without restrictions. No significant defects/structural complexities were identified to suggest extensive improvement/modification works are required to the existing deck for the new alignment. Therefore options requiring complete deck replacement have not been considered in detail. It is anticipated that the benefits associated with complete deck replacement would be disproptionate to the cost and buildablity/programme complexities encountered.

Conventional widening of the existing deck (extending sub structure elements and the deck) would provide a cost effective robust solution for accommodating the new widened highway alignment.

Two configurations have been considered for the structural widening these include.

- Option A: Symmetrical Structural Widening of the Deck
- Option B: Asymmetrical Structural Widening of the Deck

Details of the above are discussed in section 4.2 and 4.3 of the report. Below are some of the generic critical factors that have influenced the development of the two proposed widening configurations.

- Matching the structural form of the existing structure to maintain aesthetic compatibility,
- Considering the buildability and traffic management issues associated with construction over River Team and adjacent to A1,
- Minimising construction depth to achieve headroom,
- Producing a cost effective solution,
- Maintenance requirements of the proposed widened structure are no more onerous than those required to maintain the existing structure in its current condition.

During weekday peak periods and for the whole of peak holiday periods, two full lane widths of 3.25m/3.0m minimum in each direction are to be kept open. It is therefore most likely that some

works to the structure, particularly in the early stages, would be undertaken in off peak periods where traffic can be moved away from the work in progress. The structural assessment showed that contraflow TM configurations (transverse shift in lanes to allow of construction works to one side of the deck) would be permissible to facilitate any structural widening works.

For the existing structure, critical headrooms above Lamesley roundabout are 6.05m & 5.56m for span 1 and 6 respectively. The widened section of the structure should have minimum headroom of 5.3m (Table 6-1, TD27). This gives a headroom margin of 750mm and 260mm for span 1 and span 6 respectively. Allowances shall need to be made for carriageway cross falls and vertical sag curve compensation.

Longitudinal expansion joints between the widening and existing bridge deck could potentially result in significant maintenance problems. Therefore it is assumed the widened bridge deck shall be joined to the existing with an in situ stitch thereby eliminating the requirements for a longitudinal joint that is susceptible to water ingress.

Structural widening of the deck will require substructures to be extended accordingly. In particular the extension to pier 3 (refer to the Appendix B General Arrangement) is in close proximity of the adjacent river bank. It is anticipated that any works to the substructure at this location would need to be constructed with protection in the form of a sheet pile wall along the bank of river Team.

The design of the sheet pile wall structure would need to be determined through assessment of the bending moment and shear force capacities of the piles in the founding materials (influenced by the ultimate limit state), wall deflections and the analysis of settlement behind the structure (influenced by serviceability limit state). This wall could be temporary; alternatively there is a scope to leave it in permanently as a long term scour protection measure. Further consideration shall be given at detail design stage.

4.2 OPTION A: SYMMETRICAL STRUCTURAL WIDENING

This option requires a stitched deck structure to carry the additional lane as part of the mainline carriageway widening works.

Deck widening will be carried out in a symmetrical manner with extensions to both the north and south edges done independently. Refer to the Option A general arrangement drawing attached in Appendix D for details.

It will be necessary to restrict the travel of the SOV350 abnormal vehicle within the proposed widened section of the structure to prevent overstress to any of the existing beams. The proposed widened deck section will be designed to be capable of carrying the SOV350 vehicle.

The existing structural form directly influences the arrangement of the extension. Alternative forms of construction were initially considered but were dismissed in order to maintain construction compatibility and aesthetics. Steel-concrete composite beam and slab construction would be used with beam depths matching the existing as well as the span length configurations. Fabricated steel beams (at closers centres in comparison to the exiting beam centres) would be used rather than rolled sections. This is to enable the design and installation of structurally robust beams to sustain the load effects attributed to the heavier axle loads of the SOV350.

For the substructure it is desirable to eliminate any differential settlement between the old and new sections. A hold period for an agreed duration would be recommended to enable ground settlement monitoring to take place. Due to the prevalent ground conditions, piling of the new substructure extensions would be proposed to match existing.

For the superstructure it is desirable to minimise the zone of influence of the existing deck that is affected by the new widened section of deck. This would be achieved by completing the

construction of the structure extensions offline prior to casting of a final deck stitch section that would tie the new extensions to the existing deck and make the structure composite. To enable the deck stitch to be carried out, the existing parapet, concrete stringcourse beam, edge steel beam and deck slab up to the centre of the first internal beam would be demolished. The stitch section would be constructed in accordance with the guidelines set out in BA82.

The vehicle parapet on the deck will be maintained as a 1m high galvanised steel parapet with N2 containment level.

Headroom above Lamesley roundabout would be reduced by approximately 140mm. This would result in critical headrooms of 5.91m & 5.42m for span 1 and 6 respectively. Therefore the minimum requirement of 5.3m as per TD27 would be achieved.

Generally details and finishes would match those of the existing.

The indicative construction sequence for option A would be as follows:

- Install sheet pile wall to pier 3 along bank of River Team,
- Construct southern substructure extensions including piles, piers and both abutments without disturbing traffic on the A1 northbound carriageway,
- Maintain a 'hold period' to enable the substructure extensions to settle sufficiently to minimise differential settlement between new and old sections,
- Construct new deck section using night time lane closures of part or all of the existing northbound carriageway (i.e. single lane contra-flow),
- Reduce existing northbound carriageway to 6.25m wide (3m/3.25m) to allow a temporary barrier to be installed and push traffic to the inside face of the deck. This would then enable demolition of the existing southern parapet, stringcourse beam and edge steel beam and part of the deck slab,
- Stitch new deck section to the existing deck during a weekend closure of the northbound carriageway (i.e. single lane contra-flow),
- Complete waterproofing and surfacing to the widened northbound deck,
- Divert northbound carriageway onto the newly completed northbound deck,
- Construct northern substructure and deck extensions in a similar method to complete southbound carriageway,
- Reduce newly completed northbound and southbound carriageways to 6.25m wide (3m/3.25m) to allow temporary barriers to be installed and push traffic to the outside face of the deck. This would then enable works to the central reserve and waterproofing/surfacing.

The final construction sequence would be confirmed by the Principal Contractor appointed to construct the works.

The high level construction cost estimate, based on previous similar type schemes is currently £12 million. The HE cost estimating team have not been involved in developing costing information for this report.

4.3 OPTION B: ASYMMETRICAL STRUCTURAL WIDENING

This option is similar to option A, however the deck widening will be carried out in an asymmetrical manner with extension solely to the southern end (Northbound A1 section) of the structure. Refer to the Option B general arrangement drawing attached in Appendix C for details.

It is anticipated this option would have the following advantages in comparison to Option A:

- Minimising the number of traffic management phases due to widening being limited to one side only.
- Reduced costs due to widening of only one edge of the existing deck. The high level construction cost estimate, based on previous similar type schemes is currently £9 million.
- The requirement for additional land take at the J67 Coalhouse south bound merge/diverge would be reduced.
- The requirement for additional retaining wall type structures at the J67 Coalhouse south bound merge/diverge would be reduced
- The shift in alignment to the south would have a positive impact on the skew/span (both reduced) of the new offline Allerdene bridge replacement

One potential disadvantage is the structure would only be future proofed for the routing of the onerous SOV350 loading on the widened section of the northbound carriageway. In the south bound direction the SOV350 would need to be re-routed to avoid crossing the existing deck section.

A feasible solution (subject to swept path analysis/HE Abnormal load team approval) is the routing of the SOV350 off/on the southbound diverge/merge slip roads. This would enable the abnormal load to continue its journey on the A1 north bound without impacting the bridge. This proposal would also be dependent on the assessment of the River Team culverts being completed confirming sufficient load capacity to sustain the re-routed abnormal loads.

The span of the existing River Team box culvert is circa 15m. Initial thoughts are due to the limited span, the SV196/SOV250/350 should be able to pass as the actual applied loads will be significantly less than the overall size of the abnormal load considered (limited axles loads applied at any one time).

Headroom above Lamesley roundabout would be reduced by approximately 240mm. This would result in critical headrooms of 5.81m & 5.32m for span 1 and 6 respectively. Therefore minimum requirement of 5.3m as per TD27 would still be maintained.

The indicative construction sequence for option B would be as follows:

- Install sheet pile wall to pier 3 along bank of River Team,
- Construct southern substructure extensions including piles, piers and both abutments without disturbing traffic on the A1 northbound carriageway,
- Maintain a ‘hold period’ to enable the substructure extensions to settle sufficiently to minimise differential settlement between new and old sections,
- Construct new deck section using night time lane closures of part or all of the existing northbound carriageway (i.e. single lane contra-flow),

- Reduce existing northbound carriageway to 6.25m wide (3m/3.25m) to allow a temporary barrier to be installed and push traffic to the inside face of the deck. This would then enable demolition of the existing southern parapet, stringcourse beam and edge steel beam and part of the deck slab,

- Stitch new deck section to the existing deck during a weekend closure of the northbound carriageway (i.e. single lane contra-flow),

- Complete waterproofing and surfacing to the widened northbound deck,

- Divert northbound carriageway onto the newly completed northbound deck,

- Reduce newly completed northbound and existing southbound carriageway to 6.25m wide (3m/3.25m) to allow temporary barriers to be installed and push traffic to the outside face of the deck. This would then enable works to remove existing central reserve and construct new central reserve and waterproofing/surfacing,

- Once new central reserve complete, move temporary barrier and push traffic to the inside face of the deck. This would enable completion of the northbound/southbound verges.

It is noted that the extension to the piers adjacent to the carriageway will be situated very close to the existing roundabout kerb line. Therefore the roundabout would need to be slightly realigned to accommodate the proposed widening. This shall be reviewed at detailed design stage.

The final construction sequence would be confirmed by the Principal Contractor appointed to construct the works.

The high level construction cost estimate, based on previous similar type schemes is currently £9 million. The HE cost estimating team have not been involved in developing costing information for this report.

5. COMPARISON OF THE STRUCTURAL WIDENING OPTIONS

5.1 ASSESSMENT OF OPTIONS

The options have been compared based on the following;

- Initial Capital Cost
- Whole Life Cost
- Programme Length
- Buildability
- Disruption to A19 traffic
- H&S/Risks
- Environmental Impact
- Aesthetics

These factors have been scored on a scale of 1-3. A score of 1 represents a poor performance, 2 average and 3 represents the best performance on a given factor.

The option with the highest cumulative score is considered the most viable solution.

5.2 RANKING TABLE

The table below sets out the scores attributed to the key factors assessed and compared for each of the options.

KEY FACTORS	OPTION A – SYMMETRICAL STRUCTURAL WIDENING	OPTION – B ASYMMETRICAL STRUCTURAL WIDENING
Initial Capital Cost	2	3
Whole Life Cycle Cost (WLC)	2	2
Programme	2	3
Buildability	2	3
Disruption to A1 Traffic/TM complexities during construction	2	3
Disruption to Abnormal Loads during operation	3	2
H&S/Risk	2	3
Environmental Impact	2	2
Aesthetic	2	2

KEY FACTORS	OPTION A – SYMMETRICAL STRUCTURAL WIDENING	OPTION – B ASYMMETRICAL STRUCTURAL WIDENING
Total scores	**19**	**23**

Table 4 Ranking Table for Proposed Options A-B

The rationale behind the scoring is as follows:

- Initial Capital Cost – Option B received the highest score, as this option is considered to be more cost effective

- WLC – Detailed WLC analysis was not required. Based on engineering judgement it is clear that both widening options would require similar long term operations/investment regarding maintenance (renewal of bearing/painting/waterproofing/joints etc). In addition the access issues would be similar for both options. Overall the two options are considered to be similar with regards maintenance liabilities and therefore were scored equally.

- Construction Programme – Option B received the highest score, as the estimated construction programme is expected to be shorter in comparison to Option A. This was based on Option A being more complex due to structural widening and TM phasing to facilitate works, being required on both sides of the existing bridge.

- Buildability – Option B received the highest score due to the works only being required to one side of the bridge.

- Disruption to the A1/TM complexities – Both options requires traffic management to safely undertake the deck widening works. Ultimately Option B scored higher as the TM requirements/phasing would be simplified in comparison to option A.

- Disruption to abnormal loads during operation – Option A scored higher simply because the SOV350 could remain on the A1 when travelling in both directions of the A1.

- H&S/Risk – In situ works to both sides of the deck (demolition and concreting operations) in additional to the anticipated extended construction programme means Option A is considered to be more risk averse in comparison to Option B. The reduced exposure to construction risks resulted in Option B being allocated a more favourable score.

- Environmental Impact – The two options were scored equally as both involve working over water and shall require similar systems of works and protection to prevent contamination of the watercourse.

- Aesthetics – The aesthetics is limited to providing a functional design that is compatible with the existing structure. This is similar for both options and therefore equal scores have been allocated.

Based on the scores above, Option B; Asymmetrical Structural Widening is considered the most favourable option.

The comparison shows both options to be very similar. However by limiting the structural widening to only one side would reduce the complexity/duration and subsequent cost associated with the works to Kingsway viaduct for the improvement works.

6. CONCLUSION & RECOMMENDATIONS

6.1 CONCLUSION

The overall cross section of the deck needs to be increased from circa 23m to 30m to accommodate the new highway alignment for the improvement works.

The existing bridge deck has sufficient capacity to sustain general traffic and abnormal loading up to 150 tonnes without restrictions. No significant defects/structural complexities were identified to suggest extensive improvement/modification works are required to the existing deck for the new alignment. Therefore options requiring complete deck replacement have not been considered in detail. It is anticipated that the benefits associated with complete deck replacement would be disproportionate to the cost and buildablity/ programme complexities encountered.

Conventional widening of the existing deck (extending sub structure elements and the deck) would provide a cost effective robust solution for accommodating the new widened highway alignment.

Two configurations have been considered for the structural widening including;

- Option A: Symmetrical Structural Widening of the Deck- Estimated Cost £12million
- Option B: Asymmetrical Structural Widening of the Deck (Southern End) - Estimate Cost £9million

The comparison shows both options to be very similar. However by limiting the structural widening to only one side would reduce the complexity/duration and subsequent cost associated with the works required to Kingsway viaduct for the improvement works.

6.2 RECOMMENDATION

Based on the study to date, it is recommended that Asymmetrical Structural Widening of Kingsway Viaduct (southern end, northbound deck) be undertaken to increase the lane capacity over the bridge. The structural widening shall comprise a steel composite deck extension that shall be stitched to the existing deck.

The structure would be future proofed for the routing of the onerous SV196/ SOV250 & 350 loading on the widened section of the northbound carriageway. In the southbound direction the abnormal loads would need to be re-routed to avoid crossing the existing deck section. A feasible solution (subject to swept path analysis/HE Abnormal load team approval) is the routing of the SV196/ SOV250 & 350 off/on the southbound diverge/merge slip roads. This would enable the abnormal loads to continue its journey on the A1 northbound without impacting the bridge.

A structural assessment of the existing River Team culverts (carries the roundabout over the River Team) would be required to confirm the load capacity for the re-routed abnormal loads around the roundabout.

It is recommended the following works be progressed to verify the findings of this report:

- Swept Path Analysis: Confirm the SOV350 can be routed off/on the diverge/merge slip roads without any major complications

- Assessment of the River Team culverts for the desired abnormal loads.

Appendix A

INDICATIVE SCHEMATIC PLANS OF PREFERRED ROUTE

Appendix A-1

INDICATIVE SCHEMATIC PLANS OF THE PREFERRED ROUTE

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DO NOT SCALE

Millimetres 0 10 100

A1

Showing indicatively Gantries SG001&SG002 at chainages -1460 & -480 respectively
AIP - Tubular Steel Cantilever Gantries
STKEY TBC
Ref SOR09

Gantry SG003
AIP - Tubular Steel Cantilever Gantry
STKEY TBC
Ref SOR09

Retaining wall 1
AIP - Reinforced Concrete Wall
STKEY TBC
Ref SOR10

Gantry SG004
AIP - Long Span Truss Type Cantilever Gantry
STKEY TBC
Ref SOR09

Gantry SG005
AIP - Super Span Truss Portal Gantry
STKEY TBC
Ref SOR09

Kingsway Viaduct Underbridge
OS Grid Ref: 424900E, 558550N
STKEY 16271
Structure No. A1/433.30
AIP - Kingsway Viaduct
Ref SOR01

JUNCTION 67 - COALHOUSE
(424955,558553)

Retaining wall 5
AIP - Continuous Bored Piles Retaining Wall
STKEY TBC
Ref SOR10

Gantry SG006
AIP - Long Span Truss Type Cantilever Gantry
STKEY TBC
Ref SOR09

Retaining wall 2
AIP - Sheet Piles Retaining Wall
STKEY TBC
Ref SOR10

CR Retaining wall 1
STKEY TBC
Ref SOR10

Retaining wall 3
AIP - Reinforced Earth Retaining Wall
STKEY TBC
Ref SOR10

Retaining wall 4
AIP - Reinforced Earth Retaining Wall
STKEY TBC
Ref SOR10

Allerdene Culvert
OS Grid Ref: 425370E, 558520N
STKEY 8879
Structure No. A1/443.30
AIP - Allerdene Culvert
Ref SOR02

Allerdene Railway Underbridge
OS Grid Ref: 425480E, 558489N
STKEY 8880
Structure No. A1/443.00/Q
AIP - Allerdene Railway Bridge
Ref SOR03

Smithy Lane Overbridge
OS Grid Ref: 425760E, 558280N
STKEY 16439
Structure No. A1/442.50
AIP - Smithy Lane Overbridge
Ref SOR04

Gantry SG009
AIP - Long Span Truss Type Cantilever Gantry
STKEY TBC
Ref SOR09

Gantry SG007
AIP - Super Span Truss Portal Gantry
STKEY TBC
Ref SOR09

Gantry SG008
AIP - Long Span Truss Type Cantilever Gantry
STKEY TBC
Ref SOR09

ALLERDENE CULVERT EXTENSION AND DRAINAGE DITCH TO BE REALIGNED.

PROPOSED ALLERDENE UNDERBRIDGE TO BE CONSTRUCTED OFFLINE.

Gantry SG010
AIP - Long Span Truss Type Cantilever Gantry
STKEY TBC
Ref SOR09

KEY

- EXISTING STRUCTURE
- PROPOSED STRUCTURE
- PROPOSED RETAINING WALL
- PROPOSED HIGHWAYS FENCE LINE
- RETAINED EXISTING HIGHWAYS FENCE LINE
- REMOVED EXISTING HIGHWAYS FENCE LINE
- NEW CARRIAGEWAY CONSTRUCTION
- EXISTING CARRIAGEWAY TO BE RETAINED
- PROPOSED DRAINAGE DITCH
- NETWORK RAIL LAND BOUNDARY

Rev.	Date	Description	By	Chk'd	App'd
P01	05/09/16	FOR INFORMATION	JAC		
P02	07/09/16	MINOR AMENDMENTS TO EMKS & STRUCTURES, CHAINAGE ADDED	JWL	CP	NGR
P03	07/09/16	ISSUED FOR PUBLIC CONSULTATION	JWL	SG	NGR
P04	10/02/17	DESIGN DEVELOPMENT POST PUBLIC CONSULTATION	JWL	SG	NGR

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Client: Working on behalf of highways england

Project Title: A1 BIRTLEY TO COALHOUSE

Drawing Title: OPTION 1A - OFFLINE REPLACEMENT OF ALLERDENE RAILWAY BRIDGE WITH RETENTION OF COAL HOUSE JCT GENERAL ARRANGEMENT SHEET 1 OF 3

Scale	Drawn	Checked	Approved	Authorised
1:1250	J.Longmore	S.Ghosh	N.Rawcliffe	---
Original Size	Date	Date	Date	Date
A1	10/02/17	10/02/17	10/02/17	---

Drawing Status: INITIAL STATUS OR WIP — Suitability: S0

Drawing Number: Project HE551462 | Originator WSP | Volume HGN | Location BCH | Type DR | Role D | Number 10004 | Project Ref. No. | Revision P04

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Millimetres 100 0 10

DO NOT SCALE

A1

CR Retaining wall 2
STKEY TBC
Ref SOR10

Gantry SG011
AIP - Long Span Truss Type Cantilever Gantry
STKEY TBC
Ref SOR09

Gantry SG013
AIP - Super Span Truss Portal Gantry
STKEY TBC
Ref SOR09

Gantry SG012
AIP - Long Span Truss Type Cantilever Gantry
STKEY TBC
Ref SOR09

CR Retaining wall 3
STKEY TBC
Ref SOR10

Eighton Lodge Slip Road Underbridge
OS Grid Ref: 426527E, 557592N
STKEY 16441
Structure No. A1/440.90//6
AIP - Widening of Eighton Lodge North & Slip Road Underbridges
Ref SOR05

ANGEL OF THE NORTH

A167 DURHAM ROAD

EXTENT OF WORKS

CUTTING B

CUTTING C

CUTTING D

A1 SB

A1 NB

KEY

- EXISTING STRUCTURE
- PROPOSED STRUCTURE
- PROPOSED HIGHWAYS FENCE LINE
- EXISTING HIGHWAYS FENCE LINE
- REMOVED EXISTING HIGHWAYS FENCE LINE
- NEW CARRIAGEWAY CONSTRUCTION
- EXISTING CARRIAGEWAY TO BE RETAINED
- PROPOSED FOOTPATH DIVERSION
- EXISTING FOOTPATH
- PROPOSED SIGNAL
- EXISTING SIGNAL

Gantry SG014
AIP - Super Span Truss Portal Gantry
STKEY TBC
Ref SOR09

Eighton Lodge North Underbridge
OS Grid Ref: 426682E, 557517N
STKEY 16440
Structure No. A1/441.00
AIP - Widening of Eighton Lodge North & Slip Road Underbridges
Ref SOR05

JUNCTION 66 - EIGHTON LODGE
(426739,557494)

Eighton Lodge South Underbridge
OS Grid Ref: 426801E, 557466N
STKEY 8883
Structure No. A1/440.90
AIP - Widening of Eighton Lodge South Bridge
Ref SOR05

Longbank Bridleway Underbridge
OS Grid Ref: 427169E, 557294N
STKEY 26280
Structure No. A1/440.80
AIP - Longbank Underpass
Ref SOR06

Gantry SG016
AIP - Super Span Truss Portal Gantry
STKEY TBC
Ref SOR09

B1296 LONG BANK

A167 DURHAM ROAD

EXTENT OF WORKS

EXTENT OF WORKS

EXTENT OF WORKS

A1 SB

A1 NB

CUTTING C

CUTTING D

EIGHTON LODGE CULVERT; STRUCTURE KEY 15468. STRUCTURE IS APPROXIMATELY 18m BELOW GROUND LEVEL SO WILL BE UNAFFECTED.

A167 NEWCASTLE BANK

Gantry SG015
AIP - Super Span Truss Portal Gantry
STKEY TBC
Ref SOR09

CR Retaining wall 4
STKEY TBC
Ref SOR10

Gantry SG017
AIP - Long Span Truss Type Cantilever Gantry
STKEY TBC
Ref SOR09

NORTH DENE

LONG BANK

Rev.	Date	Description	By	Chk'd	App'd
P01	05/09/16	FOR INFORMATION	JAC		
P02	07/09/16	MINOR AMENDMENTS TO BNKS & STRUCTURES, CHAINAGE ADDED	JWL	CP	NGR
P03	07/09/16	ISSUED FOR PUBLIC CONSULTATION	JWL	SG	NGR
P04	10/02/17	DESIGN DEVELOPMENT POST PUBLIC CONSULTATION	JWL	SG	NGR

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Project Title
A1 BIRTLEY TO COALHOUSE

Drawing Title
OPTION 1A - OFFLINE REPLACEMENT OF ALLERDENE RAILWAY BRIDGE WITH RETENTION OF COAL HOUSE JCT GENERAL ARRANGEMENT SHEET 2 OF 3

Scale	Drawn	Checked	Approved	Authorised
1:1250	J.Longmore	S.Ghosh	N.Rawcliffe	---
Original Size	Date	Date	Date	Date
A1	10/02/17	10/02/17	10/02/17	---

Drawing Status: INITIAL STATUS OR WIP
Suitability: S0

Drawing Number
Project: HE551462 | Originator: WSP | Volume: HGN
Location: BCH | Type: DR | Role: D | Number: 10005
Project Ref. No.
Revision: P04

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DO NOT SCALE

Millimetres 100 0 10

A1

North Dene Footbridge
OS Grid Ref: 427538E, 557089N
STKEY 8886
Structure No. A1/440.30
AIP - North Dene Footbridge
Ref SOR07

Gantry SG018
AIP - Long Span Truss Type Cantilever Gantry
STKEY TBC
Ref SOR09

Retaining wall 6
AIP- King Post Retaining Wall
STKEY TBC
Ref SOR10

Gantry SG020
AIP - Super Span Truss Portal Gantry
STKEY TBC
Ref SOR09

Gantry SG019
AIP - Super Span Truss Portal Gantry
STKEY TBC
Ref SOR09

NEW BUILDING DEVELOPEMENT

CRATHIE

A1 SB
A1 NB
CUTLINE E
CUTLINE E

3700.000 3600.000 3500.000 4000.000 4100.000 4200.000 4300.000 4400.000

EXTENT OF WORKS

North Side Overbridge
OS Grid Ref: 428090E, 556770N
STKEY 8887
Structure No. A1/439.70
AIP - North Side Bridge
Ref SOR08

JUNCTION 65 - BIRTLEY
(428150,556714)

A1231 SB
A1231 NB
A1(M) SB
A1(M) NB
A194(M) NB

4300.000 4400.000 4500.000 4600.000 4700.000 4800.000 4900.000 5000.000

KEY

- EXISTING STRUCTURE
- PROPOSED RETAINING WALL
- PROPOSED HIGHWAYS FENCE LINE
- EXISTING HIGHWAYS FENCE LINE
- REMOVED EXISTING HIGHWAYS FENCE LINE
- NEW CARRIAGEWAY CONSTRUCTION
- EXISTING CARRIAGEWAY TO BE RETAINED
- PROPOSED FOOTPATH DIVERSION
- EXISTING FOOTPATH
- PROPOSED SIGNAL
- EXISTING SIGNAL

Rev.	Date	Description	By	Chk'd	App'd
P01	05/09/16	FOR INFORMATION	JAC		
P02	07/09/16	MINOR AMENDMENTS TO EWKS & STRUCTURES, CHAINAGE ADDED	JWL	CP	NGR
P03	07/09/16	ISSUED FOR PUBLIC CONSULTATION	JWL	SG	NGR
P04	10/02/17	DESIGN DEVELOPMENT POST PUBLIC CONSULTATION	JWL	SG	NGR

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Project Title
A1 BIRTLEY TO COALHOUSE

Drawing Title
OPTION 1A - OFFLINE REPLACEMENT OF ALLERDENE RAILWAY BRIDGE WITH RETENTION OF COAL HOUSE JCT GENERAL ARRANGEMENT SHEET 3 OF 3

Scale	Drawn	Checked	Approved	Authorised
1:1250	J.Longmore	S.Ghosh	N.Rawcliffe	---
Original Size	Date	Date	Date	Date
A1	10/02/17	10/02/17	10/02/17	---

Drawing Status: INITIAL STATUS OR WIP
Suitability: S0

Drawing Number
Project: HE551462 | Originator: WSP | Volume: HGN
Location: BCH | Type: DR | Role: D | Number: 10006
Project Ref. No.
Revision: P04

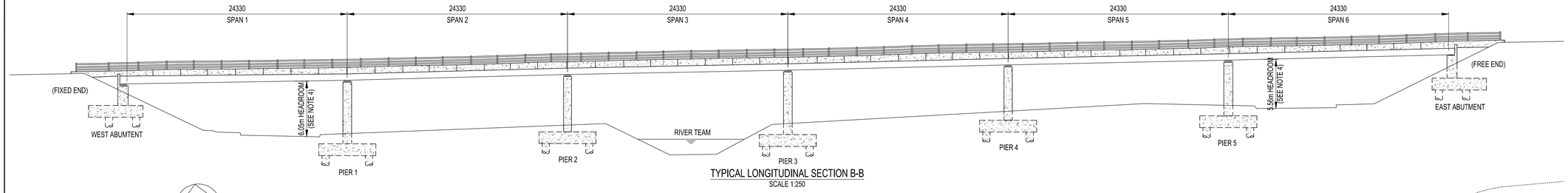
Appendix B

EXISTING INFORMATION

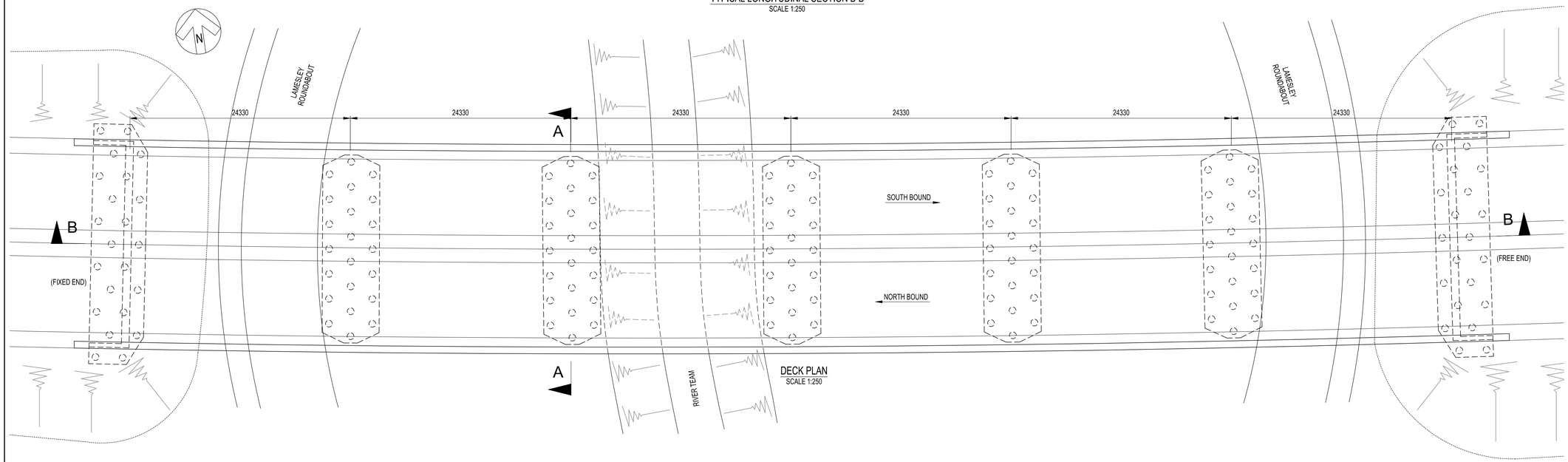
highways england

Appendix B-1

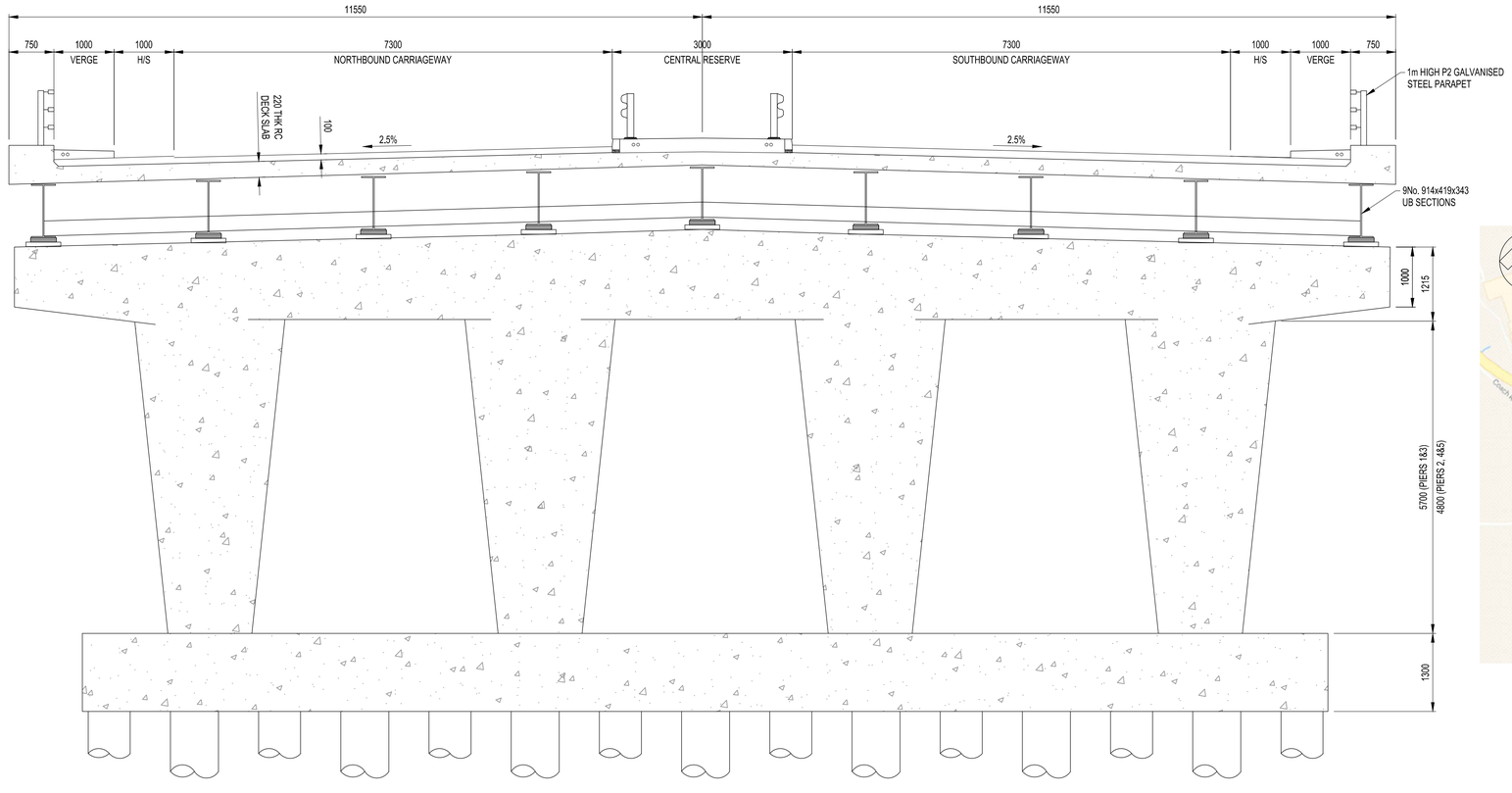
EXISTING GENERAL ARRANGEMENT DRAWINGS



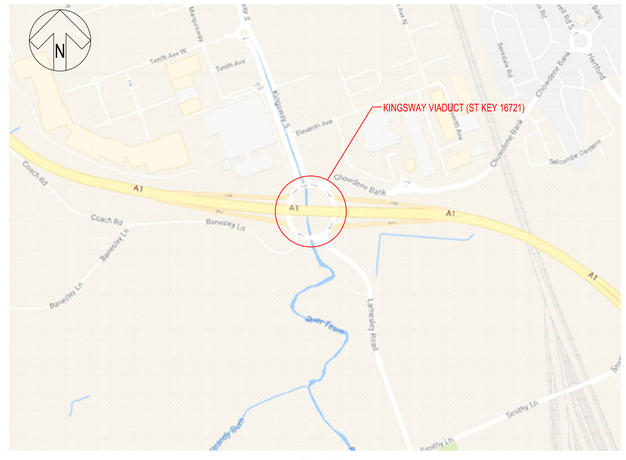
TYPICAL LONGITUDINAL SECTION B-B
SCALE 1:250



DECK PLAN
SCALE 1:250



TYPICAL PIER CROSS SECTION A-A
SCALE 1:50



LOCATION PLAN
NTS

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METERS A.O.D UNLESS NOTED OTHERWISE.
3. DO NOT SCALE IN CASE OF ANY DOUBTS, OMISSIONS OR ERRORS, SEEK CLARIFICATION FROM DESIGNERS.
4. EXISTING STRUCTURE HEADROOM LAST CHECKED ON 18/01/2011 AND MAINTAINED BY GATESHEAD COUNCIL.

SAFETY, HEALTH AND ENVIRONMENTAL SYMBOL LEGEND

INDICATES A RESIDUAL RISK AS A WARNING

Suit	Rev	Date	Description	Des	Chk	App

Designer

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Tel: +44 (0)113 395 6200, Fax: +44 (0)113 395 6201
http://www.wspgroup.com

Client

highways england

Project Title

A1 BIRTLEY TO COAL HOUSE

Drawing Title

KINGSWAY VIADUCT
EXISTING GENERAL ARRANGEMENT

Scale	Drawn	Designed	Checked	Approved	
AS SHOWN @ A1	RA	IM	RM	HM	
Size	Date	Date	Date	Date	
A1	26/01/2017	26/01/2017	26/01/2017	26/01/2017	

Status: PRELIMINARY

Suitability: S0

Drawing Number: HE551462-WSP-SBR-BCH-SK-S-1700-000

Revision: P01

DO NOT SCALE

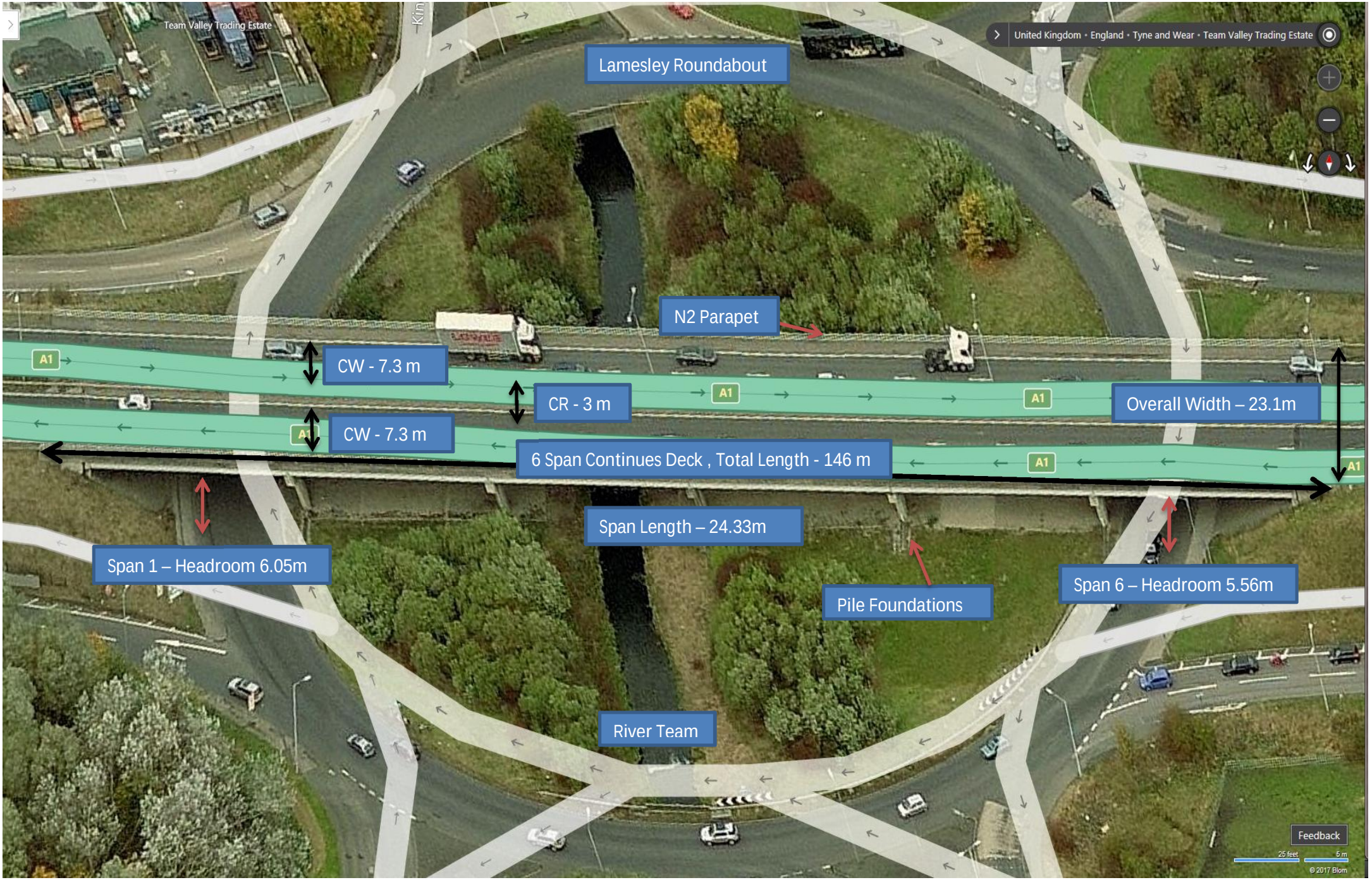
A1

Suitability: S0
Drawing Number: HE551462-WSP-SBR-BCH-SK-S-1700-000
Rev: P01

highways england

Appendix B-2

PHOTOGRAPHS OF EXISTING FEATURES


Team Valley Trading Estate
United Kingdom • England • Tyne and Wear • Team Valley Trading Estate
Lamesley Roundabout
N2 Parapet
CW - 7.3 m
CR - 3 m
CW - 7.3 m
Overall Width – 23.1m
6 Span Continues Deck , Total Length - 146 m
Span Length – 24.33m
Span 1 – Headroom 6.05m
Pile Foundations
Span 6 – Headroom 5.56m
River Team
A1
Feedback
© 2017 Blom

Appendix C

STATUTORY UNDERTAKES INFORMATION

Appendix C-1

STATUTORY UNDERTAKERS DRAWINGS

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DO NOT SCALE

Millimetres 100 0 10

A1

JUNCTION 67 - COALHOUSE
(424955,558553)

KINGSWAY VIADUCT UNDERBRIDGE; STRUCTURE KEY 16271. STRUCTURE TO BE WIDENED TO ACCOMMODATE PROPOSED CARRIAGEWAY WIDTH.

ALLERDENE CULVERT; STRUCTURE KEY 8879. STRUCTURE TO BE EXTENDED TO ACCOMMODATE PROPOSED ALIGNMENT.

ALLERDENE RAILWAY UNDERBRIDGE; STRUCTURE KEY 8880. BRIDGE TO BE DEMOLISHED FOLLOWING THE CONSTRUCTION OF THE OFFLINE REPLACEMENT.

SMITHY LANE OVERBRIDGE; STRUCTURE KEY 16439. RETENTION / REPLACEMENT OF BRIDGE AND REALIGNMENT OF SMITHY LANE TO BE CONFIRMED DURING DESIGN DEVELOPMENT. INDICATIVE LOCATION SHOWN FOR POTENTIAL REPLACEMENT BRIDGE.

RIVER TEAM CULVERT - TO BE EXTENDED TO ACCOMMODATE NEW JUNCTION LAYOUT.

ALLERDENE CULVERT EXTENSION AND DRAINAGE DITCH TO BE REALIGNED.

PROPOSED ALLERDENE UNDERBRIDGE TO BE CONSTRUCTED OFFLINE.

KEY

- EXISTING STRUCTURE
- PROPOSED STRUCTURE
- PROPOSED RETAINING WALL
- PROPOSED HIGHWAYS FENCE LINE
- EXISTING HIGHWAYS FENCE LINE
- NEW CARRIAGEWAY CONSTRUCTION
- EXISTING CARRIAGEWAY TO BE RETAINED
- NETWORK RAIL LAND BOUNDARY
- PROPOSED DRAINAGE DITCH
- PROPOSED FOOTPATH DIVERSION
- EXISTING FOOTPATH
- PROPOSED SIGNAL
- EXISTING SIGNAL
- BT — BT DUCT
- IC — INSTALCOM
- W — NORTHUMBRIAN WATER COMBINED
- W — NORTHUMBRIAN WATER FOUL
- W — NORTHUMBRIAN WATER ABANDONED
- W — NORTHUMBRAIN WATER SURFACE
- W — NORTHUMBRIAN WATER TREATED
- W — NORTHUMBRIAN WATER DISTRIBUTION
- W — NON NORTHUMBRIAN WATER PRIVATE
- G — NORTHERN GAS LOW PRESSURE
- G — NORTHERN GAS MEDIUM PRESSURE
- G — NORTHERN GAS INTERMEDIATE PRESSURE
- G — NORTHERN GAS REGIONAL HIGH PRESSURE
- T — VIRGIN MEDIA CABLE
- E — NORTHHERN POWER GRID CABLE
- C — VODAFONE CABLE
- IC01 — UTILITY REFERNCE

NOTES

1. LOCATION OF SERVICE PLANT SHOWN ON THIS DRAWING HAS BEEN OBTAINED FROM C2 STATUTORY UNDERTAKERS RETURNS AND IS SHOWN INDICATIVELY. THE STATUTORY UNDERTAKERS ARE TO SATISFY THEMSELVES OF THE LOCATION AND EXTENTS OF SERVICE PLANT.
2. REFER TO SECTION 3.10 OF THE TECHNICAL APPRAISAL REPORT FOR DETAILS OF THE DIVERSION WORKS PROPOSED.
3. ALL DIAMETERS OF WATER MAINS ARE MEASURED IN MILLIMETERS UNLESS OTHERWISE STATED.

Rev.	Date	Description	By	Chk'd	App'd
P01.1	14/12/16	DRAFT	---	---	---

WSP
PARSONS BRINCKERHOFF
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Millshaw Park Lane,
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LS11 0DL
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Client
Working on behalf of
highways england

Project Title
A1 BIRTLEY TO COALHOUSE

Drawing Title
OPTION 1A - OFFLINE REPLACEMENT OF ALLERDENE RAILWAY BRIDGE
EXISTING STATUTORY UNDERTAKERS APPARATUS

DRAFT

Scale	Designed	Checked	Authorised
1:12	---	---	---
Original Size	Drawn	Date	Date
A1	---		---

Drawing Status: Initial Status of WIP
Suitability: S0

Drawing Number
Project: HE551462
Originator: WSP
Volume: VUT
Location: BCH
Type: DR
Role: D
Number: 00001
Project Ref. No.
Revision: P01.1

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Millimetres 100 0 10

DO NOT SCALE

A1

ANGEL OF THE NORTH

A167 DURHAM ROAD

A1 SB

A1 NB

EXTENT OF WORKS

CUTLINE B

CUTLINE C

CUTLINE D

EIGHTON LODGE SLIP ROAD UNDERBRIDGE; STRUCTURE KEY 16441. STRUCTURE TO BE WIDENED TO ACCOMMODATE PROPOSED CARRIAGEWAY WIDTH.

B1296 LONG BANK

JUNCTION 66 - EIGHTON LODGE (426739,557494)

NG109

VF102

V104

V105

NG110

EIGHTON LODGE NORTH UNDERBRIDGE; STRUCTURE KEY 16440. STRUCTURE TO BE WIDENED TO ACCOMMODATE PROPOSED CARRIAGEWAY WIDTH.

EIGHTON LODGE SOUTH UNDERBRIDGE; STRUCTURE KEY 8883. STRUCTURE TO BE WIDENED TO ACCOMMODATE PROPOSED CARRIAGEWAY WIDTH.

LONGBANK BRIDLEWAY UNDERBRIDGE; STRUCTURE KEY 26280. STRUCTURE TO BE EXTENDED TO ACCOMMODATE PROPOSED CARRIAGEWAY ALIGNMENT.

NW110

NW111

NP108

BT107

NORTH DENE

LONG BANK

EIGHTON LODGE CULVERT; STRUCTURE KEY 15468. STRUCTURE IS APPROXIMATELY 18m BELOW GROUND LEVEL SO WILL BE UNAFFECTED.

A167 NEWCASTLE BANK

KEY

- EXISTING STRUCTURE
- PROPOSED STRUCTURE
- PROPOSED RETAINING WALL
- PROPOSED HIGHWAYS FENCE LINE
- EXISTING HIGHWAYS FENCE LINE
- NEW CARRIAGEWAY CONSTRUCTION
- EXISTING CARRIAGEWAY TO BE RETAINED
- NETWORK RAIL LAND BOUNDARY
- PROPOSED DRAINAGE DITCH
- PROPOSED FOOTPATH DIVERSION
- EXISTING FOOTPATH
- PROPOSED SIGNAL
- EXISTING SIGNAL
- BT — BT DUCT
- IC — INSTALCOM
- W — NORTHUMBRIAN WATER COMBINED
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- W — NORTHUMBRAIN WATER SURFACE
- W — NORTHUMBRIAN WATER TREATED
- W — NORTHUMBRIAN WATER DISTRIBUTION
- W — NON NORTHUMBRIAN WATER PRIVATE
- G — NORTHERN GAS LOW PRESSURE
- G — NORTHERN GAS MEDIUM PRESSURE
- G — NORTHERN GAS INTERMEDIATE PRESSURE
- G — NORTHERN GAS REGIONAL HIGH PRESSURE
- T — VIRGIN MEDIA CABLE
- E — NORTHHERN POWER GRID CABLE
- C — VODAFONE CABLE
- IC01 — UTILITY REFERNCE

NOTES

1. LOCATION OF SERVICE PLANT SHOWN ON THIS DRAWING HAS BEEN OBTAINED FROM C2 STATUTORY UNDERTAKERS RETURNS AND IS SHOWN INDICATIVELY. THE STATUTORY UNDERTAKERS ARE TO SATISFY THEMSELVES OF THE LOCATION AND EXTENTS OF SERVICE PLANT.
2. REFER TO SECTION 3.10 OF THE TECHNICAL APPRAISAL REPORT FOR DETAILS OF THE DIVERSION WORKS PROPOSED.
3. ALL DIAMETERS OF WATER MAINS ARE MEASURED IN MILLIMETERS UNLESS OTHERWISE STATED.

Rev.	Date	Description	By	Chk'd	App'd
P01.1	14/12/16	DRAFT	---	---	---

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www.wsp-pb.com

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Client: Working on behalf of highways england

Project Title: A1 BIRTLEY TO COALHOUSE

Drawing Title: OPTION 1A - OFFLINE REPLACEMENT OF ALLERDENE RAILWAY
EXISTING STATUTORY UNDERTAKERS APPARATUS

DRAFT

Scale: 1:12	Drawn: ---	Checked: ---	Authorised: ---
Original Size: A1	Date: ---	Date: ---	Date: ---
Drawing Status: Initial Status or WIP			Suitability: S0

Drawing Number Project	Originator	Volume	Project Ref. No.
HE551462	WSP	VUT	
BCH Location	DR Type	D Role	00002 Number
			Revision: P01.1

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Millimetres 100 0 10

DO NOT SCALE

A1

NORTH DENE FOOTBRIDGE; STRUCTURE KEY 8886. STRUCTURE TO BE TAKEN DOWN AND REPLACED.

NORTH SIDE OVERBRIDGE; STRUCTURE KEY 8887. THE PROPOSED ALIGNMENT MUST FIT BETWEEN THE EXISTING SUPPORTS TO AVOID RECONSTRUCTION.

NEW BUILDING DEVELOPEMENT

JUNCTION 65 - BIRTLEY
(428150,556714)

BT108 BT109 BT110

NP109 NP110 NP111 NP113

NW112 NW113 NW114

V106 V107

CRATHIE

EXTENT OF WORKS

A1 SB A1 NB A1(M) SB A1(M) NB A1231 SB A1231 NB

CUTLINE A CUTLINE B CUTLINE C CUTLINE D CUTLINE E

KEY

- EXISTING STRUCTURE
- PROPOSED STRUCTURE
- PROPOSED RETAINING WALL
- PROPOSED HIGHWAYS FENCE LINE
- EXISTING HIGHWAYS FENCE LINE
- NEW CARRIAGEWAY CONSTRUCTION
- EXISTING CARRIAGEWAY TO BE RETAINED
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- E — NORTHHERN POWER GRID CABLE
- C — VODAFONE CABLE
- IC01 — UTILITY REFERNCE

NOTES

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3. ALL DIAMETERS OF WATER MAINS ARE MEASURED IN MILLIMETERS UNLESS OTHERWISE STATED.

Rev.	Date	Description	By	Chk'd	App'd
P01.1	14/12/16	DRAFT	---	---	---

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LS11 0DL
Tel: +44 (0)113 395 6200
www.wsp-pb.com

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Client: Working on behalf of highways england

Project Title: A1 BIRTLEY TO COALHOUSE

Drawing Title: OPTION 1A - OFFLINE REPLACEMENT OF ALLERDENE RAILWAY BRIDGE
EXISTING STATUTORY UNDERTAKERS APPARATUS

DRAFT

Scale 1:1	Drawn	Checked	Authorised ---
Original Size A1		Date	Date ---
Drawing Status			Suitability
Initial Status of WIP			S0

Drawing Number				Project Ref. No.
Project	Originator	Volume		
HE551462	WSP	VUT		Revision
Location BCH	Type DR	Role D	Number 00003	P01.1

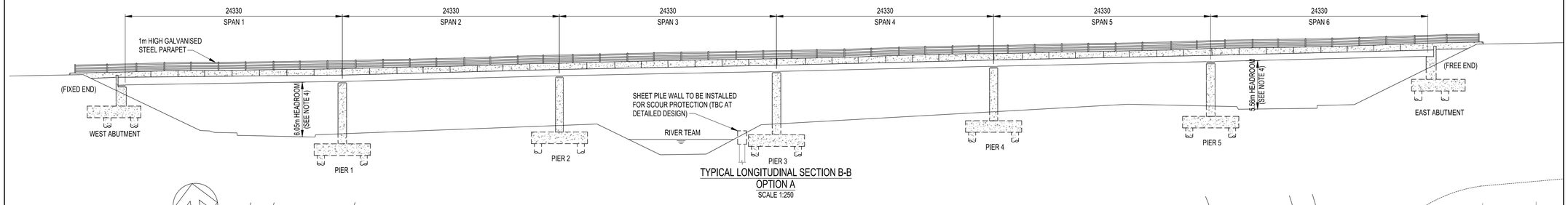
Appendix D

DRAWINGS FOR PROPOSED STRUCTURAL WIDENING OPTIONS

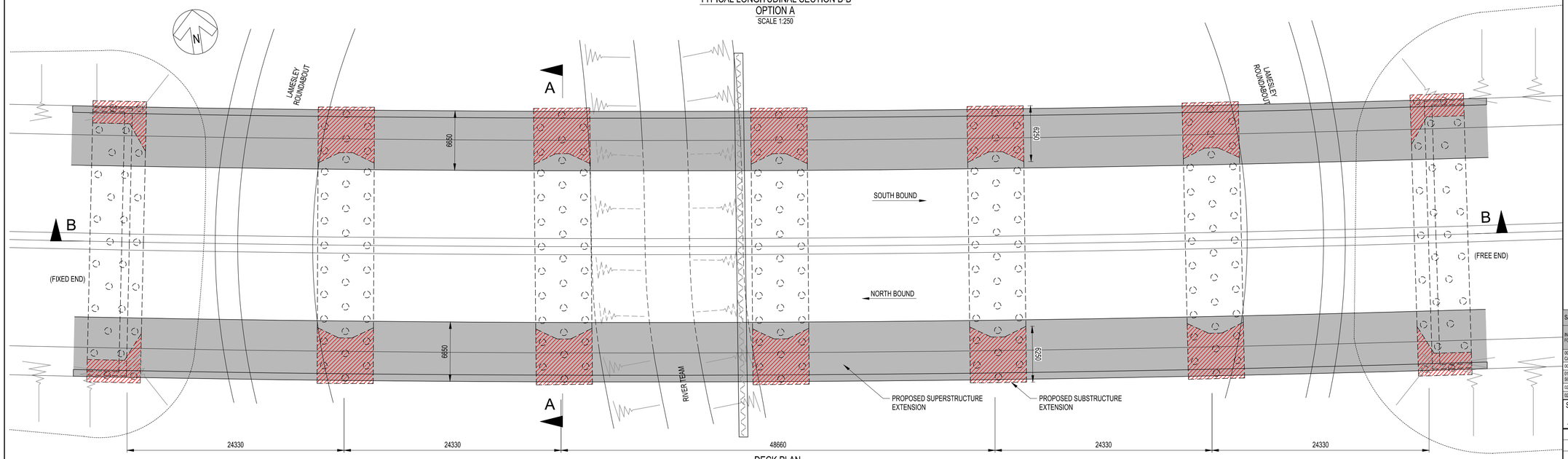
highways england

Appendix D-1

OPTION A: SYMMETRICAL STRUCTURAL WIDENING



TYPICAL LONGITUDINAL SECTION B-B
OPTION A
SCALE 1:250



DECK PLAN
OPTION A
SCALE 1:250

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METERS A.O.D UNLESS NOTED OTHERWISE.
3. DO NOT SCALE IN CASE OF ANY DOUBTS, OMISSIONS OR ERRORS, SEEK CLARIFICATION FROM DESIGNERS.
4. EXISTING STRUCTURE HEADROOM LAST CHECKED ON 18/01/2011 AND MAINTAINED BY GATESHEAD COUNCIL.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING SIGNIFICANT RESIDUAL RISKS

007 - STRUCTURE IS TO BE WIDENED IN PHASES INCORPORATING TRAFFIC MANAGEMENT AND WORKING ADJACENT TO LIVE CARRIAGEWAYS.

008 - BEAM STABILITY DURING ERECTION TO BE CONFIRMED AND INDEPENDENTLY CHECKED.

019 - STITCHING OF NEW EXTENSION TO THE EXISTING STRUCTURE TO BE CARRIED OUT ONLY AFTER HOLD PERIOD TO ALLOW INITIAL SOIL SETTLEMENT TO OCCUR. DESIGNER TO CONFIRM DETAILS.

025 - DESIGNER TO ASSESS EFFECT OF DECK EDGE REMOVAL ON THE LOAD CARRYING CAPACITY OF EXISTING STRUCTURE.

026 - CONTRACTOR TO IMPLEMENT A SAFE SYSTEM OF WORK DURING DEMOLITION OF DECK EDGE.

SAFETY, HEALTH AND ENVIRONMENTAL SYMBOL LEGEND

INDICATES A RESIDUAL RISK AS A WARNING

Suit	Rev	Date	Description	Des	Chk	App
S0	P01	26/01/2017	FOR INFORMATION	IM	RM	HM

Designer

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http://www.wspgroup.com

Client

highways england

Project Title

A1 BIRTLEY TO COAL HOUSE

Drawing Title

KINGSWAY VIADUCT
STRUCTURE OPTION A
GENERAL ARRANGEMENT
SHEET 1 OF 2

Scale	Drawn	Designed	Checked	Approved
AS SHOWN @ A1	RA	IM	RM	HM
Size	Date	Date	Date	Date
A1	26/01/2017	26/01/2017	26/01/2017	26/01/2017

Status: PRELIMINARY

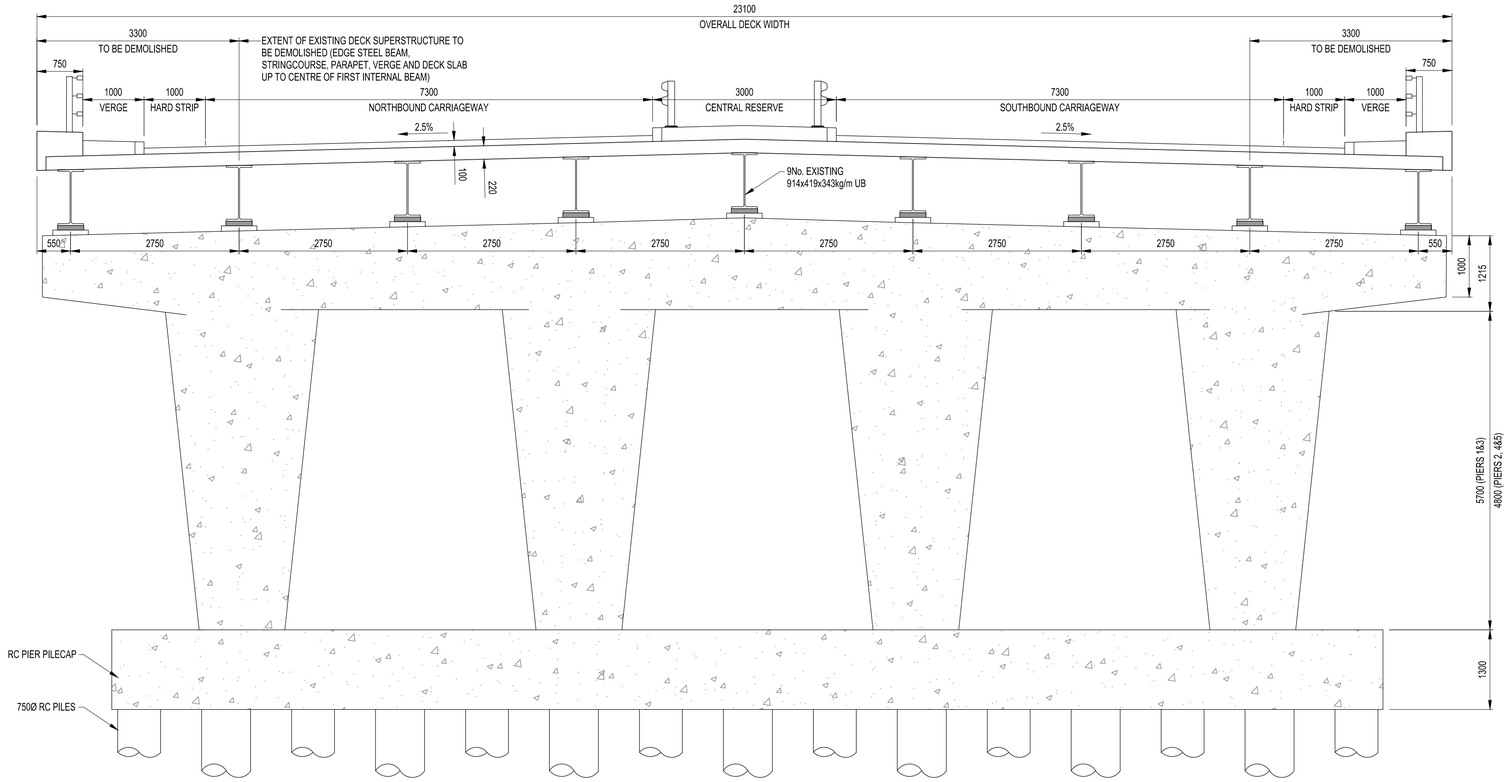
Suitability: S0

Drawing Number: HE551462-WSP-SBR-BCH-SK-S-1700-001

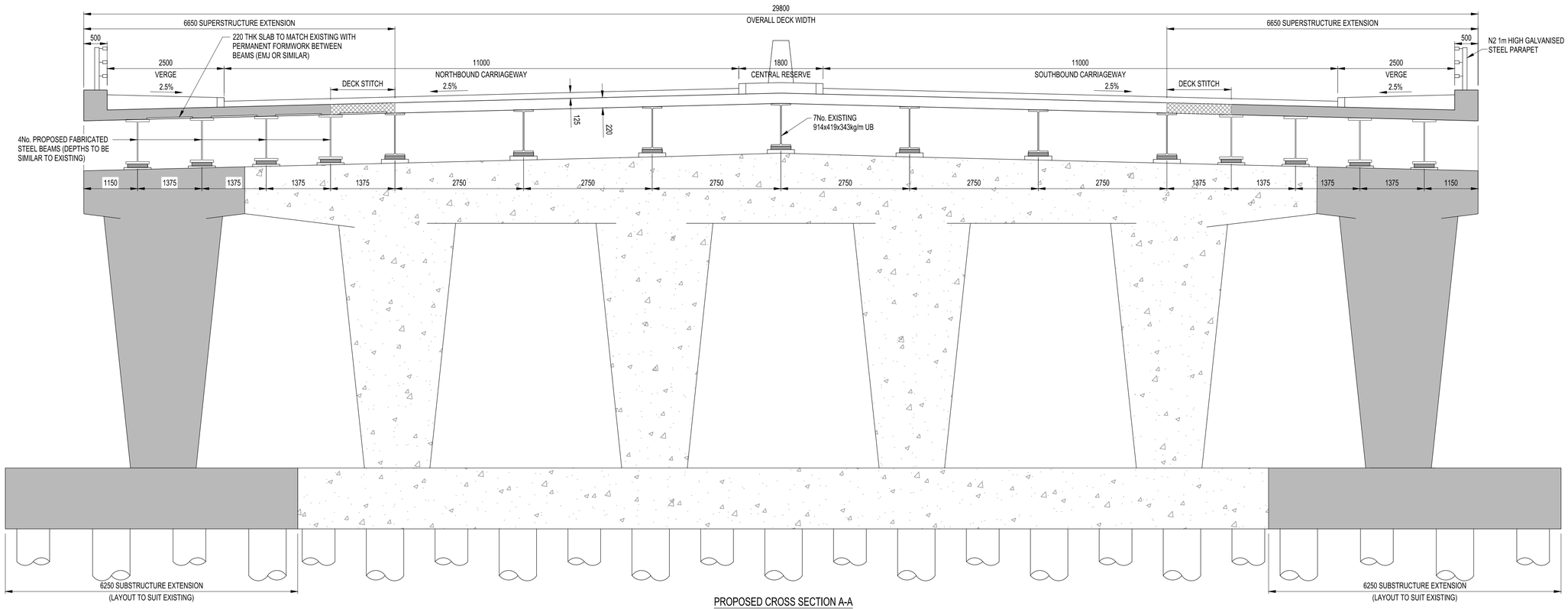
Revision: P01

DO NOT SCALE

A1



EXISTING CROSS SECTION
SCALE 1:50



PROPOSED CROSS SECTION A-A
OPTION A
SCALE 1:50

DO NOT SCALE

A1

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METERS A.O.D UNLESS NOTED OTHERWISE.
3. DO NOT SCALE IN CASE OF ANY DOUBTS, OMISSIONS OR ERRORS, SEEK CLARIFICATION FROM DESIGNERS.
4. LAST CHECKED ON 18/01/2011 AND MAINTAINED BY GATESHEAD COUNCIL.

CONSTRUCTION SEQUNCE FOR OPTION A TO BE AS FOLLOWS:

- INSTALL SHEET PILE WALL TO PIER 3 ALONG BANK OF RIVER TEAM,
- CONSTRUCT SOUTHERN SUBSTRUCTURE EXTENSIONS INCLUDING PILES, PIERS AND BOTH ABUTMENTS WITHOUT DISTURBING TRAFFIC ON THE A1 NORTHBOUND CARRIAGEWAY,
- MAINTAIN A 'HOLD PERIOD' TO ENABLE THE SUBSTRUCTURE EXTENSIONS TO SETTLE SUFFICIENTLY TO MINIMISE DIFFERENTIAL SETTLEMENT BETWEEN NEW AND OLD SECTIONS,
- CONSTRUCT NEW DECK SECTION USING NIGHT TIME LANE CLOSURES OF PART OR ALL OF THE EXISTING NORTHBOUND CARRIAGEWAY (I.E. SINGLE LANE CONTRA-FLOW),
- REDUCE EXISTING NORTHBOUND CARRIAGEWAY TO 6.25M WIDE (3M/3.25M) TO ALLOW A TEMPORARY BARRIER TO BE INSTALLED AND PUSH TRAFFIC TO THE INSIDE FACE OF THE DECK. THIS WOULD THEN ENABLE DEMOLITION OF THE EXISTING SOUTHERN PARAPET, STRINGCOURSE BEAM AND EDGE STEEL BEAM AND PART OF THE DECK SLAB,
- STITCH NEW DECK SECTION TO THE EXISTING DECK DURING A WEEKEND CLOSURE OF THE NORTHBOUND CARRIAGEWAY (I.E, SINGLE LANE CONTRA-FLOW),
- COMPLETE WATERPROOFING AND SURFACING TO THE WIDENED NORTHBOUND DECK,
- DIVERT NORTHBOUND CARRIAGEWAY ONTO THE NEWLY COMPLETED NORTHBOUND DECK,
- CONSTRUCT NORTHERN SUBSTRUCTURE AND DECK EXTENSIONS IN A SIMILAR METHOD TO COMPLETE SOUTHBOUND CARRIAGEWAY,
- REDUCE NEWLY COMPLETED NORTHBOUND AND SOUTHBOUND CARRIAGEWAYS TO 6.25M WIDE (3M/3.25M) TO ALLOW TEMPORARY BARRIERS TO BE INSTALLED AND PUSH TRAFFIC TO THE OUTSIDE FACE OF THE DECK. THIS WOULD THEN ENABLE WORKS TO THE CENTRAL RESERVE AND WATERPROOFING/SURFACING.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING SIGNIFICANT RESIDUAL RISKS

007 - STRUCTURE IS TO BE WIDENED IN PHASES INCORPORATING TRAFFIC MANAGEMENT AND WORKING ADJACENT TO LIVE CARRIAGEWAYS.
008 - BEAM STABILITY DURING ERECTION TO BE CONFIRMED AND INDEPENDENTLY CHECKED.
010 - STITCHING OF NEW EXTENSION TO THE EXISTING STRUCTURE TO BE CARRIED OUT ONLY AFTER HOLD PERIOD TO ALLOW INITIAL SOIL SETTLEMENT TO OCCUR. DESIGNER TO CONFIRM DETAILS.
025 - DESIGNER TO ASSESS EFFECT OF DECK EDGE REMOVAL ON THE LOAD CARRYING CAPACITY OF EXISTING STRUCTURE.
026 - CONTRACTOR TO IMPLEMENT A SAFE SYSTEM OF WORK DURING DEMOLITION OF DECK EDGE.

SAFETY, HEALTH AND ENVIRONMENTAL SYMBOL LEGEND

⚠ INDICATES A RESIDUAL RISK AS A WARNING

Suit	Rev	Date	Description	Des	Chk	App
	P01					

Designer

WSP | PARSONS BRINCKERHOFF

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Tel: +44 (0)113 395 6200, Fax: +44 (0)113 395 6201
http://www.wspgroup.com

Client

highways england

Project Title

A1 BIRTLEY TO COAL HOUSE

Drawing Title

KINGSWAY VIADUCT
STRUCTURE OPTION A
GENERAL ARRANGEMENT
SHEET 2 OF 2

Scale	Drawn	Designed	Checked	Approved	
AS SHOWN @ A1	RA	IM	RM	HM	
Size	Date	Date	Date	Date	
A1	26/01/2017	26/01/2017	26/01/2017	26/01/2017	

Status: PRELIMINARY
Suitability: S0

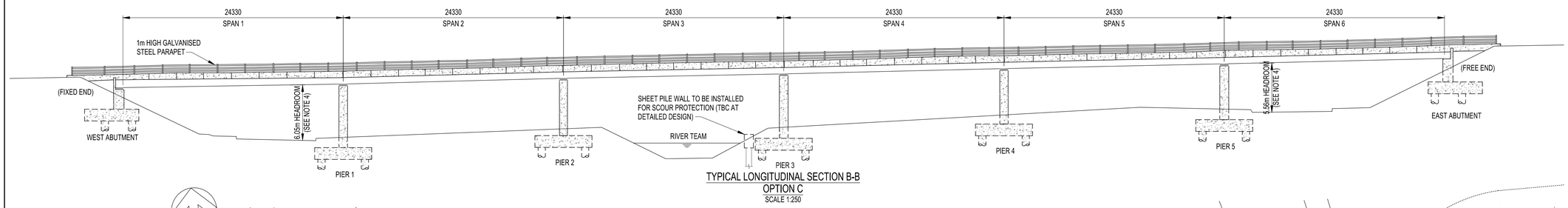
Drawing Number: HE551462-WSP-SBR-BCH-SK-S-1700-002
Revision: P01

Suitability S0
Drawing Number HE551462-WSP-SBR-BCH-SK-S-1700-002
Revision P01

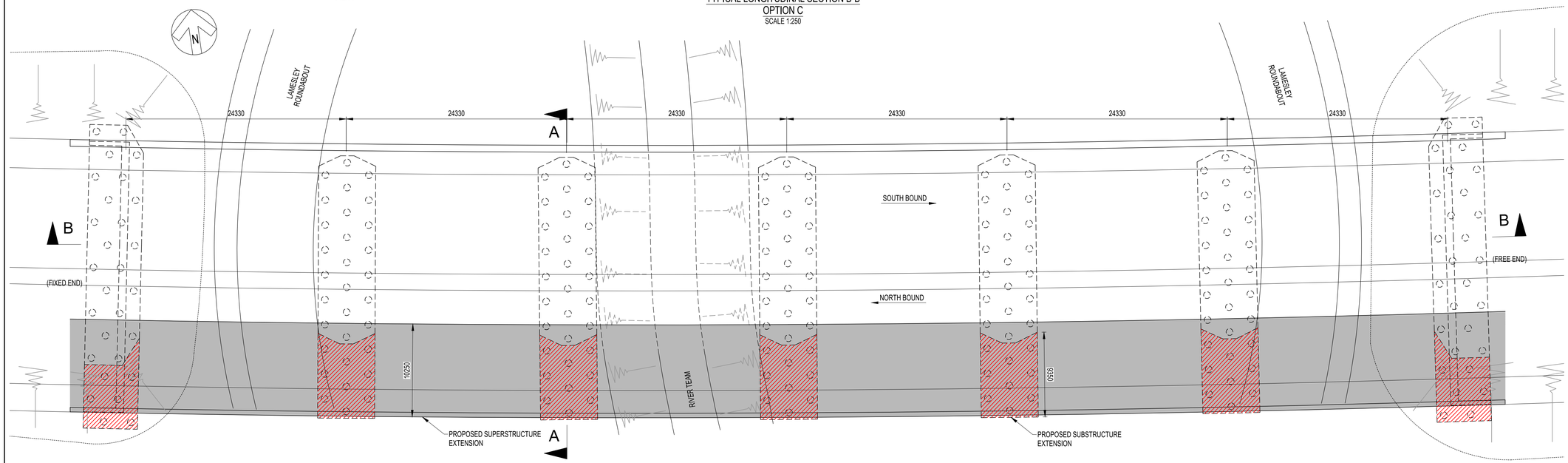
highways england

Appendix D-2

OPTION B: ASYMMETRICAL STRUCTURAL WIDENING



TYPICAL LONGITUDINAL SECTION B-B
OPTION C
SCALE 1:250



DECK PLAN
SCALE 1:250

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METERS A.O.D UNLESS NOTED OTHERWISE.
3. DO NOT SCALE IN CASE OF ANY DOUBTS, OMISSIONS OR ERRORS, SEEK CLARIFICATION FROM DESIGNERS.
4. EXISTING STRUCTURE HEADROOM LAST CHECKED ON 18/01/2011 AND MAINTAINED BY GATESHEAD COUNCIL.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING SIGNIFICANT RESIDUAL RISKS:

007 - STRUCTURE IS TO BE WIDENED IN PHASES INCORPORATING TRAFFIC MANAGEMENT AND WORKING ADJACENT TO LIVE CARRIAGEWAYS.

008 - BEAM STABILITY DURING ERECTION TO BE CONFIRMED AND INDEPENDENTLY CHECKED.

010 - STITCHING OF NEW EXTENSION TO THE EXISTING STRUCTURE TO BE CARRIED OUT ONLY AFTER HOLD PERIOD TO ALLOW INITIAL SOIL SETTLEMENT TO OCCUR. DESIGNER TO CONFIRM DETAILS.

025 - DESIGNER TO ASSESS EFFECT OF DECK EDGE REMOVAL ON THE LOAD CARRYING CAPACITY OF EXISTING STRUCTURE.

026 - CONTRACTOR TO IMPLEMENT A SAFE SYSTEM OF WORK DURING DEMOLITION OF DECK EDGE.

SAFETY, HEALTH AND ENVIRONMENTAL SYMBOL LEGEND

INDICATES A RESIDUAL RISK AS A WARNING

Suit	Rev	Date	Description	Des	Chk	App
S0	P01	26/01/2017	FOR INFORMATION	IM	RM	HM

Designer

WSP | PARSONS BRINCKERHOFF
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Tel: +44 (0)113 395 6200, Fax: +44 (0)113 395 6201
http://www.wspgroup.com

Client

highways england

Project Title

A1 BIRTLEY TO COAL HOUSE

Drawing Title

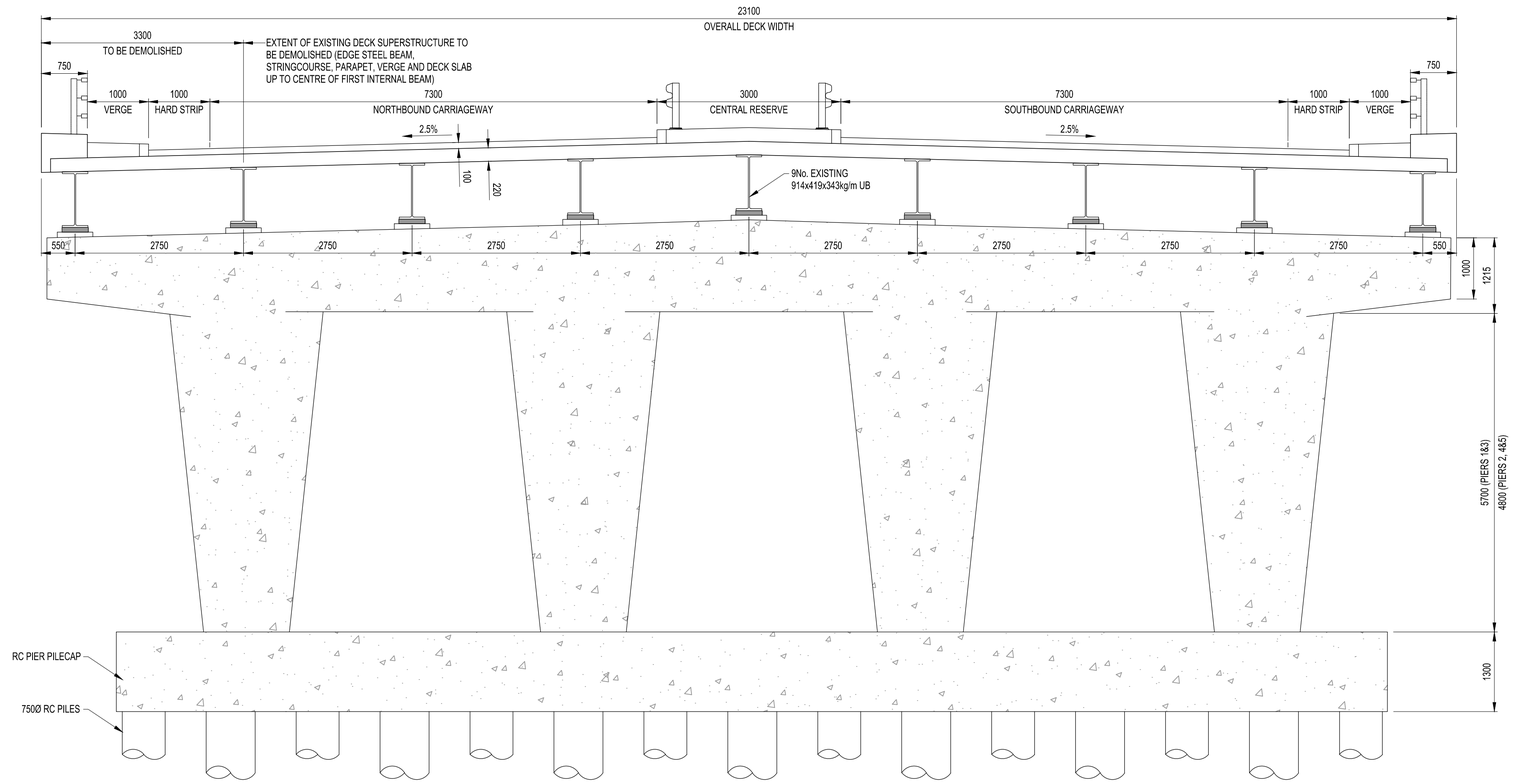
KINGSWAY VIADUCT
STRUCTURE OPTION B
GENERAL ARRANGEMENT
SHEET 1 OF 2

Scale	Drawn	Designed	Checked	Approved
AS SHOWN @ A1	RA	IM	RM	HM
Size	Date	Date	Date	Date
A1	26/01/2017	26/01/2017	26/01/2017	26/01/2017

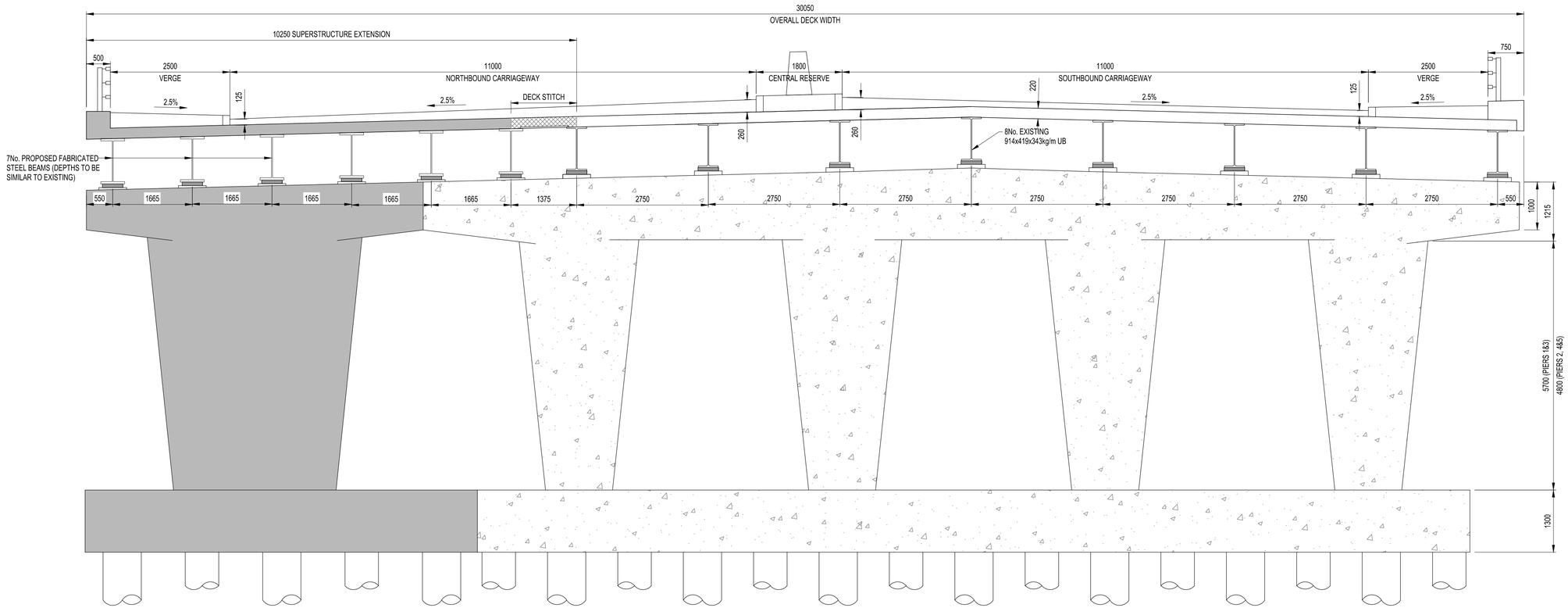
Status: PRELIMINARY
Suitability: S0
Drawing Number: HE551462-WSP-SBR-BCH-SK-S-1700-005
Revision: P01

DO NOT SCALE

A1



EXISTING CROSS SECTION
SCALE 1:50



PROPOSED CROSS SECTION A-A
OPTION C
SCALE 1:50

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METERS A.O.D UNLESS NOTED OTHERWISE.
3. DO NOT SCALE IN CASE OF ANY DOUBTS, OMISSIONS OR ERRORS, SEEK CLARIFICATION FROM DESIGNERS.
4. EXISTING STRUCTURE HEADROOM LAST CHECKED ON 18/01/2011 AND MAINTAINED BY GATESHEAD COUNCIL.

CONSTRUCTION SEQUENCE FOR OPTION B TO BE AS FOLLOWED:

- INSTALL SHEET PILE WALL TO PIER 3 ALONG BANK OF RIVER TEAM,
- CONSTRUCT SOUTHERN SUBSTRUCTURE EXTENSIONS INCLUDING PILES, PIERS AND BOTH ABUTMENTS WITHOUT DISTURBING TRAFFIC ON THE A1 NORTHBOUND CARRIAGEWAY,
- MAINTAIN A 'HOLD PERIOD' TO ENABLE THE SUBSTRUCTURE EXTENSIONS TO SETTLE SUFFICIENTLY TO MINIMISE DIFFERENTIAL SETTLEMENT BETWEEN NEW AND OLD SECTIONS,
- CONSTRUCT NEW DECK SECTION USING NIGHT TIME LANE CLOSURES OF PART OR ALL OF THE EXISTING NORTHBOUND CARRIAGEWAY (I.E. SINGLE LANE CONTRA-FLOW),
- REDUCE EXISTING NORTHBOUND CARRIAGEWAY TO 6.25M WIDE (3M/3.25M) TO ALLOW A TEMPORARY BARRIER TO BE INSTALLED AND PUSH TRAFFIC TO THE INSIDE FACE OF THE DECK, THIS WOULD THEN ENABLE DEMOLITION OF THE EXISTING SOUTHERN PARAPET, STRINGCOURSE BEAM AND EDGE STEEL BEAM AND PART OF THE DECK SLAB,
- STITCH NEW DECK SECTION TO THE EXISTING DECK DURING A WEEKEND CLOSURE OF THE NORTHBOUND CARRIAGEWAY (I.E. SINGLE LANE CONTRA-FLOW),
- COMPLETE WATERPROOFING AND SURFACING TO THE WIDENED NORTHBOUND DECK,
- DIVERT NORTHBOUND CARRIAGEWAY ONTO THE NEWLY COMPLETED NORTHBOUND DECK,
- REDUCE NEWLY COMPLETED NORTHBOUND AND EXISTING SOUTHBOUND CARRIAGEWAY TO 6.25M WIDE (3M/3.25M) TO ALLOW TEMPORARY BARRIERS TO BE INSTALLED AND PUSH TRAFFIC TO THE OUTSIDE FACE OF THE DECK, THIS WOULD THEN ENABLE WORKS TO REMOVE EXISTING CENTRAL RESERVE AND CONSTRUCT NEW CENTRAL RESERVE AND WATERPROOFING/SURFACING,
- ONCE NEW CENTRAL RESERVE COMPLETE, MOVE TEMPORARY BARRIER AND PUSH TRAFFIC TO THE INSIDE FACE OF THE DECK, THIS WOULD ENABLE COMPLETION OF THE NORTHBOUND/SOUTHBOUND VERGES.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING SIGNIFICANT RESIDUAL RISKS

007 - STRUCTURE IS TO BE WIDENED IN PHASES INCORPORATING TRAFFIC MANAGEMENT AND WORKING ADJACENT TO LIVE CARRIAGEWAYS.
008 - BEAM STABILITY DURING ERECTION TO BE CONFIRMED AND INDEPENDENTLY CHECKED.
010 - STITCHING OF NEW EXTENSION TO THE EXISTING STRUCTURE TO BE CARRIED OUT ONLY AFTER HOLD PERIOD TO ALLOW INITIAL SOIL SETTLEMENT TO OCCUR. DESIGNER TO CONFIRM DETAILS.
025 - DESIGNER TO ASSESS EFFECT OF DECK EDGE REMOVAL ON THE LOAD CARRYING CAPACITY OF EXISTING STRUCTURE.
026 - CONTRACTOR TO IMPLEMENT A SAFE SYSTEM OF WORK DURING DEMOLITION OF DECK EDGE.

SAFETY, HEALTH AND ENVIRONMENTAL SYMBOL LEGEND

⚠ INDICATES A RESIDUAL RISK AS A WARNING

Suit	Rev	Date	Description	Des	Chk	App
	P01					

Designer

WSP | PARSONS BRINCKERHOFF

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Client

highways england

Project Title

A1 BIRTLEY TO COAL HOUSE

Drawing Title

KINGSWAY VIADUCT
STRUCTURE OPTION B
GENERAL ARRANGEMENT
SHEET 2 OF 2

Scale	Drawn	Designed	Checked	Approved	
AS SHOWN @ A1	RA	IM	RM	HM	
Size	Date	Date	Date	Date	
A1	26/01/2017	26/01/2017	26/01/2017	26/01/2017	

Status: PRELIMINARY — Suitability: S0

Drawing Number: HE551462-WSP-SBR-BCH-SK-S-1700-006 — Revision: P01

Revision P01
Drawing Number ..
Suitability S0

DO NOT SCALE

A1

Appendix E

DESIGNER RISK ASSESSMENT

highways england

Appendix E-1

DRA

T446: Design H&S Risk Register

Project No: 70015226-11A

Project Name: Package H: A1 BIRTLEY TO COAL HOUSE- KINGSWAY VIADUCT

Provide Feedback

WSP

Guidance notes *(see guidance notes page for more details)*

Design risk management should be an integral part of the overall design development and designers should think of it in terms of considering constructability, maintainability, etc. Designers only need to document their consideration of risks in this simple risk register format. There is no requirement for quantitative design risk assessments to be carried out/documented and these should be avoided

** Risks should be considered in a logical sequence relating to the location/operational environment, constructability/installability, operability (normal/emergency), maintainability (inc. routine cleaning, replacement, etc.), and alteration/decommissioning/dismantling/demolition, and should be categorised against those headings,*

CIRIA guidance documents C662, C663, C611, C607, etc. provide a useful checklist and detailed guidance on the identification of risks to be considered during design and how those risks might be addressed - see detailed guidance notes for more details

§ Significant residual risks are those which are unusual, not obvious, difficult to manage, or where critical design assumptions apply. The documentation by designers of residual risks that cover well-known and understood hazards should be avoided

Ref	Risk Category* (and Phase where appropriate, *e.g.. location/environment, construction, operation, maintenance, alteration/demolition)*	Work Element/Location (where appropriate)	Hazard or Risk Issue Identified	Risk Management Owner	Design ERIC Action Required *(e.g.. hazard elimination/risk mitigation action, information to be provided to others)*	Significant Temporary Works Requirements/Management Arrangements and/or any Special Erection/Installation Sequences or Requirements	Design Action Status/Final Resolution Notes *(e.g.. traceability of ERIC action, communication of significant residual risk, critical design criteria, etc.)*	Significant Residual Risk§ (Y/N)	Date Logged/ Reviewed	Raised By
001	Construction / Operation / Maintenance	Overall structural from of bridge	Working close to / amongst moving traffic and watercourse - maintenance of bridge superstructure	Designer / Contractor	Considering the location of the structure, it is considered most practical and economical to retain and widen the existing structure. The structure will be designed and detailed to minimize maintenance requirements over the life of the structure to minimize work required within the Team River watercourse and from the A1.	Consideration shall be given for prefabricated elements to minimise on site activities. Contractor to plan TM accordingly and establish a safe system of work.	N/A	N	24/02/2017	Imtiaz Mulla
002	Construction / Operation / Maintenance	Overall structural from of bridge	Working close to / amongst moving traffic and watercourse - maintenance of bridge substructure & bearings	Designer / Contractor	Intergral bridge construction for new decks not possible due to existing bridge arrangement. New bearings to be compatible with the current structure articulation, Scour protection to be provided to pier footings adjacent to River Team.	Temporary sheet piles within the River Team watercourse during construction to be designed so that they can be left in permanently to act as scour protection for the permanent structure. Alternatively gabion baskets may be provided depending on client preference (TBC) and benefit cost ratio.	N/A	N	24/02/2017	Imtiaz Mulla
003	Construction	Overall structural from of bridge	Working with concrete - In-situ concrete deck construction require handling of large volumes of concrete, Shuttering requires significant temporary works. Also large reinforcement cages with dangers from impaling and lifting of bars, working at heights etc.	Designer	In-situ concrete works for the bridge deck has been limited by the proposed installation of steel beams which reduces concrete operations on site. The in-situ deck slab would use permanent formwork that eliminates additional site operations associated with the removal of formwork.	-	Details of steel beams (size/length etc) to be defined on drawings.	N	24/02/2017	Imtiaz Mulla
004	Construction / Operation / Maintenance	Materials	Working at height - maintenance of bridge beams	Designer / Contractor	Steel beams have been selected as the most economical and appropriate form of construction for the widened structure. This will ensure aesthetic compatibility with existing structure. Beams and concrete deck will be designed and detailed to minimize maintenance requirements over the life of the structure and minimize work required over River Team. Consideration was given to adopting weathering steel for bridge steelwork to minimise long term maintenance requirements. To maintain continuity of appearance, new steel beams shall be painted a similar colour to the existing structure beams.	-	N/A	N	24/02/2017	Imtiaz Mulla
005	Construction / Operation / Maintenance	Materials	Working at height - maintenance of concrete subject to exposure to chlorides	Designer	Reinforced concrete within the parapet cantilevers of the proposed widened structure will be subject to direct exposure to de-icing salts from the carriageway. In order to improve the long term durability and consequently reduce maintenance hazards use of stainless steel reinforcement will be considered subject to costing.	-	N/A	N	24/02/2017	Imtiaz Mulla
006	Construction / Operation / Maintenance	Materials	Working with materials harmful to health - silane	Designer / Contractor	Due to the health, safety and environmental hazards associated with the use of silane, it is proposed to consider alternative concrete pore impregnant treatment. In addition, following issue of CHE Memo 227/08 the use of concrete pore impregnant treatments to any exposed concrete is under review.	Designer to specify appropriate approved method of concrete impregnation to ensure robust durability.	N/A	N	24/02/2017	Imtiaz Mulla
007	Construction	Method of deck construction	Working close to / amongst moving traffic - construction	Contractor	Works adjacent to live traffic to be minimised by appropriate phasing of works.	Contractor to implement a safe system of work.	Note on drawing highlighting TM requirements as appropriate.	Y	24/02/2017	Imtiaz Mulla
008	Construction	Method of deck construction	Working at height - erection of bridge beams	Designer / Contractor	The temporary stability of the steel beams has been considered. Beams are to be erected in braced pairs where they are most stable to avoid instability and high torsion buckling of single beams. Following detailed design, contractor shall if necessary provide temporary works to ensure stability of beams in temporary condition. Design to consider designated lifting points.	Designer to review contractor temporary works design to ensure structural adequacy. Appropriate craneage to be used.	Note on drawing indicating erection method(s) to be used.	Y	24/02/2017	Imtiaz Mulla

T446: Design H&S Risk Register

Project No: 70015226-11A

Project Name: Package H: A1 BIRTLEY TO COAL HOUSE- KINGSWAY VIADUCT

Provide Feedback

Guidance notes *(see guidance notes page for more details)*

Design risk management should be an integral part of the overall design development and designers should think of it in terms of considering constructability, maintainability, etc. Designers only need to document their consideration of risks in this simple risk register format. There is no requirement for quantitative design risk assessments to be carried out/documented and these should be avoided

** Risks should be considered in a logical sequence relating to the location/operational environment, constructability/installability, operability (normal/emergency), maintainability (inc. routine cleaning, replacement, etc.), and alteration/decommissioning/dismantling/demolition, and should be categorised against those headings,*

CIRIA guidance documents C662, C663, C611, C607, etc. provide a useful checklist and detailed guidance on the identification of risks to be considered during design and how those risks might be addressed - see detailed guidance notes for more details

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Ref	Risk Category* (and Phase where appropriate, *e.g.. location/environment, construction, operation, maintenance, alteration/demolition)*	Work Element/Location (where appropriate)	Hazard or Risk Issue Identified	Risk Management Owner	Design ERIC Action Required *(e.g.. hazard elimination/risk mitigation action, information to be provided to others)*	Significant Temporary Works Requirements/Management Arrangements and/or any Special Erection/Installation Sequences or Requirements	Design Action Status/Final Resolution Notes *(e.g.. traceability of ERIC action, communication of significant residual risk, critical design criteria, etc.)*	Significant Residual Risk§ (Y/N)	Date Logged/ Reviewed	Raised By
009	Construction	Method of deck construction	Environment - flooding of River Team	Designer / Contractor	Works within the watercourse are necessary for construction of substructure extensions. River Team is not known to be located within a flood plain.	Temporary sheet piles within the River Team watercourse during construction to be designed so that they can be left in permanently to act as scour protection for the permanent structure. Alternatively gabion baskets may be provided depending on client preference (TBC) and benefit cost ratio.	N/A	N	24/02/2017	Imtiaz Mulla
010	Construction	Method of deck construction	Working at height - Construction of insitu concrete deck	Designer / Contractor	To avoid the use of temporary formwork the design will utilize permanent formwork wherever possible (GRP/GRC planks), in particular the areas between the steel beams. Use of permanent formwork will restrict working at height to a minimum during deck construction. The deck edge cantilever extensions are to be constructed using temporary formwork supported off the edge beam. Consideration will be given to pre-fixing some of the permanent and temporary formwork to the steel beams prior to erection to minimise work at height.	Designer to check adequacy of fixing temporary formwork to steel beams prior to erection.	Note on drawing indicating erection method(s) to be used.	Y	24/02/2017	Imtiaz Mulla
011	Construction	Method of deck construction	Working with lifting devices - erection of bridge beams	Designer / Contractor	Installation of the beams will be carried out by crane from a suitable location adjacent to the bridge. Consideration will be given to locating the crane on Lamesley roundabout.	Contractor to implement a safe system of work. Geotech engineer to determine adeqaucy of ground to support crane during erection.	Note on drawing indicating erection method(s) to be used.	Y	24/02/2017	Imtiaz Mulla
012	Construction	Method of deck construction	Connection to existing deck	Contractor	Rapid strength gain concrete to be used for the casting of the deck slab stitch between existing deck and proposed extension to minimise likelihood of cracking due to the concrete curing time before structure open to live traffic. Guidelines within BA82/00 to be followed.	Contractor to implement a safe system of work. Appropriate TM to be in place during casting of deck slab extension.	Note on drawing highlighting TM requirements as appropriate.	Y	24/02/2017	Imtiaz Mulla
013	Construction	Method of deck construction	Steel beams will require require prior delivery arrangements and transportation to site will be problematic, leading to potential road side incidents.	Designer	Detailed design to ensure fabricated girders are manageable and are not excessively long etc to ensure they can be delivered to site with minimal logistical risks. Consideration to be given to potential areas for beams to be stored on site prior to being lifted/installed.	Access to construction area to be designed as part of TM plan.	Contractors to consider method of delivery and erection. Defined loading and unloading areas to be shown on drawings	N	24/02/2017	Imtiaz Mulla
014	Construction	Method of deck construction	Deep excavations for open/pad foundation for substructure construction. Potential risk of collapsing of excavation, entrapment of personnel, overturning of plant and vehicles.	Designer	CFA/ bored piled foundation for abutments eliminates risk of deep excavations	Temporary works minimised	N/A	N	24/02/2017	Imtiaz Mulla
015	Construction	Method of deck construction	Instability/movement of GRP deck planks, create gaps and risk of tools/materials falling onto the live roundabout carriageway below	Contractor	Concreting to be done in a controlled manner, to ensure planks are not dislodged	Contractor to implement a suitable safe system of work	N/A	N	24/02/2017	Imtiaz Mulla
016	Construction	Design of Superstructure	Thickness of deck slab extension	Designer	Proposed deck slab extension set at 250mm thick with nominal 125mm thick surfacing. Surfacing on existing structure to be removed and replaced. Existing slab thickness is 220mm. New surfacing and deck slab thicknesses will be tapered over the deck stitch section to ensure a smooth transition.	Contractor to implement appropriate method of construction.	N/A	N	24/02/2017	Imtiaz Mulla
017	Construction	Design of Superstructure	Proposed steel beams	Designer	New deck steelwork will be detailed to align with the new highway design and will vary slightly from the existing deck alignment. Any variation will be accommodated by a variation in the deck slab alignment between the existing and proposed steelwork. There will be no steel connection between new and existing steelwork.	-	N/A	N	24/02/2017	Imtiaz Mulla
018	Construction	Design of Substructure	Stitching of existing/widened structure - Drilling of dowel holes in existing substructure	Contractor	The proposed pier and abutment extensions are to be stitched connected together using stainless steel dowels. Dowels are to be installed in holes that are drilled in the existing concrete substructures.	Contractor to implement appropriate method of construction and maintain a safe system of work.	N/A	N	24/02/2017	Imtiaz Mulla

T446: Design H&S Risk Register

Project No: 70015226-11A

Project Name: Package H: A1 BIRTLEY TO COAL HOUSE- KINGSWAY VIADUCT

Provide Feedback

WSP

Guidance notes *(see guidance notes page for more details)*

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019	Construction	Design of Substructure	Stitching of existing/widened structure	Designer / Contractor	Proposed abutment/pier extensions to be detailed with box out section at stitch between existing and proposed widened structure. This will allow extensions to be constructed without developing a structural connection between the existing/widened structure. The stitches will be made following an agreed hold period to allow initial soil settlement to occur (geotech to confirm length of hold soil settlement period).	Geotech engineer to advise on length of hold period to allow initial soil settlement to occur.	Note on drawing highlighting proposed hold period prior to stitching existing/widened structure.	Y	24/02/2017	Imtiaz Mulla
020	Operation / Maintenance	Design of Substructure	Abnormal vehicle loading	Designer	The bridge deck extensions have been designed to accommodate the SOV 350 vehicle. The existing deck has been assessed for the effects of the SOV 350 vehicle and has been found to have insuficient capacity. All movements of SOV vehicles over the bridge deck shall be strictly controlled such that they may only travel within the proposed widened portion of the A1.	-	N/A	N	24/02/2017	Imtiaz Mulla
021	Construction	Design of Substructure	Pile Construction	Designer / Contractor	Care must be taken when removing the soil material adjacent to existing structural foundations to avoid undermining them. Areas of loose material to be confirmed in the GI. Any overdig to be approved by geotech team.	Contractor to implement appropriate method of construction and maintain a safe system of work. Geotech engineer to advise on suitability of construction methods.	Note on drawing highlighting any special temporary works requirements.	Y	24/02/2017	Imtiaz Mulla
022	Construction	Design of Substructure	Excavation for abutment/pier extensions	Designer / Contractor	Care must be taken when removing the soil material adjacent to existing structural foundations to avoid undermining them. Areas of loose material to be confirmed in the GI. Any overdig to be approved by geotech team.	Contractor to implement appropriate method of construction and maintain a safe system of work. Geotech engineer to advise on suitability of construction methods.	Note on drawing highlighting any special temporary works requirements.	Y	24/02/2017	Imtiaz Mulla
023	Construction / Operation / Maintenance	Statutory Undertakers Services	Damage to services during construction of substructure for widened structure	Contractor	Service requirements to be confirmed prior to constructions. Details to be included in appendix 1/16 of the works information. Any proposed services to be located within the verges to simplify access.	-	Appropriate note/reference to be put on drawings relating to the proposed service ducts provided and their location (TBC). Appropriate note/reference to be put on drawing for the location of existing services.	Y	24/02/2017	Imtiaz Mulla
024	Construction	Construction Waste Disposal	Site vehicles using public highways to transport excess materials to disposal sites. Mud on roads, airborne contamination during/after transit	Contractor	Identify agreed route where disruption will be minimised and how the site will be accessed by construction traffic during works.	Wheel washing facility to be used on site to minimise mud tracked onto road network. Tarpaulins and straps to be checked before deliveries leave site. Appropraite encapsulation to be done to ensure any waste material is not exposed to the environment.	Contractor to plan all site deliveries and make suppliers aware of these. To be defined in TM plan.	N	24/02/2017	Imtiaz Mulla
025	Demolition	Demolition of deck edge	Removal of existing deck edge - instability of existing structure	Designer	To facilitate widening of existing superstructure and maintain structural continuity at the deck edge, a portion of the deck edge under the verges will require demolition. This will include a single steel beam, concrete stringcourse and deck slab. Consideration shall be given to the best method for their demolition including hydrodemolition.	Designer to assess effect of the deck edge removal on the load carrying capacity of existing structure. Contractor to be notified of any temporary requirements during demolition (i.e. reduction of traffic lane widths).	Risk to be added to drawings	Y	24/02/2017	Imtiaz Mulla
026	Demolition	Demolition of deck edge	Removal of existing deck edge - debris falling onto live carriageway below	Demolition contractor	To facilitate widening of existing superstructure and maintain structural continuity at the deck edge, a portion of the deck edge under the verges will require demolition. This will include a single steel beam, concrete stringcourse and deck slab. Consideration shall be given to the best method for their demolition including hydrodemolition.	Contractor to implement a suitable safe system of work including encapsulation during demolition process to prevent debris from falling onto live carriageway below. TM to be planned accordingly.	Risk to be added to drawings	Y	24/02/2017	Imtiaz Mulla

Appendix F

KEY CORRESPONDENCE

Appendix F-1

CLOSE OUT COMMENTS BETWEEN HE / WSP

Al-Shalechy, Shehed

Subject: FW: A1B2CH Kingsway Viaduct SOR report submission 08-06-17
Attachments: Kingsway Viaduct SOR Report Final 01-04-17 (3) HE final comments 23-05-1….docx; A1 B2CH Comments on Kingsway SOR

From: Sunderland, Martin [mailto:Martin.Sunderland@highwaysengland.co.uk]
Sent: 23 May 2017 14:29
To: Mistry, Hitan
Cc: Wilkes, Nicola; Mulla, Imtiaz; Clapham, Joe; Ghosh, Sulagna; Dennis, Stephen
Subject: RE: A1B2CH Kingsway Viaduct SOR report submission 18-05-17

Hitan

Thank you for your communication below, enclosing your response to my comments on the Kingsway Viaduct Options Report.

I confirm acceptance of your responses, although please see my response to point 2.7.2 where I would like an extra item adding in the table of works to the existing viaduct.

If you are in agreement then I am happy for you to finalise the report and send to me for acceptance.

regards

Martin Sunderland
Highways England | Lateral | 8 City Walk | Leeds | LS11 9AT
TEL +44(0)300 470 6165
[redacted]
Web: http://www.highways.gov.uk
GTN 0300 470 6165

From: Mistry, Hitan [mailto:Hitan.Mistry@WSPGroup.com]
Sent: 18 May 2017 17:13
To: Sunderland, Martin
Cc: Wilkes, Nicola; Mulla, Imtiaz; Clapham, Joe; Ghosh, Sulagna; Dennis, Stephen
Subject: A1B2CH Kingsway Viaduct SOR report submission 18-05-17

Afternoon Martin,

Tried calling this afternoon but could not get through. Attached is our response to the Kingsway comments once accepted will update/finalise the report accordingly.

Regards

Hitan Mistry
Associate Director

T+ 44 (0)113 395 6329
Three White Rose Office Park, Millshaw Park Lane, Leeds LS11 0DL

wsp.com

Al-Shalechy, Shehed

From: Wilkes, Nicola <Nicola.Wilkes@highwaysengland.co.uk>
Sent: 22 May 2017 13:29
To: Clapham, Joe; Mistry, Hitan
Cc: A1BirtleytoCoalhouse
Subject: A1 B2CH Comments on Kingsway SOR

Hitan

Sorry for the delay in getting my comments to you, I had started reviewing the report but then other things took priority. I have also reviewed Martin's comments so there is nothing that contradicts. Some of the comments particularly in the intro/executive summary we discussed how the comments on Allerdene SOR also applied to this.

Revision History
Check date is correct

Production Team
Bruce Donaldson is the Project Director

Executive Summary
I much preferred the summary on Allerdene if you can use that but ensure you include:

- Need more context about why doing this report i.e brought forward form PCF stage 3 to stage 2 to give more assurance about the scheme and ensure we are aware of any potential issues, followed on from buildability advice received from Costain and input from SES.
- Make it clear at the start that there are two options, however we have a preferred option that will be announced as our preferred route in July, therefore work being done is focused around option 1a (although if relevant you can say for this structure the option is irrelevant)
- Make it clear how many lanes we have now and what we are proposing
- Can you be clear where the costs have come from and caveat it as it is not a HE Cost Estimate but an estimation by WSP
- There needs to be more information about what this report is trying to achieve, it also seems to focus on 350T whereas I thought it was about the structure in general as well

Introduction

- I think it needs to a bit clearer either here or in the executive summary that the junction is Coal House, but the structure is Kingsway. It seems to flit between the two.
- Need to show as options 1a and 1b and put 1 and 2 in brackets, not the other way round.
- 1.2.4 this is wrong. The costs for option 3 were significantly higher than options 1a and 1b, more land was required and there was more land required and there was a great impact on the surrounding environment, however the benefits achieved on all options are pretty similar. Therefore option 3 was deemed to not offer good value for money and so was discounted.
- 1.2.5 I don't think the word 'inclines' is strong enough. We are at the end of the stage and everyone has bought in to option 1a, this is our preferred option and there is unlikely that anything would change this now. This is the reason why we were confident in focusing on this option when producing recent reports.

Existing Structure
2.2.2 don't we know what is in the central reserve?
2.5 was this maintenance work ever done? The report is not clear

Option A
4.2.12 again, can you caveat the costs as they are not form HE cost estimating team

Regards

Nicola

Nicola Wilkes, Project Manager
Regional Investment Programme (RIP) North
Highways England | Lateral | 8 City Walk | Leeds | LS11 9AT

Structures Options Report	Name of Project:	A1 Birtley to Coalhouse Improvement Scheme
(Bridges and other Highway Structures)	Name of Bridge/Structure:	Kingsway Viaduct
	Structure Ref No:	A1/443.30

Structures Engineering and Standards SES Record Sheet

		Comments Sheet Document Control			
		Comment sheet version	**Date HA comment sheet**	**Date Designer's reply sent**	**Notes**
Document Ref	HA551462-WSP-SBR-BCH-RP-S-1700_048	**A**	15/05/2017	18/05/17	
		B	23/05/17		
SOR version	Revision P01	**C**			
		D			
SOR Date	31-03-17	**E**			

No	Section	Initial comment (HA response) and further comments on Designer's reply	Designer's reply	Accepted by HA
1	Front Page	Please amend STKEY to state 16271	Noted, report to be updated where required	Accepted
2	Executive Summary	The last paragraph recommends the following works to be progressed to verify the findings of this report: • Swept Path Analysis to confirm that the SOV350 vehicle can be routed off/on the diverge slip roads - Agreed • Liaison with Highways England Abnormal Loads Officer to confirm this proposal is acceptable – Agreed but this is standard practice to liaise with HE Abnormal Loads Team. Include correspondence as part of report.	Noted, we shall remove the second bullet point.	Accepted

3	1.2.3	Report states that “online widening is not possible at Allerdene railway Bridge”, this is not correct, amend to state that “online widening is not practical at Allerdene Railway Bridge”. The next sentence of the report states that “Existing maintenance issues dictate that the existing structure has to be replaced”, this is also not correct, amend to state that “Maintenance issues with the existing Allerdene have been assessed and on balance it has been agreed that modification of the existing bridge by widening would not suit the aims of the overall scheme (see Allerdene SOR)”.	1.2.3 to be amended to the following: *Three option were identified at PCF Stage 1 (option Identification) with the same alignment and cross section between J66 (Eighton Lodge) and J65(Birtley),where online widening is considered to not be practical at Allerdene Bridge.* *Maintenance issues with the existing Allerdene have been assessed and on balance it has been agreed that modification of the existing bridge by widening would not suit the aims of the overall scheme (refer to the Allerdene SOR Report No. HA551462-WSP-SBR-BCH-RP-S-1700-056 for details).*	Accepted
4	1.2.3 1.2.4 1.2.5	It is not totally clear that what is stated in the report in these three sections are all relating to Alleredene Bridge except for the first sentence. Can this be made clearer (i.e 1.2.5 first bullet point mentions demolition of the “existing” structure).	Section 1.2 was included to provide an overview of the routes considered to date and the current preference to progress Option 2 (now referred to as Option 1a) Upon review we believe section 1.2.5 can be removed and the report progress onto section 1.3. Please be aware we have had initial discussions with Nicola Wilkes and shall be amending the introduction to this report so that it is similar to the format of the introduction within the Allerdene SOR.	Accepted
5	1.2.5	Reasons favouring option 2 – also include a bullet point to mention the Network Rail requirement for “enhanced headroom due to OLE requirements”.	We propose section 1.2.5 be removed in its entirety. However if you prefer this section to remain we will include the additional bullet point.	Agreed Section 1.2.5 can be removed
6	2.1	Amend STKEY to 16271	Noted, text to be amended	Accepted
7	2.1.7	Add a sentence to state that the existing piers are not protected from vehicle impact by VRS.	Noted, addition reference to the VRS to the piers shall be added.	Accepted

<table>
<tr>
<td>8</td>
<td>2.6.4</td>
<td>Comment on SOV 250 and SV196 vehicles as well.</td>
<td>Noted, reference to SV250 and SV196 to be added.</td>
<td>Accepted</td>
</tr>
<tr>
<td>9</td>
<td>2.7.2</td>
<td>As part of this section add a table with three columns, one column titled “works to be undertaken” and one column titled “works considered as maintenance”, and one column titled “estimated cost”, then list in the relevant column the works will be carried out to the existing viaduct as part of the widening works.
For example;
Works to existing Parapets
Concrete repairs
Scour protection to existing viaduct
Painting of existing steel beams
Bearing refurbishment
VRS to existing structure to protect piers</td>
<td>Noted, we will include a table similar to below and populate accordingly. Our view is only maintenance works that are NOT considered to be routine/safety critical or require special access be included as part of the widening scheme.

Please confirm if you agree with the table below highlighting maintenance works to be included. Cost estimates shall be based on previous type works;
<table>
<tr><th>Work element</th><th>Work to be undertaken as part of the A1B2CH widening scheme</th><th>Works considered as Maintenance</th><th>Estimated Cost</th></tr>
<tr><td>Parapet rails to be repainted</td><td>YES
(note one side is to be replace for widening – consideration to upgrade parapet both sides during d.design)</td><td>NA</td><td>TBC</td></tr>
<tr><td>Replace joints</td><td>YES</td><td>NA</td><td>TBC</td></tr>
<tr><td>Settlement to abutment revetments</td><td>No</td><td>YES – Suggest be investigated/rectified now determine further movement or if ceased</td><td></td></tr>
<tr><td>Erosion of river team banks install fencing</td><td>No</td><td>Yes</td><td></td></tr>
<tr><td>Structural bearing painting</td><td>YES – complete when access in place.</td><td>NA</td><td>TBC</td></tr>
<tr><td>Conc repairs</td><td>YES – include as</td><td></td><td></td></tr>
</table>
</td>
<td>Accepted if bottom row added for maintenance painting of main beams and connections</td>
</tr>
</table>

<table>
<tr><td></td><td></td><td></td><td>
<table>
<tr><td>to cracks parapet edge beam</td><td>part of VRS upgarde</td><td></td><td></td></tr>
<tr><td>General replacement of debonded sealant</td><td>YES</td><td></td><td>TBC</td></tr>
<tr><td>Vegetation clearance</td><td>No</td><td>YES – part of routine maintenance</td><td></td></tr>
<tr><td>Maintenance painting of Beams and connections</td><td>Yes</td><td></td><td></td></tr>
</table>
The principal Inspection Report dated 2016 highlights as one of the main items of work “rusting to the main beams and connections throughout the structure”. Preparation and painting of these members would require special access, and the ideal time to carry out this work would be as part of a major scheme and at the same time as the painting works to the bearings, which will require similar access.
</td><td></td></tr>
<tr><td>10</td><td>2.7.4</td><td>As well as a swept path analysis needed to determine if SV196/SOV350 vehicles could be navigable around the roundabout at junction 67, will an assessment be required of the 2 No existing structures which carry the roundabout over the river Team?</td><td>We have reviewed the as builts for the river team roundabout culverts. The span of these box culverts is circa 15m. We agree an assessment should be undertaken to confirm the abnormal load capacity if not already complete.

Initial thoughts are due to the limited span, the SV196/SOV250/350 should be able to pass as the actual applied loads will be significantly less than the overall size of the abnormal load considered (limited axles loads applied at any one time).

This assessment shall be progress as part of the Stage 3 preliminary design under technical approval and certified accordingly.</td><td>Accepted</td></tr>
<tr><td>11</td><td>3.4.2</td><td>Although the detailed design of any piled solution/technique may be carried out by a specialist Piling Contractor, the responsibility for the design will remain with the Principal Designer for the project.
Please amend the statement.</td><td>Noted wording to be amended to the following.

“Detailed design of any piled solution shall be undertaken by a specialist piling contractor (and reported within a Geotechnical Design Report in line with HA22/08). Whilst this shall be certified accordingly we note the overall responsibility of the design will remain with the Principal Designer.</td><td>Accepted</td></tr>
<tr><td>12</td><td>4.1.6</td><td>Please reword the last bullet point, i.e Ensuring future</td><td>Noted wording to be amended as proposed</td><td>Accepted</td></tr>
</table>

		maintenance requirements of the proposed widened structure are no more onerous than those required to maintain the existing structure in its current condition.		
13	4.1.2	Insert a paragraph to discuss scope for future widening to four lanes in each direction. Is there scope for a hardstrip be provided as part of the widening work?	Proposed the following wording: *The assessment for four lanes in each direction has not been reviewed for this study. However there appears to be scope to increase the number of lanes to four based on the provision of reduced lane widths and verges.* *If required this would be subject to further review of the highway alignment and load bearing capacity of the structure.* The requirement for hard strips shall be reviewed at detailed design.	Accepted
14	4.3.3	Please refer to comments re 2.7.4	Noted, will make reference to the requirements for the abnormal load assessment for the River Team bridges	Accepted
15	4.3.5	Please insert a paragraph to discuss the proximity of the existing and proposed viaduct piers to the local road/roundabout below. From the plans it appears that the new pier will be situated very close to the existing roundabout kerbline. Is it anticipated that VRS will be required and or the roundabout realigned slightly to accommodate? The inspection summary in section 2.3.1 mentions a bridge strike to span 1 pier in June 2011.	We anticipate the roundabout shall be slightly realigned to accommodate the proposed widening. This shall be reviewed at detailed design. We shall make reference to this within section 4.3.5. Consideration for safeguarding of the piers shall be considered during the review of the roundabout alignment to accommodate the widening.	Accepted
16	5.2.2	Bullet point starting H&S/Risk, sentence compares Option A to Option A.	Noted, shall be amended accordingly.	Accepted

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