

**National Asset Delivery  
Technical Surveys and Testing**

**Site Information for M5 J11/A40 EB  
Onslip Ground Investigation**

## 1 SITE INFORMATION

For ease of correlation the schedule numbers given in the Works Information are used in the following sections.

### S1.1. Name of Contract

The contract is M5 J11/A40 EB Onslip.

### S1.3. Description of Site

The defective section of carriageway is identified on the Highways Agency Geotechnical Data Management System as Earthwork 63685 on the A40 eastbound embankment, adjacent to the M5 J11/A40 interchange EB on-slip between:

- Start NGR: 389889, 221333
- End NGR: 389927, 221345

The site is located on an embankment and according to the information held on HAGDMS the maximum slope angle of the embankment is recorded as 13° at a height of 4.4m.

The location of the site is shown in Figure 1 and Figure 2 shows the site in detail.

Figure 1: Site Location

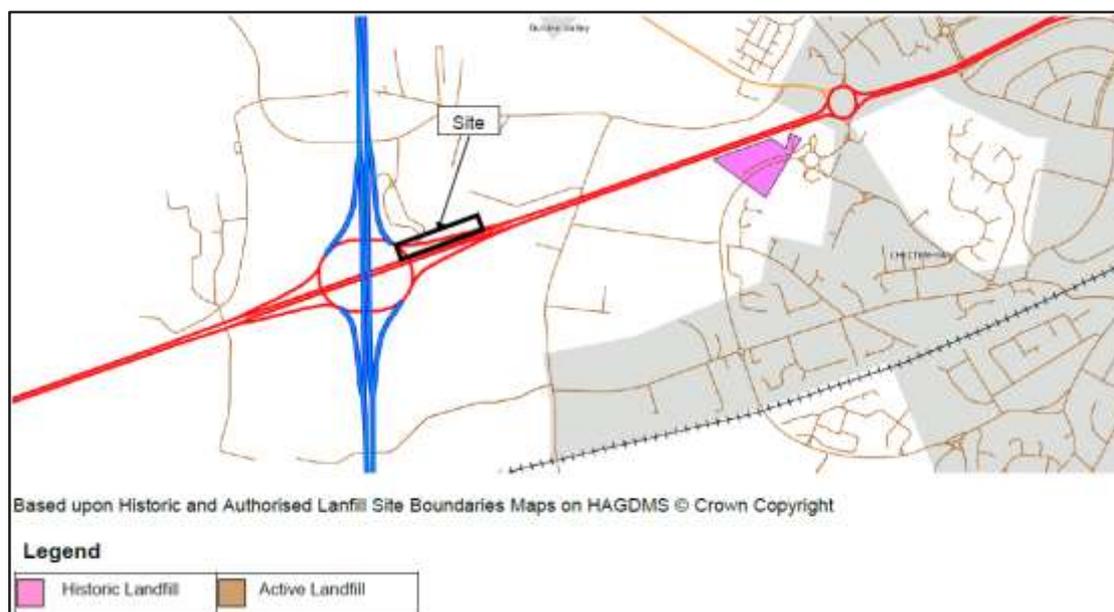


Figure 2: Site View



### Embankment Defect

Slope angles of up to 34 degrees are considered too steep for an embankment comprising reworked Lias Clays. Hence, the likely cause of the defect is an over steep slope possibly exacerbated by poor or defective drainage at the crest of the slope.

Figure 3: Photographs of Defect



### Site History

The construction date for this section of the A40 was during 1969.

The 1885 – 1887 map shows that the site is located within an extensive area of agricultural land. The Midland Great Western Railway is present to the south of the site. There are no tracks or roads which would have developed into the A40 or the M5.

The 1954 — 1955 map shows an airfield.

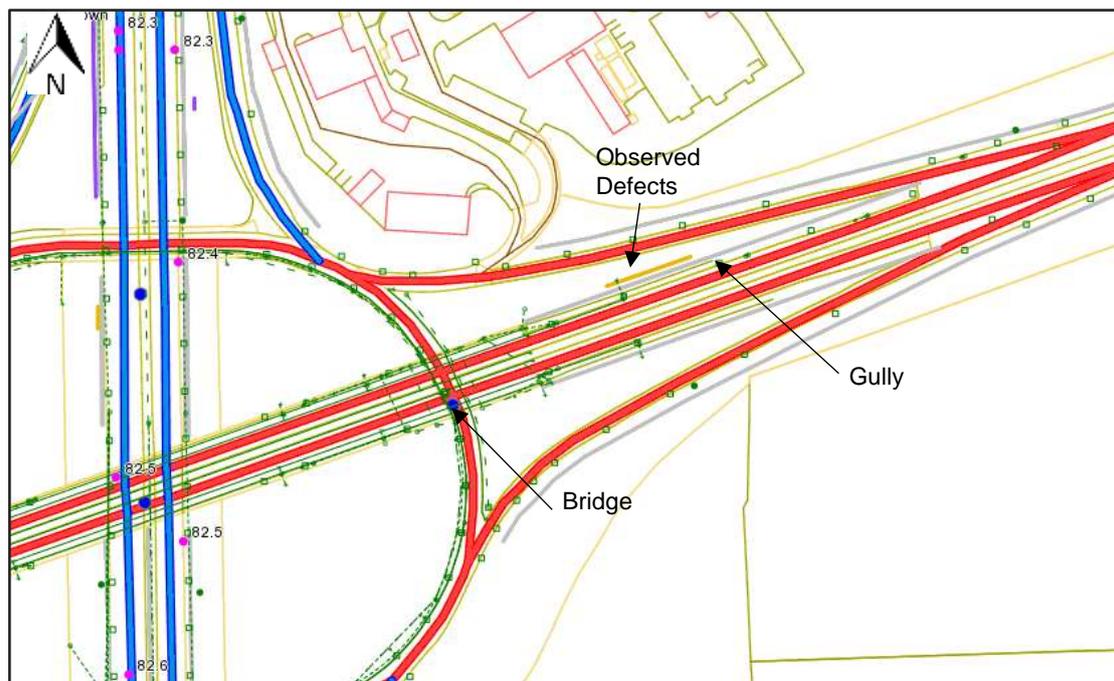
The 1972-74 map shows significant changes to the site as both the A40 and M5 have been constructed alongside further infrastructure development in the area, with no further significant on site changes to the present day.

## Structures

A bridge is shown in Figure 4, west of the observed defect.

- Structure ID: 6687
- Structure name: Golden Valley I/C East

Figure 4: Structure and Drainage Locations



### S1.4. Main works proposed and purpose of this contract

Investigation is proposed to provide information for design of repairs to three geotechnical defects within the widened hard shoulder / refuge area of the northbound embankment as follows:

- The nature, strength and thickness of the embankment fill & underlying natural ground
- To positively identify underground services and NRTS cables

### S1.5. Scope of investigation

The scope of the investigation will comprise percussion boreholes (BH) dynamic (windowless) sampler holes, dynamic probes and hand dug inspection trenches to positively identify underground services and NRTS cables. Borehole installations include remotely read inclinometers and remotely read vibrating wire piezometers.

Testing will include in situ testing (SPT) and laboratory geotechnical, chemical and environmental tests. If bedrock is encountered the boreholes shall prove 100mm of rock.

Full details of the above are given in Schedule 2 and the drawings listed in Table 2.

### S1.6. Geology and ground conditions to include BGS logs

Reference to digital mapping provided by the British Geological Survey shows no superficial deposits on site, the bedrock geology comprises the Rugby Limestone Member of the Lias Group.

BH50H (63m to the southwest on the westbound M5), dated January 1965 (M5 Ross Spur-Easington contract) at 389840, 221290 recorded 0.3m of topsoil over bedrock comprising stiff grey/brown CLAY. A water strike is recorded at a depth of 6.1m. Ground elevation is recorded at 41.5m OD.

BH03 (95m to the northwest in the depot), dated February 2010 (Area 2 Depots Pre Wetting Installation Phase 1 contract) at 389816, 221393 recorded 0.80m of made ground overlying 1.90m of bedrock comprising very stiff dark blue-grey fissured CLAY with selenite (weathered Rugby Limestone Member). Extremely weak, grey MUDSTONE was recorded at a depth of 2.70m (31.30m OD) to the end of the borehole at 10.20m. No groundwater entries were recorded during drilling. Ground elevation is recorded at 34m OD.

Table 1 provides a summary of the likely strata to be encountered during the ground investigation. Due to a lack of available borehole data post construction of the M5 and A40 the likely strata to be encountered is based on an assumption of the embankment height and existing boreholes near the site, the embankment fill is assumed to comprise locally gained Lias materials.

Table 1 Ground Summary

Stratum		Approx. Depth (m)	Description
Made Ground (Embankment Fill)		0 - 5	Firm to stiff grey slightly gravelly silty clays. Gravel comprises mainly limestone, siliceous and brick fragments. Fill is assumed to be mainly derived from reworked Rugby Limestone Member materials.
Rugby Limestone Member	Weathered	5 - 10	Stiff to very stiff, occasionally hard, grey mottled brown/orange silty clays with occasional gravel sized shell fragments.
	Unweathered	10 +	Dark grey/bluish grey hard clays to extremely weak to weak mudstones, with bands of argillaceous limestones.

### S1.7. Schedule of drawing(s) and documents

The list of available drawings showing the location of the proposed exploratory holes and the extends of the proposed topographic and CCTV survey are presented in Table 2.

Table 2 Drawings & Documents

Reference	Title
HE570127C-KIER-HGT-M5_J11_A40-DR-CE-0600_01	Exploratory hole location plan (Sheet 1 of 2)
HE570127C-KIER-HGT-M5_J11_A40-DR-CE-0600_02	Exploratory hole location plan (Sheet 2 of 2)
HE570127C-KIER-HGT-M5_J11_A40-DR-CE-0600_05	Vegetation clearance
Works Information for South West Region M5 and M4 Embankment Repairs for Ground Investigation	
Ecological Survey	
Asbestos Survey	

#### **S1.8.4 Hazardous ground, land affected by contamination and notifiable and invasive weeds (Clauses 3.7.1 and 3.22)**

An asbestos action plan and an Initial Asbestos Report (Type 2 Sampling Survey) in 2010, reference 1491098 reported no asbestos on site.

Whilst no ACMs have been recorded on site, in the event ACMs are encountered or suspected, all activities shall cease until an assessment of the material can be made.

The site is classified as “**GREEN**” in accordance with the Guidance for Safe Investigation of Potentially Contaminated Land, Part 4.

#### **S1.8.5 Additional information on services not shown on Contract drawings – (including copies of individual stats returns)**

The Statutory Undertakers information has been combined into the exploratory hole location plan, see Table 2.

Site drainage includes highways drainage near the defects. The HADDMS drainage inventory indicates the carriageway surface water drainage is by kerb and gully systems. The full extent of the carrier pipework is not recorded.

#### **S1.8.6 Known/suspected mine workings, mineral extractions, etc. (Clause 3.7.3)**

None known.

#### **S1.8.7 Protected species (Clause 3.7.4)**

The scheme extent is predominantly broadleaved plantation and dense scrub comprising hawthorn, holly, field maple, dog rose, bramble and ivy.

Towards the end of the splitter island the verge becomes improved grassland containing occasional ribwort plantain, cleavers, dandelion, hybrid bluebell, daffodil and cowslip.

The wooded area is considered suitable for nesting birds. There was evidence of a mammal path along the length of the wooded area, however no further signs of badger were found. Although suitable for badger, badger presence is considered to be a lower risk due to the works being isolated to the splitter island.

**S1.8.8 Archaeological remains (Clause 3.7.5)**

None known.

**S1.8.11 Restricted working hours (Clause 3.13)**

No local restrictions over and above that in the Works Information.

**S1.8.16 Hygiene facilities– depot locations**

The nearest depot to the site is Bamfurlong Depot, opposite the site off M5 J11/A40  
GL51 6SU.

**S1.8.20 Access to site**

Access to the site is off the A40 Eastbound. Traffic management will be provided.

**S1.19.5 Rock testing requirements (Clause 14.5)**

None.

National AD Technical Surveys & Testing / Site Information for M5 J11 A40 EB Onslip  
Ground Investigation

**SCHEDULE 2**

Exploratory hole reference	Position relative to slope	BH Type	Provisional Depths (m bgl)	Coordinates	Approximate Ground Level (m OD)	Provisional Instrument Types & Depths (m bgl)	Remarks
BH01/19	Crest	Percussion	10.00	E: 389887 N: 221329	39	Remotely read vibrating wire piezometer with tip at 4.00	Located in the eastbound verge of the A40 at embankment crest.
IT01A/19	Crest	Hand dug inspection trench	1.2	E: 389887 N: 221329	39	None	To positively identify underground services and NRTS cables within the verge
DP02/19	Crest	Dynamic Probe	6.00	E: 389882 N: 221328	39	None	Located in the eastbound verge of the A40 at embankment crest.
WLS03/19	Mid	Dynamic (Windowless) Sampler	4.00	E: 389885 N: 221335	37	Remotely read vibrating wire piezometer with tip at 3.00	Located on the mid slope of the embankment in line with the defect.
DP04/19	Mid	Dynamic Probe	4.00	E: 389880 N: 221333	37	None	Located on the mid slope of the embankment in line with the defect.
WLS05/19	Toe	Dynamic (Windowless) Sampler	4.00	E: 389883 N: 221340	35	Remotely read vibrating wire piezometer with tip at 3.00	Located at the toe of the embankment within the verge of the A40 eastbound on slip.
DP06/19	Toe	Dynamic probe	4.00	E: 389878 N: 221339	35	None	Located at the toe of the embankment within the verge of the A40 eastbound on slip.
BH07/19	Crest	Percussion	10.00	E: 389825 N: 221343	39	Remotely read inclinometer to 6.00	Located in the eastbound verge of the A40 at embankment crest.
IT07A/19	Crest	Hand dug inspection trench	1.2	E: 389825 N: 221343	39	None	To positively identify underground services and NRTS cables within the verge
DP08/19	Crest	Dynamic Probe	6.00	E: 389829 N: 221346	39	None	Located in the eastbound verge of the A40 at embankment crest.
WLS09/19	Mid	Dynamic (Windowless) Sampler	4.00	E: 389923 N: 221348	37	None	Located on the mid slope of the embankment.

The actual scope of works is dependent on Traffic Management constraints and the above locations are provisional and subject to access and services.

Holes are to be formed on the earthwork crest, mid slope and toe. An allowance for this will be included in the programme and priced bill of quantities.

A pre start meeting will be held in Brunel House, 930 Hempton Court, Aztec West, Almondsbury, BS32 4SR at least 2 weeks prior to mobilisation to site.

## Notes to Accompany Schedule 2

The following guidance is given regarding the objectives of the investigation and the types and frequency of laboratory testing:

- The percussion boreholes are to be located as close to the crest as possible and are to extend a minimum depth of 5m into natural ground to provide data for design of retaining walls
- Access to the mid slope and toe of the earthwork is required for the dynamic (windowless) sample holes and dynamic probes, hence the equipment will either need to have the ability to climb slopes or be winched up and down the earthwork, or be handheld
- If boreholes hit refusal on bedrock then they may be terminated, but the logs should record a minimum of 100mm of the appropriately described rock in order to capture that reason for termination
- The inspection trenches will extend from the earthwork crest to the back of the pavement and are required to positively identify underground services and NRTS cables (horizontal and vertical positions) within the crest
- The remotely read instrumentation will include vibrating wire piezometers, in-place biaxial inclinometers, a wireless central gateway, wireless nodes and either a battery operated or solar panel
- Within fine grained soils, undisturbed UT100 samples to be obtained at provisional 1m centres, if a sample cannot be retrieved an SPT test will be undertaken
- Within coarse soils Standard Penetration Tests (SPT) are to be undertaken in the percussion and dynamic (windowless) sample boreholes at provisional 1m centres

The aspired types and frequency of testing is as follows:

Fine Embankment Fill / Fine Superficial Deposits / Weathered Mudstone:

- Water Content - at 1m intervals
- Classification - at 1m intervals
- UUT - at 1m intervals
- CUT - 2 from the embankment fill and 2 from the natural ground
- CBR (soaked with 10kPa surcharge) - 1 from each of the boreholes at the crest at approx. 1-1.5m below carriageway level
- Environmental tests Modified Suite E - 3 per cluster of boreholes within Engineered Embankment, additional samples to be taken in the event contamination is encountered or suspected - chemical testing suites are based on the UK Specification for Ground Investigation and included in the works information
- pH, Sulphates/ Sulphur (Suite D Brownfield with pyrite) - 2 per hole - test methods for sulfate testing shall be in accordance with the recommendations of TRL report 447

Coarse Embankment Fill / Coarse Superficial Deposits:

- Water Content - at 1m intervals (only where the driller has not added water)
- Classification - at 1m intervals
- CBR (soaked with 10kPa surcharge) - 1 from each of the boreholes at the crest at approx. 1-1.5m below carriageway level
- Environmental tests Modified Suite E - 3 per cluster of boreholes within Engineered Embankment, additional samples to be taken in the event contamination is encountered or suspected - chemical testing suites are based on the UK Specification for Ground Investigation and included in the works information
- pH, Sulphates/ Sulphur (suite D Brownfield with pyrite) - 2 per hole - test methods for sulfate testing shall be in accordance with the recommendations of TRL report 447

In producing borehole logs, the contractor will be expected to comply with the following:

- Engineered fills shall be described, labelled and given a legend as such and differentiated from uncontrolled made ground
- The British Geological Survey Lexicon strata code shall be applied to each layer as per the following codes:
  - MBU Engineered Embankment
  - MGR Uncontrolled made ground or fill
  - RLS Rugby Limestone Member

All boreholes shall be given the reason for termination. If boreholes terminate on impenetrable bedrock, then a 100mm section, suitably described, shall be added to the borehole log.

**Extents of CCTV survey (including reference to a drawing)**

Not required.

**Extents of topographic survey (including reference to a drawing)**

Not required.

**Drawings Statutory Utility drawings (include the original returns)**

C2 stats returns are included in the TST documentation.