National Asset Delivery
Technical Surveys and Testing

Works Information
570459 M5 J19-20 Wynhol Viaduct
Post-Tensioned Special Inspection

CONTENTS AMENDMENT SHEET

Amend. No.	Revision No.	Amendments	Initials	Date
0	0	Issued with tender	ET	08/0721

TABLE OF CONTENTS

1 DESCRIPTION OF THE WORKS

1.1 Project Objectives

1.1.1 The principle objective of the project is to undertake the Value Management process on 9 structures. The following specification sets out the investigation requirements required to assess the condition of the Post-Tensioning of the Wynhol Viaducts - Lower Northbound and Upper Southbound and options to extend their serviceable lifespan.

1.1.2 This document should be read in conjunction with PTSI Technical Plans Reference 70067536/11071/PTSI20 (Wynhol Viaduct North) and 70067536/1770/PTSI20 (Wynhol Viaduct South). These two documents form part of the Works Information and are referenced as the Technical Plan throughout this document.

1.1.3 The specification that applies to the *Works* is included in Section 6.

1.1.4 The requirements contained in GG 101 shall be followed in respect of activities covered by this document.

1.2 Scope of works

The *Works* to be provided under this contract are detailed in the Technical Plan. The scope of works to be provided by the *Contractor* is as follows:

1) Intrusive Investigation of the Post-Tensioning System (Duct and Tendon and Anchorage Exposures);

2) Corrosion Test Areas comprising;

   a) Delamination Survey

   b) Concrete cover survey

   c) Half-cell Potential survey

   d) Concrete resistivity measurements

   e) Depth of carbonation

   f) Chloride ion contents determination

   g) Cement contents determination

   h) Sulfate contents determination

   i) Alkali contents determination

1.2.1 Duct and Tendon / End Anchorage Exposures

Locations of Duct and Tendon Exposures (DTEs) and End Anchorage Exposures (EAEs), with types, referencing, size and dimensions are detailed in the Technical Plan.

It is proposed to undertake Duct and Tendon Exposures (DTEs) and End Anchorage Exposures (EAEs) at 35 No. locations to Wynhol Viaduct North (Lower), and 37 No. locations to Wynhol Viaduct South (Upper).

The required standards for testing are detailed in Section 6. Reporting requirements are set out in Section 1.3.

(1) The PTSI site investigation shall be undertaken in accordance with the Technical Plan, as agreed with the Overseeing Organisation. The site works shall be undertaken by companies with experience in PTSI site investigations. The person supervising the site works shall have experience in PTSI site investigations.

(2) All material sampling, site and laboratory testing shall be carried out by companies approved for the relevant sampling and testing as detailed in Section 6.1.3 of this document.

(3) The position of ducts shall be located on-site by reference to as-built drawings and XYZ (Table 1) and the use of non-destructive testing (NDT).

(4) Where voids in ducts have been detected using NDT methods, ducts and tendons at these locations should be targeted for exposure.

(5) The condition of the internal post-tensioning system(s) shall be determined by visual inspection, using percussion drilling.

(6) The following procedure shall be used to expose ducts and tendons, and anchorages:

a) confirm duct location with a pilot hole;

b) enlarge the pilot hole to within 25mm of the duct;

c) remove remaining concrete to expose duct;

d) open the duct to expose the grout;

e) remove the grout using hand tools to expose the tendon.

(7) A minimum of 50% of the duct section should be removed to enable inspection of the grout and tendon. Exposures should target the tops of ducts, where possible, since this is the most likely location for voiding to be present.

(8) Removal of concrete within the bursting zone of the anchorage should be avoided since this localised region is likely to be highly stressed.

(9) The intrusive investigations shall identify details and defects relevant to the post-tensioning system(s). The intrusive investigations should also confirm details relevant to the post-tensioning system(s) including:

a) type and size of the duct;

b) the precise location of the duct at the point of exposure;

c) type and size of the tendon;

d) position of the tendon within the duct;

e) packing of wires or strands in a tendon.

(10) The intrusive investigations should identify defects relevant to the post-tensioning system(s) including the condition of:

a) concrete and reinforcement in the vicinity of the exposures;

b) duct sheaths, both externally and internally;

c) duct grout;

d) tendons;

e) anchorages.

(11) When water is found within a duct, a sample should be collected for laboratory analysis of:

a) chloride ion content;

b) sulfate ion content;

c) pH value.

(12) When a void is discovered within a post-tensioning duct then its extent shall be recorded and classified in accordance with CS 465 Management of Post-Tensioned Concrete Bridges. The void volume should be determined using air pressure or vacuum testing techniques.

(13) All areas of removed concrete shall be reinstated as per Section 6.1.4 of this document.

(14) Chloride content tests shall be obtained from post-tensioning grout at all test locations where obtaining a sample is possible and be taken to a laboratory for testing. Each sample shall be sealed and uniquely labelled and weigh at least 25g. Determination of sulfate content shall also be undertaken at all grout sampling locations.

(15) The mean cement content as determined by laboratory testing shall be used in the calculation of chloride ion content by mass of cement.

(16) Cement content, sulfate content and alkali content of concrete shall be determined on dust and lump samples retrieved from tendon exposure/half-cell connection locations (refer to Section 1.2.2). The cement content from locations not associated with elevated corrosion potential shall be determined from samples that are from representative locations as opposed to in one relatively concentrated location.

The proposed post-tensioned Special Inspection work shall be assumed as a stand-alone delivery. If following review of delivery programmes there is an opportunity for combining of other survey works, this will be discussed with the Contractor and adjustment of the site programme may be required.

1.2.2 Corrosion Test Areas

Locations of Corrosion Test Areas (CTAs), with CTA types, referencing, size and dimensions are detailed in the Technical Plan.

It is proposed to undertake Corrosion Test Areas (CTAs) in 10 No. areas per structure.

The required standards for testing are detailed in Section 6. Reporting requirements are set out in Section 1.3.

The scope of these investigations is as follows:

(1) The Contractor shall carry out a comprehensive delamination/hammer tap survey on all the concrete elements within the full extent and immediate vicinity of Corrosion Test Areas

(i.e. an additional 0.5m around the CTA, except for those within trial pits where the survey shall be undertaken to the entirety of the exposed concrete surface). The delamination survey shall be undertaken to determine the extent of any “hollow” or “ringing” spots which indicates the early onset of delamination or spalling. The location and the extent of any loose, detached, or ‘drummy’ sections of concrete shall be recorded and reported. The location, extent and section loss of any exposed reinforcement shall additionally be recorded and reported.

(2) Any concrete identified as loose, or which poses a threat to the public or the maintenance staff shall be fully removed. Highways England are to be made aware of areas of spalled concrete above 0.3m x 0.3m, or where reinforcement is exposed due to spalling, where loose concrete is removed.

(3) An electromagnetic cover meter shall be used to detect reinforcement bars positioned parallel and perpendicular to the concrete surfaces. The cover meter survey shall be used to locate the reinforcement prior to half-cell and resistivity surveys. The cover meter survey shall be used to avoid steel reinforcement and cables in drilling holes for carbonation test and dust samples.

(4) Test areas within trial pits are to be a minimum of 0.7m x 0.7m, allowing a 3 x 3 test grid with node spacings at 350mm centres (this considers a trial hole plan size of circa 1m x 1m with allowance of 150mm waterproofing laps around its perimeter. Test areas to the webs and bottom flange of the bridge deck are to be a minimum size of 1.5m x 1.5m, allowing a 4 x 4 test grid with node spacings at 500mm centres. Test areas to the tops of piers are to be a minimum of 3.0m x 1.5m, allowing a 7 x 4 test grid with node spacings at 500mm centres. The dimensions can be altered to suit the size and shape of the element being investigated and the level of associated risk. Readings shall be taken at 0.5m x 0.5m grid spacings within the test areas to determine the minimum concrete cover in that area, unless this is impractical, in which case nodes at smaller centres covering approximately the same size test panel as proposed is acceptable.

(5) An electrical potential survey using half-cell test equipment shall be carried out at node points defined by a grid marked on the concrete within the test areas and shall be undertaken on sound and non-delaminated concrete. Electrical continuity of the reinforcement shall be checked and confirmed prior to carrying out the corrosion potential survey. Portable silver/silver chloride reference electrode (SSC [0.5M KCl], Ag/AgCl/0.5M KCl) shall be used for half-cell potential surveys and results shall be recorded in millivolts (mV).

The ASTM C876 [Ref 27.I] infers that a saturated copper/copper sulfate electrode (CSE) is the normal reference electrode used for measuring corrosion potential using half-cell survey. The advice

reflects practice in the United States, but the use of a CSE electrode is not recommended in the UK. Significant errors can arise from the use of CSE electrodes and their use is discouraged.

(6) Half-cell potential measurements shall be undertaken at 0.5m x 0.5m grid spacings over the proposed test panels. The survey grid spacing may be reduced near to vulnerable areas (such as joints) or if the potential gradient is greater than 100mV between readings taken at 0.5m x 0.5m spacings.

(7) Where corrosion potential readings indicate there is a high risk of reinforcement corrosion (-300mV for SSC probe and -350 mV for CSE probe), but concrete is intact with no detectable delamination, the actual condition of the reinforcement shall be investigated by an exploratory breakout. A small grid CTA is to be undertaken surrounding any nodes where the electrical potential exceeds the threshold for the potential onset of pitting corrosion. Half-cell potential measurements within small grid CTAs are to be undertaken at 0.1m x 0.1m nodes, within a 0.5m x 0.5m area. Additional chloride sampling and resistivity measurements are to be undertaken at the location of the lowest reading and a localised reinforcement breakout is to be made to allow visual inspection of the steel.

(8) Where small breakouts are necessary to enable electrical connections to the reinforcing steel, they shall be reinstated as per Section 6.1.4 of this document. Breakouts undertaken to facilitate connection to reinforcement (half-cell potential survey) shall be used to confirm reinforcement type, orientation, size, cover and condition. Furthermore, where corrosion potential readings indicate there is a high risk of reinforcement corrosion (-300mV for SSC probe and -350 mV for CSE probe), a local concrete breakout to check for initiation and severity of rebar corrosion shall be undertaken.

(9) Concrete resistivity measurements shall be carried out at the locations of the most negative half-cell potential values, at a minimum of two locations per test panel. The resistivity of the concrete shall be measured using electrodes temporarily attached to the concrete, across which measurements of voltage and current are taken. These measurements may be taken using a four-probe array or a two-probe array system. Probes shall be placed in holes drilled through the carbonated surface layer and through the surface contamination (a depth of 5mm is considered sufficient), filled with a low resistivity contact medium. If the system is spring-loaded, an applied pressure is considered sufficient to maintain electrical contact and as such these holes do not need to be drilled. The concrete resistivity shall be reported in units of kΩcm.

(10) The depth of carbonation shall be determined by testing freshly exposed concrete using phenolphthalein indicator in ethanol. The

test shall be undertaken at each location where concrete has been drilled to obtain samples for determination of chloride ion content. The depth of carbonation at each location shall be recorded and supported with photographic record.

(11) Chloride content tests shall be obtained from all test panels from locations near to the most negative electrical potentials measured. Samples shall be removed from the concrete at a minimum of two locations within each test area and be taken to a laboratory for testing. Before drilling holes, the position of existing reinforcement should be detected and marked on the concrete to minimise the risk of damaging bars. The diameter of the sample holes should be small and a function of aggregate size. Incremental samples shall be obtained at depths of 5-30mm, 30-55mm, 55-80mm and 80-105mm. Each sample shall be sealed and uniquely labelled and weigh at least 25g.

(12) Sampling holes shall be reinstated as per Section 6.1.4 of this document.

(13) Cement content, sulfate content and alkali content of concrete shall be determined on dust and lump samples retrieved from breakouts used to facilitate the inspection of reinforcement if highly negative half-cell readings are found. If no breakouts are necessary to check reinforcement condition, samples of concrete shall be collected from tendon exposure/half-cell connection locations. The cement content from locations not associated with elevated corrosion potential shall be determined from samples that are from representative locations as opposed to in one relatively concentrated location.

(14) Determination of alkali content, cement content and sulfate content shall be undertaken from a minimum of three samples per structure at representative locations. At least one sample from a pier, deck web and top or bottom of the bridge deck shall be tested per structure.

(15) The mean cement content as determined by laboratory testing shall be used in the calculation of chloride ion content by mass of cement.

(16) All concrete removed from the structure, for the purposes of testing, shall be reinstated with a high strength, non-shrink, quick setting, proprietary mortar in accordance with MCHW Series 5700 Appendices. Reinstatement material shall be placed in accordance with the manufacturer's instructions. All equipment used for placing shall be clean and free from contaminants. The finished surface shall have a colour and texture similar to that of the existing concrete. Delaminated or spalled concrete does not need to be reinstated.

1.2.3 Trial Pitting Works and Works Associated with Trial Pitting Activities

Trial pits are to be excavated within the carriageway at locations specified in the Technical Plan.

Trial pit sizes are to be 1m x 1m to accommodate corrosion testing and allow for a sufficient waterproofing lap. The required standards for testing are detailed in Section 6 and reporting requirements are set out in Section 1.3.

The scope of these investigations is as follows:

(1) The trial pits are to be located and marked on the carriageway surface. At trial pit locations, the proposed work area shall be assessed for the location of buried services using appropriate equipment. Statutory undertakers' drawings (Site Information Pack) are to be consulted and a permit to dig shall be in place before works are to commence.

(2) The surfacing shall be saw cut with dust suppression methods used, to the perimeter of the marked area, to the depth of the surfacing. The surfacing shall be broken out and spoil removed, to expose the waterproofing layer within the full extent of the trial pit.

(3) The *Contractor* is to assume no asbestos is present in survey locations, however, it is expected that the *Contractor* will have Asbestos Awareness training for all site staff. A Refurbishment and Demolition Asbestos Survey shall be undertaken by *Others*, prior to disturbance of the waterproofing material within each trial pit, or any intrusive works. The results of this survey will be made available before contract commencement. Record information indicated that the waterproofing system was replaced in 1993 with a Servi-Deck / Servi-Pak system.

(4) The waterproofing layer is then to be fully removed within the extents of the trial pit (except for a lap of 150mm or greater to enable a sufficient bond to the waterproofing reinstatement material) to reveal the concrete deck slab. The visual condition of the deck slab shall be recorded. Corrosion testing shall be undertaken within each trial pit, in alignment with the requirements set out in this document. Depths of surfacing are to be recorded at all four corners of each trial pit.

(5) Reinstatement of waterproofing shall be undertaken using a compatible system with BBA certification. Prior to the reinstatement of the waterproofing, the bridge deck shall be prepared by removing all traces of existing waterproofing within the trial pit (with the exception of the lap) and abrading the concrete to remove laitance and contamination.

(6) On completion of waterproofing reinstatement, the excavation shall be reinstated using 12mm Hot Rolled Asphalt surface course directly from a hot box. Reinstatement shall be laid and compacted to leave a level

finish with the existing road surface. An appropriate number and thickness of lifts and the number of compaction passes shall be determined by the *Contractor*. Joints are to be sealed using a compatible sealant.

(7) All waste materials are to be disposed of in accordance with relevant legislation and requirements. Waste Acceptance Criteria Testing and testing for the presence of tar shall be undertaken by *Others*, prior to disturbance of the waterproofing material within each trial pit, or any intrusive works. The results of this testing will be made available before contract commencement.

1.3 Deliverables

The *Contractor* is required to produce the following deliverables:

1.3.1 The *Contractor* will be required to present the findings of the site survey in a detailed Post-Tensioned Special Inspection (PTSI) report. The report shall be issued in PDF format and Microsoft Word format. The report shall be provided in a timely manner as per Section 5. There is to be one report per structure.

1.3.2 The PTSI report is to contain the following information:

a) The report shall contain the factual data from the PTSI site investigation and provide an interpretation of the results.

b) The reasons for any variations between the technical plan and the PTSI site investigation shall be recorded.

c) The factual data from the PTSI site investigation shall be recorded under the following headings:

1) visual inspection results;

2) visual results from intrusive investigations;

3) grout material tests;

4) concrete material tests;

5) tests for corrosion risk.

d) Results of the previous testing to determine corrosion risk and materials testing should be presented for comparison.

e) Results of the testing and intrusive investigations should be collated for each critical section to enable their condition to be appraised.

f) The data shall be interpreted and the following provided:

1) discussion on the current condition of the post-tensioned elements;

2) discussion on the risk of deterioration in the future;

3) discussion of the risk of brittle failure mode in the structure's current condition;

4) recommendations for the future management of the bridge.

1.3.3 The corrosion risk testing and concrete materials testing elements of the report are to contain the following information:

g) Date, temperature, weather conditions and test locations;

h) Location and description of the components under investigation;

i) Description of the apparatus used during the cover meter survey;

j) A summary table of cover meter readings, half-cell readings in mV (SSC / CSE probe), depths of carbonation, resistivity readings and results of laboratory analysis for each test panel to identify the key site measurements taken, and interpretation of the minimum and mean depth of concrete cover over each test panel area;

k) Plots of half-cell readings into a contour map for each test panel. The plots are to identify the key site measurements taken and whether the likelihood of corrosion activity is low/intermediate/high;

l) Date and place of the laboratory analysis;

m) Chloride ion content results for each dust sample as % by mass of cement. The summary shall record whether the chloride content is deemed to be low/intermediate/high as applicable.

n) Cement content results for each dust sample as % by mass of concrete. The summary shall record whether the cement content is deemed to be low/intermediate/high as applicable.

o) Sulfate content results for each dust sample as % by mass of cement. The summary shall record whether the sulfate content is deemed to be low/intermediate/high as applicable.

p) Alkali content results for each dust sample shall be presented in kg/m3. The summary shall record whether the sulfate content is deemed to be low/intermediate/high as applicable.

q) Copies of the laboratory testing results for each of the dust samples recovered.

r) Copies of the UKAS accreditation for any testing laboratories used.

s) Proprietary details of the repair mortar used for the reinstatement of concrete.

t) Any surface preparation is undertaken for each reinstatement location before placing.

u) The placing method used for each reinstatement location.

v) A photographic record at each location, before, during and after the reinstatement works.

w) A photographic record of the survey with at least one photograph per test panel location and any defects noted during the inspection.

x) Photographic record of reinforcement at each breakout location.

y) Details of reinforcement exposures including the size of the breakout in mm, (including depth), concrete cover to reinforcement in that location, and condition, diameter and type of rebar.

z) Date and place of sampling and other relevant details supplied with the sample. This shall be in the form of a series of sketches showing the location of each sample.

aa) A summary sketch showing the location of reinforcement breakouts.

bb) Sketches showing the extent and position of any delaminating and/or spalled concrete during the survey, and the location, extent and section loss of any exposed reinforcement.

cc) Summary sketches showing the location of CTAs.

dd) A series of detailed CTA sketches including node points, orientation and relative position, location of reinforcement breakouts, chloride dust drillings, carbonation measurements and resistivity measurements kΩcm for each the test panel. Where CTAs were undertaken within trial pits, the depths of surfacing in each corner of the trial pit should be included.

ee) Date and place of sampling and other relevant details supplied with the sample. This shall be in the form of a series of sketches showing the location of each sample.

ff) A summary sketch showing the location and readings of the resistivity survey in kΩcm for each the test panel.

gg) A summary table presenting the findings of the asbestos check shall be provided.

2. EXISTING INFORMATION

2.1.1 Existing information relevant to the *Works* is provided in the Technical Plan.

The following information is provided in the Site Information package, as it is not available on IAMIS.

File Title	Comment
A13-3a-bat-work-schedule.doc (2).pdf	Works will be scheduled by the *Employer.* The *Contractor* will work in accordance with the schedule.
Appendix H1.pdf	Previous reports that have recorded information from the Structure. These provide the ecological history of the structure.
Appendix H2 - 07.11.16.pdf	
Appendix H2 - 2008-2010.pdf	
Appendix H2 -23.11.16.pdf	
Appendix H2 -31.03.16.pdf	
Appendix H2 -2006-2008.pdf	
Appendix H2-07.07.20.pdf	
bats-method-statement amended.pdf	Any works undertaken by the *Contractor* will require similar controls. The *Contractor* will provide a Method Statement for the works that consider all ecological and environmental constraints to undertake the Works. The *Contractor* will plan and undertake all works in accordance with their accepted method statement.
bats-method-statement_ July 2020.doc	
Work Schedule, amended - 23.12.19.PDF	Works will be scheduled by the *Employer.* The *Contractor* will work in accordance with the schedule.
5.282.07.01_Wynhol_BatRoostInspectionResults_Sept2019.pdf	It is anticipated that current roost conditions are as per the provided report.
Dwgs\HE601873-KIER-ELS-M5_ML_151.3_Z-DR-LE-300008 C1.pdf	These drawings show the typical supervision extent required for similar works undertaken. This supervision is to be undertaken by *Others.*
Dwgs\HE601873-KIER-ELS-M5_ML_151.3_Z-DR-LE-300001 C1.pdf	
Dwgs\HE601873-KIER-ELS-M5_ML_151.3_Z-DR-LE-300002 C1.pdf	
Dwgs\HE601873-KIER-ELS-M5_ML_151.3_Z-DR-LE-300003 C1.pdf	
Dwgs\HE601873-KIER-ELS-M5_ML_151.3_Z-DR-LE-300004 C1.pdf	
Dwgs\HE601873-KIER-ELS-M5_ML_151.3_Z-DR-LE-300005 C1.pdf	
Dwgs\HE601873-KIER-ELS-M5_ML_151.3_Z-DR-LE-300006 C1.pdf	
Dwgs\HE601873-KIER-ELS-M5_ML_151.3_Z-DR-LE-300007 C1.pdf	

3. CONSTRAINTS ON HOW THE CONTRACTOR PROVIDES THE WORKS

3.1 General

3.1.1 The *Contractor* Provides the Works in such manner as to minimise the risk of damage or disturbance to or destruction of third party property.

3.1.2 The *Contractor* complies with the constraints and meets with the requirements outlined in Appendix 1.

3.1.3 The *Contractor* submits information detailing how the *Contractor* will provide the Works to the *Employer* before the mobilisation. This information will include any lifting plans, risk assessments, method statements, the *Contractor's* staff training information and any other relevant Health and Safety requirements.

3.2 Working hours & site-specific constraints

3.2.1 Any required lane closures shall be deemed as taking place during night-time hours. Other works shall be deemed to take place during daylight hours.

3.2.2 The Principal Contractor (to be appointed by Highways England) will provide all traffic management. Final details of the lane closures required with sufficient regard to safety zones and vehicle, plant or machinery operations will be discussed during mobilisation. A full road closure will not be allowed under this contract.

3.2.3 The traffic management is to be off-peak lane closures. Night time working windows shall be assumed as Monday to Friday between the hours of 23:00hrs and 05:00 hrs (but will be subject to actual traffic conditions).

3.2.4 The post-tensioned tendons follow a hogging profile over piers and the edge of the duct is anticipated to be within 100mm of the top of the deck slab at the location of trial pits over piers. The total depth of the carriageway surfacing is anticipated to be circa 40-70mm. Care must be taken when undertaking trial pitting and related activities so as not to cause damage to the post-tensioned tendons.

3.2.5 Bats have been recorded roosting in the viaduct. These include the Lesser Horseshoe Bat (Rhinolophus Hipposideros). This is a major colony with upwards of 100 bats observed. A bat mitigation license will need to be obtained from Natural England prior to works within the abutments. The *Employer* will apply for this licence. The *Contractor* will implement any requirements of the licence. It is anticipated that works will adopt a precautionary approach, be restricted to avoid maternal and hibernating seasons and specific working hours with the following constraints:

3.2.5.1 Bats roost within abutment chambers and at joint locations. Previous agreements and working methodologies have specified that timber (plywood)

screens will be placed over manholes accessed from within the abutments which provide access into deck chambers to avoid dust, light and noise from carrying into the deck chambers (where the majority of bats roost). Note that these screens can only be erected one end of the deck at a time to ensure a constant route of exit for any present bats. Timber screens will need to be erected at the front of each shift and removed at the end of each shift to ensure voids are fully open during the day.

3.2.5.2 Bats will be temporarily excluded from working areas during works, and access will be reinstated after works have been completed. At all times there will be entry/exit locations open into the deck chambers for bats whilst works is being undertaken.

3.2.5.3 Temporary lighting (and other generator-powered equipment) will be required during the works. The generator will be located in an area to prevent a toxic build-up of fumes potentially affecting bats and site operatives.

3.2.5.4 Due to the requirement for a protected species licence, it is likely that any works will only be able to occur outside of the hibernation season. It shall be assumed that works on site will complete no later than November 2021.

3.2.5.5 To aid with agreement of a protected species licence, it shall be assumed that works will only be undertaken on one viaduct structure at a time. This will provide an opportunity for bats to naturally migrate to an adjacent and similar structure that is not subject to disturbance.

3.2.5.6 Refer to the Site Information for other bat mitigation measures that are typically required on this site. The *Contractor* will implement all required mitigations as part of their proposed methodology.

3.2.6 Access into the structure is via the abutments which have locked steel doors. Keys will need to be obtained from Highways England prior to entry to abutments. The *Contractor* will need to apply a safe confined space working methodology when working within the abutments.

3.2.7 Access to the land beneath the structures will require third party consent (refer to Survey Information Pack for Land Registry Plans).

3.2.8 Vegetation clearance may be required to facilitate access to both Viaduct structures and the need for any vegetation clearance must be made clear as part of the tender submission. Consideration will need to be given for the programme delivery constraint – start of site delivery anticipated to be November 2021 and due allowance made for vegetation that will have grown and become an access issue between now and the delivery of proposed works. The Contractor will be responsible for undertaking vegetation removal. It shall be noted that removal of vegetation depending on the location and extent will be subject to a best practice approach from an ecological

perspective. Contractors undertaking vegetation removal works must be NHSS Sector Scheme 18 approved.

3.2.9 Pipes associated with the structure are predominantly asbestos cement pipes. These pipes are not to be interfered with as part of these works. The *Contractor* will be provided with all asbestos information prior to the *Start Date.*

3.3 Health, Safety and Environment & Risk Management

Health and Safety requirements

3.3.1 In Providing the Works the *Contractor* meets the requirements of Annex 2 of the supplementary constraints in relation to health and safety duties.

3.3.2 When implemented, the *Contractor* shall comply with the requirements of Highways England's safety passport scheme and ensure that all of his employees, and any of his subcontractor's, are registered in accordance with the implementation of the scheme.

3.3.3 For details of the CDM duty holders, refer below:

Client – Highways England (*Employer)*

Principal Contractor – *To be appointed by Highways England*

Principal Designer – Highways England (*Employer)*

Contractor – *Contractor*

Designer – WSP

3.3.4 Before commencing the construction phase of the *works*, the *Contractor* confirms to the *Employer* that adequate welfare facilities are in place. Where the facilities detailed in Section 5 are not deemed adequate, the *Contractor* provides all necessary facilities to Provide the Works, and to comply with the minimum requirements set out in HSE guidance document L153.

Environmental requirements

3.3.5 In Providing the Works the *Contractor* meets the requirements of Annex 2 of the supplementary constraints in relation to environmental duties.

3.2.10 Highways England shall apply for a bat mitigation licence from Natural England to enable works within and adjacent to the deck and abutments.

Risk Management

3.3.6 The *Contractor* identifies, manages and mitigates risks in accordance with the principles of ISO 31000.

3.3.7 The *Contractor* submits a risk register, which captures all risks associated with the delivery of the *works* including those identified by the *Employer*, with his tender and maintains it for the contract period.

4. REQUIREMENTS FOR THE PROGRAMME

4.1 The *Contractor* submits programme to the *Employer* with his tender.

4.2 The *Contractor* Provides the Works taking into account the following programme constraints:

(i) The *starting date* and *completion date* and any post site work, reporting and review period;

(ii) The services and other things provided by the *Employer* (see Section 5).

4.3 The programme should be in the form of an activity and time related bar chart, produced as a result of a critical path analysis.

4.4 The programme should preferably be provided in either a PDF or MS Excel format and cover the full contract period including post-site activities. Activities should be clearly defined and named and the programme should detail the following:

(i) dates and times associated with the project, including the *starting date*, *completion date* & *Contractor's* planned completion, and any other dates or times that will specifically impact the delivery of the project;

(ii) activities associated with delivering the site works and project outputs.

4.4.1 The *Contractor* updates the programme every 2 weeks. The *Contractor* submits an updated programme to the *Employer* upon request.

Commission Date: As awarded

Mobilisation – 3 weeks from Commission Date

Draft Report Submission Date – 6 weeks from completion of site works

Review Period for Highways England – 2 weeks

Final Report Submission Date – 1 week from Draft Report Submission Date

Completion – 1 week following final report approval on IAMIS

5 SERVICES AND OTHER THINGS PROVIDED BY THE *EMPLOYER*

5.1.1 The following services will be facilitated/provided by the *Employer* to allow the *Contractor* to Provide the Works:

(1) Traffic Management (to be provided by the Principal Contractor). The traffic management is to be off-peak lane closures.

(2) Welfare facilities will be provided by the *Employer.*

(3) Bat Mitigation License to be obtained by *the Employer.* The *Contractor* shall work in accordance with the Bat Mitigation License.

5.1.2 The other things that will be provided by the *Employer* are as follows:

(17) not used.

5.1.3 Things that will be provided by the *Contractor* are as follows:

(1) Specialist access equipment/machinery, plant and materials required for trial pitting activities and all aspects of testing are to be provided by the *Contractor.*

6 SPECIFICATION FOR THE WORKS

The *Contractor* shall undertake the works in accordance with:

6.1.1 The Works shall be undertaken in accordance with CS 465 Management of Post Tensioned Concrete Bridges. Guidance on exposure methods can be found in Inspection Manual for Highway Structures IMHS V1.

6.1.2 Corrosion risk testing shall be undertaken in accordance with departmental Standard CS 462 Repair and Management of Deteriorated Concrete Highway Structures and CS 464 Non-destructive testing of highways structures.

6.1.3 All sampling and testing should be carried out by specialist testing firms or laboratories approved by the UK's Accreditation Service (UKAS) Body for laboratory testing to ISO/IEC 17025.

6.1.4 All concrete removed from the structure shall be reinstated using a suitable high strength, non-shrink, quick setting, proprietary repair mortar complying with BS EN 1504-3:2005 Structural and non-structural repair and placed in accordance with BS EN 1504-10:2017 Site application of products and systems and quality control of the works.

6.1.5 Electromagnetic cover meter surveys shall be undertaken using the method described in BS 1881-204:1988 Testing concrete. Recommendations on the use of electromagnetic cover meters. The information to be included in the testing report shall be in accordance with BS 1881-204:1988 Clause 10.

6.1.6 The procedure for measuring the electrode potential of steel reinforcement and interpretation criteria shall be in accordance with TRL AG9 The Half-Cell Potential Method of Locating Corroding Reinforcement in Concrete Structures, ASTM C876-15 Standard Method for Half-cell Potentials of Uncoated Reinforcing Steel in Concrete, and in accordance with the recommendations of CS TR60 Electrochemical Tests for Reinforcement Corrosion and CS TG2 Guide to testing and monitoring the durability of concrete structures.

6.1.7 Measuring electrical resistivity of concrete shall be in accordance with the procedure given in CS TR60 Electrochemical Tests for Reinforcement Corrosion. Resistivity interpretation criteria shall be aligned with Table 5 of Digest 434 Corrosion of reinforcement in concrete: Electrochemical Monitoring.

6.1.8 The depth of carbonation shall be determined in accordance with BS EN 14630 Products and systems for the protection and repair of concrete structures. Test methods. Determination of carbonation depth in hardened concrete by the phenolphthalein method.

6.1.9 Analysis of dust samples to determine chloride content, sulfate content and alkali content shall be carried out through a UKAS accredited laboratory in accordance with BS 1881-124, Testing Concrete - Part 124: Methods for Analysis of Hardened Concrete. No chemical tests shall be undertaken on-site with the exception of carbonation testing.

6.1.10 Sampling for measuring chloride and cement content shall be undertaken using the procedures described in BRE IP 21/86 Determination of the chloride and cement contents of hardened concrete and in accordance with the

recommendations of CS TR60 Electrochemical Tests for Reinforcement Corrosion and CS TR32 Analysis of hardened concrete: A guide to tests, procedures and interpretation of results.

6.1.1 Waterproofing shall be reinstated in accordance with the method statement agreed with the Certification Body and in accordance with CD 358 Waterproofing and surfacing of concrete bridge decks Revision 1. The minimum adhesion and bond strength of the waterproofing system shall be compliant with Table 6.4 of CD 358.

6.1.2 Excavation, laying and compaction of materials (trial pitting) shall be undertaken in accordance with the DfT Specification for the reinstatement of openings in Highways, Fourth Edition S10. Simplified guidance can be sought in the DfT Practical Guide to Street Works. The minimum, nominal and maximum compacted lift thickness is to be in alignment with Annex 8 Table A2.2 of DfT Practical Guide to Streetworks.

6.1.3 Deliverables are to be produced in accordance with the requirements of CS 465 Management of Post-Tensioned Concrete Bridges.