

**National Asset Delivery
Technical Surveys and Testing**

Scope for

570135 - M5 J23-24 MP194.10

Huntworth Viaduct,

Topographical Survey

CONTENTS AMENDMENT SHEET

Amend. No.	Revision No.	Amendments	Initials	Date
0	0	Original version issued with tender	DH	28/04/20

FOR INFORMATION ONLY
DO NOT COMPLETE AT THIS STAGE

TABLE OF CONTENTS

1	PURPOSE OF THE <i>SERVICES</i>	4
2	EXISTING INFORMATION	5
3	CONSTRAINTS ON HOW THE CONSULTANT PROVIDES THE <i>SERVICES</i> ..	6
4	REQUIREMENTS FOR THE PROGRAMME	8
5	SERVICES AND OTHER THINGS PROVIDED BY THE <i>CLIENT</i>	9
6	SPECIFICATION FOR THE <i>SERVICES</i>	10

LIST OF ANNEXES

Appendix 1 **Supplementary Constraints**

Appendix 2 **General Survey Data**

FOR INFORMATION ONLY
DO NOT COMPLETE AT THIS STAGE

1 PURPOSE OF THE SERVICES

1.1 Project objectives

- 1.1.1 To carry out a detailed Topographical survey of Dunwear Lane/River Lane and the surrounding area underneath the Huntworth Viaduct. The detailed survey area also includes measurement of the bridge deck from ground level on Dunwear Lane.
- 1.1.2 To carry out a targeted Topographical Survey of the land in the survey area including measurement of the underside of the bridge deck.
- 1.1.3 The specification that applies to the *services* to be provided is included in Section 6

1.2 Scope of services

- 1.2.1 The services to be provided under this contract are:
 - (1) Undertake topographical surveys as specified within Section 6 and Figures 1 to 12.
 - (2) The survey work is limited to minor roads and private property. No works are to take place on the high-speed motorway network.
 - (3) No survey works are required on Network Rail Land. The Consultant may need to cross the railway at the level crossing southeast of the structure. The Consultant shall follow the signage in place at the level crossing to cross safely.
 - (4) Vegetation clearance at the North Abutment to allow the Topo survey. Vegetation clearance if undertaken during March-October will require to be supervised by an appropriately experienced ecologist with regards for nesting season. It is also necessary to inform Western Power Distribution before carrying out vegetation clearance.

1.3 Deliverables

- 1.3.1 The *Consultant* is required to produce the following deliverables:
 - (1) A two dimensional (2D) and three dimensional (3D) .dwg drawing file of requested survey for use in autoCAD 2D & Civil 3D. Drawings shall also be issued in .pdf format.
 - (2) Survey report including: Permanent Ground Marker (PGM) locations, photo locations and directions.

2 EXISTING INFORMATION

- 2.1.1 All relevant existing information including C2 stats searches can be found within the Pre-Construction Information (PCI) document.
- 2.1.2 Figures 1 to 12 show the location and type of surveys required.

FOR INFORMATION ONLY
DO NOT COMPLETE AT THIS STAGE

3 CONSTRAINTS ON HOW THE CONSULTANT PROVIDES THE SERVICES

3.1 General

- 3.1.1 The *Consultant* Provides the Services in such manner as to minimise the risk of damage or disturbance to or destruction of third party property.
- 3.1.2 The *Consultant* complies with the constraints and meets with the requirements outlined in Appendix 1.
- 3.1.3 The *Consultant* submits information detailing how the *Consultant* will provide the Services to the *Client* prior to the *services* commencing. This information will include any lifting plans, risk assessments, method statements, the *Consultant's* staff training information and any other relevant Health and Safety requirements.

3.2 Working hours & site specific constraints

- 3.2.1 The *Consultant's* working hours for site works shall be 08:00 to 18:00, Monday to Friday.
- 3.2.2 A number of locations are on private land. Highways England has access rights to the underside of the structure provided notice is given of the works. Highways England will confirm when access has been arranged.

3.3 Health, Safety and Environment & Risk Management

Health and Safety requirements

- 3.3.1 In Providing the Services the *Consultant* meets the requirements of Annex 2 of the supplementary constraints relation to health and safety duties.
- 3.3.2 When implemented, the *Consultant* 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 to the pre-construction information document.
- 3.3.4 Before commencing the construction phase of the *services*, the *Consultant* confirms to the *Client* that adequate welfare facilities are in place. Where the facilities detailed in section 5 are not deemed adequate, the *Consultant* provides all necessary facilities to Provide the Services and to comply with the minimum requirements set out in HSE guidance document L153.

Environmental requirements

- 3.3.5 In Providing the Services the *Consultant* meets the requirements of Annex 2 of the supplementary constraints in relation to environmental duties.

Risk Management

- 3.3.6 The *Consultant* identifies, manages and mitigates risks in accordance with the principles of ISO31000.
- 3.3.7 The *Consultant* submits a risk register, which captures all risks associated with the delivery of the services including those identified by the *Client*, with their tender and maintains it for the contract period.

FOR INFORMATION ONLY
DO NOT COMPLETE AT THIS STAGE

4 REQUIREMENTS FOR THE PROGRAMME

- 4.1.1 The *Consultant* submits programme to the *Client* with his tender.
- 4.1.2 The *Consultant* Provides the Services taking into account the following programme constraints:
- (i) the *starting date* and *completion date* and any post site works, reporting and review period
 - (ii) The services and other things provided by *Client* (see Section 5)
 - (iii) The *Consultant* is to provide 2D and 3D autoCAD .dwg files (see section 6) within 2 weeks of agreed site completion. The drawings shall also be in .pdf format.
- 4.1.3 The programme should be in the form of an activity and time related bar chart, produced as a result of a critical path analysis.
- 4.1.4 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) the *starting date*, *completion date* & *Consultant's* planned completion
 - (ii) for each activity, the proposed resources (plant & labour) expected to deliver each activity should be shown on the programme
 - (iii) review periods for any reporting requirements
 - (iv) key dates for the Client to provide 'services and other things'
 - (v) key dates for co-ordination with Others
- 4.1.5 The *Consultant* should provide details of the proposed resources (plant, labour, subcontractors etc.) expected to deliver each activity. This information can either be shown on the programme itself or provided in an associated resource statement included in the Proposal for Providing the Services.
- 4.1.6 The *Consultant* updates the programme every week. The *Consultant* submits an updated programme to the *Client* upon request.

5 SERVICES AND OTHER THINGS PROVIDED BY THE *CLIENT*

5.1.1 The following temporary traffic management will be provided by the *Employer* to allow the *Contractor* to Provide the Works:

- (1) The Principal Contractor is responsible for Traffic Management on Marsh Lane and Dunwear Lane.
- (2) The Principal Contractor will be responsible for the management of walkers/cyclists and vehicles within the survey areas. The extent and scope of the management need will vary depending on the extent of public access to an area. Traffic Management on the M5 is not permitted.

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

- (1) Welfare facilities will be provided by the Principal Contractor.

FOR INFORMATION ONLY
DO NOT COMPLETE AT THIS STAGE

6 SPECIFICATION FOR THE SERVICES

6.1.1 The *Consultant* shall Provide the Services in accordance with this specification and the Specification for Geodetic Surveying Services for Highway Works Schemes and Manual of Contract Documents for Highway Works – Volume 5 – Contract Documents for Specialist Activities – Part 2 – Specification for Geodetic Surveying Services.

6.1.2 The following specification is for the Topographical Survey of Huntworth Viaduct.

The planned works will involve the painting of the underside of the bridge. The topographical survey results will be used to plan the access requirements during the painting works.

6.1.3 The findings of the survey shall be recorded in format ".dwg" & ".pdf".

The survey boundaries are as shown in Figure 3, Figure 9 & Figure 10.

Traffic management will be provided by the Principal Contractor. Traffic management will be limited to Dunwear Lane / River Lane.

6.1.4 The following minimum items shall be recorded within the detailed survey area (Figure 3)

- a. All changes in level.
- b. Position of vehicle restraint systems, parapets, fences and their posts.
- c. Position of environment screens, including the position of posts.
- d. Position of verges, hard shoulder, central reserve, kerbs and each lane within the carriageway.
- e. Position of street furniture including electrical cabinets, SOS Phones, control cabinets, drainage covers and gullies.
- f. Sign post and marker posts
- g. Areas of vegetation
- h. Position of electrical and telegraph poles.
- i. Carriageway layout, including position of white lining.
- j. Position of the trial pits being carried out onsite. (1 No. full width of carriageway and verges of Dunwear Lane/River Lane.

- k. Positions shown within Figures 4-8
- l. Surveying below deck required, this shall include the positioning and height of key structural parts as shown in Figures 4-8.
- m. Extents of bodies of water including the river and canal.
- n. Surveying by reflectorless means is acceptable for measuring the position of the underside of the bridge structure and the extents of water bodies including the river.
- o. The position of trial pits undertaken on Dunwear Lane by another contractor.

Further details on item types to be surveyed and the accuracy are included within Appendix 2.

6.1.5 The following minimum items shall be recorded within the General survey areas (Figure 9 and Figure 10).

- p. The points shown in Figure 11 and Figure 12 within each span.
- q. Ground 1 m from each pier, East & West
- r. Underside of box girder, 1m from each pier, East and West
- s. Ground 15m from each pier, East and West
- t. Ground – Midspan, East and West
- u. Underside of box girder, midspan, East and West
- v. Extents of bodies of water including the river and canal.
- w. Surveying by reflectorless means is acceptable for measuring the position of the underside of the bridge structure and the extents of water bodies including the river.
- x. The consultant shall not survey the railway line.
- y. Where a prescribed measurement point cannot be measured due to obstructions, the Consultant shall measure the required points as close as possible.

The General Survey area shall be carried out as detailed in Appendix 2 – Within Third Party Land.

6.1.6 The primary and secondary control points shall be defined by permanent ground markers. Final positions of permanent ground markers shall be

determined by terrain and intervisibility constraints. Minor control points need not be permanently marked.

6.1.7 Permanent Ground Markers shall be stable for a period of 5 years and shall be of a construction which conforms to the types illustrated in Appendix J of Manual of Contract Documents for Highway Works Volume 5 Section 1 Part 2, Specification for Geodetic Surveying Services.

6.1.8 A Schedule of Permanent Control Stations shall be prepared incorporate the following information:

- Station designation
- Plan co-ordinates
- Level value
- Description
- Ordnance Survey triangulation stations (if used)
- Ground marker type

6.1.9 The acceptance criteria specified below are in terms of internal rather than absolute accuracies and are given as permitted deviations for distances, angles and levels. Internal accuracies are more critical to the construction process than the absolute accuracy of points in a higher coordinate system.

6.1.10 The relation between the permitted deviation (PD) and root mean square error (rmse) is:

$$PD = 2.5 \times rmse.$$

Where the control system forms a network, it shall be observed by measuring sufficient distances and angles to obtain a redundant number of observations, which shall then be adjusted by a least squares method.

When comparing measured distances and angles with those derived from the adjusted co-ordinates the differences shall not exceed the following permitted deviations:-

(a) Primary Points

Distances:- $\pm 0.5\sqrt{L}$ mm

Angles:- $\pm 0.035/\sqrt{L}$ degrees

As an offset:- $\pm 0.61\sqrt{L}$ mm

(b) Secondary Points

Distances:- $\pm 0.75\sqrt{L}$ mm

Angles:- $\pm 0.045/\sqrt{L}$ degrees

As an offset:- $\pm 0.75\sqrt{L}$ mm

(c) Minor Control

Distances:- $\pm 1.0\sqrt{L}$ mm

Angles:- $\pm 0.09/\sqrt{L}$ degrees.

As an offset:- $\pm 1.5\sqrt{L}$

Where L is the distance in metres between the points concerned. In the case of angles, the shorter of the two distances defining the angle shall be used.

When using GPS the adjustment must pass the chi squared test on the control network.

Post adjustment relative errors for distances and bearings at the 95% confidence level should be calculated for each line to show compliance with the criteria above. In addition, compliance measurements should be

observed between selected points in the network to confirm the validity of the adjustment positions on plan.

- 6.1.11 When comparing measured height differences with those derived from the adjusted reduced levels, the differences shall not exceed the following permitted deviations:

Between bench marks, primary stations and other closed loops in the framework:

$\pm 12\sqrt{K}$ mm where K is the distance levelled in km

Between adjacent secondary stations or minor control points less than 300 m ± 5 mm

- 6.1.12 A Total Station offering accuracy tolerance of +/- 5mm or better can be used. Use of GPS survey techniques or other means not providing this level of accuracy shall not be permitted.

- 6.1.13 Presentation

The Consultant shall provide two CAD files in AutoCAD 2017 dwg or dxf format one to be 2D and the other 3D for use with AutoCAD Civil 3D.

The presentation scale for the survey output drawings shall be 1:250 on trunk roads and 1:500 on motorways unless otherwise stated in the Scheme Task Order.

Drawings shall contain the Survey Contractors title block and contact details and a table detailing the control stations created / used. Additionally a legend of all symbol types used shall be incorporated.

2D files shall include contours represented at regular intervals across the survey extents. The required interval for contours will vary between sites and as such should be determined in a manner that provides sufficient indication of the general topography of the site without undue 'clutter'. Broadly the interval shall not be less than 100mm on flat sites or greater than 500mm on sites with significant level range. Major contours at each fifth interval shall be shown differently (weight or line type) so as to aid reading and shall be labelled with its level.

The 2D output file shall contain spot level information for all key features along with heights of features such as walls, fences and overhead cables.

Additional information on type, size and nature of features surveyed shall also be included.

No string lines shall cross any other string or block entity as this causes errors when creating a surface with AutoCAD Civil 3D. Contours shall not be included in the 3D file.

No feature or item within the 3D file shall have a zero level.

Within the detailed survey area the consultant shall also create drawings showing detailed sections. The sections are shown in Figures 5 to 7 (Sections A-A, B-B, C-C, D-D, E-E, F-F and G-G). They shall be submitted in .dwg or .dxf and pdf format.

Within the general survey area the consultant shall create drawings shows the sections under each box girder as shown in Figures 11 & 12.

Within the general survey area the consultant shall create

The Consultant has been provided with the AutoCAD drawing 4487-3-0102D. The contractor shall create an east and west section along the whole length of the bridge. The contractor shall add the level locations recorded showing the height of the ground and underside of box girder. The Consultant shall show the east and west sections along the length of the bridge on one drawing. It shall be submitted in .dwg or .dxf and pdf format.

6.1.14 Quality Control

The Survey Contractor shall employ a suitable methodology to ensure that the requirements of this specification are met and that all relevant features are recorded.

The survey contractor shall undertake a review of both 2D and 3D output files for compliance to this specification prior to issue to Highways England. For the 3D file particular attention should be paid to ensuring there are no level anomalies that produce an inaccurate representation of the site topography.

All source survey information shall be safely held by the Survey Contractor for a period of five years from the date of completion of the Survey Contract.

Omission of multiple items or of items of significant size / obvious nature particularly where these have a bearing on the proposed works will be considered sub-standard.

In such circumstances Highways England will review the impacts of the omission(s) and any mitigating circumstances offered for the omission. In exceptional circumstances Highways England reserve the right to instruct a

return to site for collection of the missing data at the surveyors own expense, including TM costs if deemed appropriate.

FOR INFORMATION ONLY
DO NOT COMPLETE AT THIS STAGE

Appendix 2

The primary information to be surveyed is that which determines the shape, alignment and make-up of the public highway envelope. This shall extend into the adjacent third-party land where identified by the Scheme Task Order. Specific items that must be recorded are detailed below. This shall not be taken as a complete list and any features / items not specifically referenced shall also be recorded.

The line or point to be surveyed on a feature shall be at the feature's intersection with the ground surface unless otherwise noted.

Roads, Tracks, Footways and Road Markings

Ref.	Features	Trunk Roads	Motorways	To be Included in Output drawings	Accuracy	3D feature type
5.1.1	All Road edges (where no kerbs) including side roads, laybys, private access's etc.	5m (2.5m on radii below ~12m)	10m	2D + 3D	Max	String
5.1.2	All Kerb lines at channels + Channel blocks including side roads, laybys, private access's and traffic islands	5m (2.5m on radii below ~12m)	10m	2D + 3D	Max	String
5.1.3	All Kerb tops including side roads, laybys, private access's and traffic islands	5m (2.5m on radii below ~12m)	10m	2D + 3D	Max	String
5.1.4	Location of drop kerbs and transition kerbs (each end)	All	All	2D + 3D	Max	Part of kerb strings
5.1.5	Tactile paving and colour	Footprint	N/A	2D	Medium	-
5.1.6	Footway (each edge)	5m (2.5m on radii below ~12m)	5m	2D + 3D	Max	String
5.1.7	Other paved areas (extents / material type and changes)	Footprint (max 5m)	Footprint (max 5m)	2D + 3D	Max	String
5.1.8	Zebra and signal controlled crossings	Position and extents	N/A	2D	Max	-
5.1.9	All Road and footway crown lines	5m	10m	2D + 3D	Max	String
5.1.10	Steps including construction type and railings if present.	Position, extents and height of each step	Position, extents and height of each step	2D + 3D	Max	Strings
5.1.11	Road markings – edge of carriageway	5m	10m	2D	Max	-

Ref.	Features	Trunk Roads	Motorways	To be Included in Output drawings	Accuracy	3D feature type
	/ rib line, lane markings, give way markings and stop lines and directional arrows and text					
5.1.12	Extents of High Friction Surfacing and colour surfacing including 'gateway features'	Footprint / extents	Footprint / extents	2D	Medium	-
5.1.13	Subways / underpasses / bridges including piers.	Footprint / extents	Footprint / extents	2D	Max	-
5.1.14	Bridge piers at 2m above ground level.	Cross section	Cross section	2D	Max	-
5.1.15	Bridge / structures expansion joints	Footprint / extents	Footprint / extents	2D	Max	-

Additional notes:

1. Quadrant radii kerbs to have start, middle and end points picked up.
2. Bus kerbs shall be picked up in the same manner as drop kerbs.
3. For road markings the centre of the lines shall be recorded.

Verges, earthworks and other soft landscaping and vegetation

Ref.	Feature	Trunk Roads	Motorways	To be Included in Output drawings	Accuracy	3D Feature type
5.2.1	Cuttings and embankments – crest and toe lines	5m	10m	2D + 3D	Medium	String
5.2.2	Retaining Walls or other level change without a slope such as raised planting beds.	Footprint (max 5m) Levels at top and bottom	Footprint (max 5m) Levels at top and bottom	2D + 3D	Max	String
5.2.3	Localised changes of level such as mounds and swales.	Footprint (max 5m) Enough levels to illustrate form / shape	Footprint (max 5m) Enough levels to illustrate form / shape	2D + 3D	Medium	Strings and points as required
5.2.4	Drainage ditches and all other waterways. Footprint including embankments and bed plus levels of each element including water.	5m or less if required to accurately capture shape	10m or less if required to accurately capture shape	2D + 3D	Medium	String

Within third party land

Where the survey extents extend into third party land this will be highlighted in the Scheme Task Order and the necessary permissions to enter the land obtained by Highways England in advance.

Agricultural land and public open spaces

The same requirements as identified above shall apply except the accuracy level may be reduced to medium.

Private and commercial / industrial properties

Where included within the survey extents these shall be treated as identified above with the same frequency and accuracy as that required on trunk roads regardless of the class of the adjacent highway.

Particular attention should be paid to the building footprint, line of roadways, drives and paths as well as boundary information.

FOR INFORMATION ONLY
DO NOT COMPLETE AT THIS STAGE