

1G081-HES-0001

Euston Station - Ground Investigation Factual Report

Document No.: 1G081-WYG-GT-REP-000-000006

Revision	Date	Author	Checked by	Approved by	Revision Details:
P01	20/12/17	F. Baudrain	M. Hawkins	C. Pugh	For Comment
P02	22/01/18	F. Baudrain	N. Paulakis	M. Hawkins	Updated



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1G081-HES-001

Ground Investigation Framework

Euston Station - Ground Investigation
Factual Report

WYG Document Reference: 1G081-WYG-GT-REP-000-000006

Status: Final P02

Security Classification: Unclassified

Code 2 - Accepted with Comments
Code 1 - Fit for Implementation



Document Control

Document: **Euston Station - Ground Investigation Factual Report**
Project: **HS2 Ground Investigation Framework**
Work Package: **1G081 – HES – 001**
Client: **High Speed Two Limited**
Job Number: **A085215-1**
File Origin: H:\A080000-A089999\A085215\HS2 DELIVERY PHASE\WORK PACKAGE
ORDERS\HES-001\Documents\Reports\Factual report\Issue\HES_Final Factual
Report.docx

Revision: - **P01 - Final**
Date: **29/09/2017**
Prepared by: **Franck Baudrain** Checked by: **Mark Hawkins** Approved By: **Chris Pugh**

Revision: - **P02 - Final**
Date: **22/01/2018**
Prepared by: **Franck Baudrain** Checked by: **Nick Paulakis** Approved By: **Mark Hawkins**

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1 General

1.1 Introduction

WYG Environment Planning Transport Limited (WYG) was commissioned by High Speed Two (HS2) Limited to undertake a ground investigation and produce a factual report for the HS2 Euston Station (HES001) work package. The investigation was specified by HS2 Ltd who also provided assurance on a small sample of site work.

This report has been prepared for High Speed Two (HS2) Limited and other agreed parties in accordance with the terms and conditions of the contract. Attention is drawn to the report conditions, outlined in Appendix A, and the terms and conditions of the engagement.

The Ground Investigation was undertaken in two phases. A first phase comprised a limited deployment for drilling works during Easter term holiday within Maria Fidelis Lower School from the 10th to the 22nd April 2017. The second and main phase of works was undertaken between the 22nd May and the 4th August 2017.

1.2 Objectives of the Investigation

The purpose of the ground investigation is to provide both geotechnical and geo-environmental factual information to enable safe and cost-effective design and construction of the proposed terminus for the proposed HS2 routes to and from the north. To accommodate the proposed new additional high-speed lines the main works will comprise the re-development of the existing Euston station in addition to widening and deepening of the existing Station approach to the north of Euston Station, and extension of Euston Underground Station, linking to Euston Square Underground Station.



2 Site Details

2.1 Site Location

Euston Station is located in central London within the London Borough of Camden.

The 'site' is defined as the required working area within which each of the fieldwork, site compound(s) and access routes are located.

The whole of the site to be investigated is located immediately adjacent to the west side of Euston station and falls within an area of approximately 110,000m².

The National Grid Reference (NGR) for the centre of the site is approximately E: 529346, N: 182669.

The Site Location Plan (ref: 1G081-HS2-GT-MAP-000-000001) is located in Appendix B.

2.2 Site Description

The site predominantly contains both commercial and residential buildings in addition to public roads. Much of the site, therefore comprises hardstanding ground, with the exception of St James' Gardens and Euston Square Garden. The former is the area of an historical cemetery, which is located towards the centre of the site. Whilst no exploratory holes have been undertaken within St James Gardens, one borehole was drilled within Euston Square Garden.

The site is bordered to the east by the existing Euston Station, the station approach and related rail infrastructure. To the west the site is bordered by Hampstead Road (A400) and to the south by Gower Place. To the north the site is bordered by commercial and residential properties in addition to the existing rail lines servicing Euston Station.

Several existing underground structures have been identified within the site boundary which include but should not be limited to;

LUL tunnels and shafts comprising:

- Northern Line "Bank Branch" – running north-south within west of site area
- Northern Line "Charing Cross Branch" – running east-west within south of site area
- Victoria Line – running east-west within south of site area
- Relief tunnel – running parallel to the Northern Line Charing Cross Branch
- Disused tunnels and shafts
- Cable tunnel (Euston Square Station to Drummond Street)



Obstructions

- Potential bridge abutments
- Possible turn table
- Disused burial ground
- Brick foundations of historic structures/buildings

The site has been classified by the Employer as Yellow in accordance with the Guidance for Safe Intrusive Activities on Contaminated or Potentially Contaminated Land (BDA, 2008). This classification has been based on information presented in the London-West Midlands Environmental Statement.

Potential sources of contamination within the site included the following;

- Former printing works (E:529314, N:182791)
- Garage (centred at E:529445, N:182582)
- Wagon works, garage, hotel (centred at E:529416, N:182642)
- Builders yard (centred at E:529235, N:182860)
- Burial ground/cemetery (centred at E:529331, N:182723)
- Historical warehouses (E:529455, N:182519)
- Historical printing works; municipal building (E:529503, N:182477)
- Railway station and rail land

Further detail is presented in the Geotechnical Desk Study report (reference: C220-ARP-DL-REP-01A-000002) and the Environmental Statement available from HS2 Ltd.

The site is predominantly classed as having a low risk of encountering unexploded ordnance (UXO). An area of medium risk, however, has been identified covering locations ML000-CR001 (formerly CP007), ML000-PC010 & PC011, ML000-CP001, ML000-WS001, 2 and 3.

Further detail and suggested mitigation measures are provided by Zetica in their report titled 'Unexploded Ordnance Desk Study', (HS2 reference: 0615-ZET-GT-REP-000-000001).



2.3 Anticipated Geology

The conjectured geological profile at the site is as follows;

Table 1 – Geological profile

Stratum	Approx. base of strata – depth (mbgl) [elevation mOD]	Approx. Thickness (m)
Made Ground	<3 [+20]	<3
London Clay Formation	19 [+4]	16
Harwich Formation	21 [+2]	<2
Lambeth Group	38 [-15]	19
Thanet Sand Formation	44 [-21]	6
Chalk	-	-

River Terrace Deposits are shown to overly the London Clay to the south of the site and therefore may be encountered during the proposed ground investigation works.

The above geological profile has been inferred from available information, including borehole data from the British Geological Survey (BGS). No assurance is given to its accuracy.

Perched groundwater to be expected in Made Ground and alluvium overlying the London Clay Formation. Small quantities of water to be expected during drilling through sand bands of the London Clay. Standing water has been recorded at approximately 0 – 5mOD within the top of the Lambeth Group, there is expected to be an underdrainage effect of the Lambeth Group and non-hydrostatic pore pressures are expected in the London Clay. Sand channels within the Lambeth Group with potentially high groundwater pressures and running sand should be expected. The Environment Agency (2010) review of groundwater levels shows that the groundwater levels in the chalk beneath the site are between -30m.OD and -40m.OD approximately 60m below ground level.

Further detail is presented in the Geotechnical Desk Study report (ref: C220-ARP-DL-REP-01A-080002).



3 Ground Investigation Works

3.1 Scope of Work

The ground investigation, designed by HS2 Ltd, was undertaken by WYG and their approved subcontractors and was carried out in two distinct mobilisations, although for the purpose of this report the information is reported as one.

The ground investigation was undertaken in stages. In addition to obtaining the latest service diagrams and drawings from the relevant service providers (PASS128 Type D), Stage 1 comprised site reconnaissance (PASS128 Type C) and non-intrusive geophysical mapping surveys (PASS128 Type B) to establish the location and depth of existing utilities. The surveys were carried out at each exploratory hole location prior to breaking ground, in line with PASS128 requirement. Stage 1 works were carried out utilising the following equipment:

- Mala HDR Ground Penetration Radar (GPR).
- RD8000 Tracing Set, transmitter & receiver (Electromagnetic Locator [EML]).

The outputs of the geophysical surveys are enclosed as Appendix C.

Stage 2 comprised the following intrusive investigations and related in-situ testing:

- Excavation of inspection pits (data enclosed as Appendix D.1, D.2, D.3, D.4, D.5 with associated photographs provided as Appendix E.1, E.2, E.3 and E.4) in line with PASS128 Type A verification.
- Rotary Geobore-S boreholes (water flush) through superficial deposits, weathered and solid strata (data enclosed as Appendix D.1 with associated core photographs provided as Appendix E.1). Use of biodegradable polymer (Purebore) was approved for use by HS2 Ltd when drilling through Lambeth Group and Chalk to ease drilling and improve recovery.
- Windowless sampling (exploratory hole logs enclosed as Appendix D.2 with associated photographs provided as Appendix E.2).
- Cable percussive boreholes (exploratory hole logs enclosed as Appendix D.3 with associated photographs for the inspection pits provided as Appendix E.3).
- Cone Penetrometer Test boreholes (exploratory hole logs enclosed as Appendix D.4 with associated photographs provided as Appendix E.4).
- Pavement cores (data enclosed as Appendix D.5 with associated photographs provided as Appendix E.5).
- Recovery of disturbed and undisturbed samples from appropriate intrusive methods.
- Variable head permeability testing in boreholes (results enclosed as Appendix F).



- Down-the-hole geophysical survey to include natural gamma and televiwer (data enclosed as Appendix G).
- Laboratory testing: classification tests; strength tests; compressibility and swelling tests; specialist soil testing; contamination testing; rock testing; and groundwater chemistry (enclosed as Appendix J & K).
- Installation of groundwater monitoring instrumentation and subsequent monitoring, including development and sampling of monitoring wells and ground gas (enclosed as Appendix L).

There were some changes to the scope of work from the original January 2015 specification to the one issued prior to the start of the fieldwork in March 2017. The investigation methods and numbers are given in Table 2 below. Exploratory hole logs are enclosed as Appendix D.



Table 2 – Summary of Investigation Methods

Method	Original Scope (7 th January 2015) No. / total meerage	Revised Scope (27 th March 2017) No. / total meterage	Completed No. / total meterage
Rotary cored holes	2 / 100m	4 / 200m	5 / 225.8m
Rotary open holes	2 / 100m	2 / 100m	0
Cable percussive holes	7 / 290m	8 / 290m	6 / 218m
Inspection pits	16	18	19
Trial pits	14	0	0
Windowless sampling	5	5	3
Concrete Coring	0	0	2
Pavement Core	2	2	1
CPT	3 / 75m	3 / 75m	3 / 88m
SBPT / Dilatometer	24	14	9
Optical/Acoustic Televiwer	0	0	1 / 23m
Natural Gamma	2 / 100m	5 / 230m	3 / 181m



Some changes were also implemented during the fieldwork phase as follows:

Table 3 – Changes from Final Scope during fieldwork

Location	Reason for change in scope/Comments
ML000-RC007 and ML000-RO001	<ul style="list-style-type: none"> Both boreholes are located within the school Maria Fidelis' playground. These formed the Phase 1 of the ground investigation, completed in advance of the main element of work in order that the works could be completed during half term school holiday. The boreholes were terminated at shallower depths than scheduled (53.75m target of 60m for RC007 and 30m target of 50m for RO001) due to the time restrictions (surrendering the drilling area before start of the term).
ML000-RO001 and ML000-RO002	<ul style="list-style-type: none"> Changed due to programming and logistical constraints. Both boreholes were drilled by rotary coring (Geo-bore S system) in order to provide a better hole quality for the implementation of insitu pressuremeter testing.
ML000-RC012	<ul style="list-style-type: none"> The proposed rotary core borehole was located adjacent to the ML000-RO002. Given ML000-RO002 was cored, ML000-RC012 was deemed obsolete and cancelled.
ML000-CR002 / ML000-CP016	<ul style="list-style-type: none"> Location of the two boreholes swapped to mitigate issue of available working areas.
ML000-CR002	<ul style="list-style-type: none"> The cable percussive element of the work was cancelled and the borehole drilled solely by rotary coring means (Geo-bore S technique). The borehole depth was increased from 60 m to 70 m.
ML000-CP003	<ul style="list-style-type: none"> The borehole was terminated at shallower depth (29m instead of 40m) due to site constraints and high risk of mud splash to members of the public.
ML000-CR001	<ul style="list-style-type: none"> The borehole was terminated at shallower depth (53m instead of 60m) than scheduled due to significant flint obstruction being encountered at 52.65m which



Location	Reason for change in scope/Comments
	could not be penetrated. Numerous attempts and variations of drilling techniques were utilised.
ML000-WS001	<ul style="list-style-type: none"> Two inspection pits were excavated for this location, both refused on a concrete obstruction at 0.85-1.2m depth potentially associated with the adjacent former underground station.
ML000-WS005	<ul style="list-style-type: none"> The inspection pit was unable to identify safe clearance of existing services to facilitate drilling the borehole safely. The borehole location was on the pavement and provided limited scope to move its location outside the dense corridor of utility services.
ML000-CP016	<ul style="list-style-type: none"> The inspection pit identified type 1 backfill material at 1.2m depth near major utility service. The pit was extended deeper via vacuum extraction system to 2.3m where it refused on an unknown brick structure. Bricks removed from the borehole were shown to a historic brick specialist from EDP Services, who commented that based on colour, composition and size of the bricks removed, the layers of bricks were likely to be late 17th/early 18th century. The bricks contained large air holes and impurities so it is unlikely to have been used for facing and may have formed part of the foundations/basement structures associated with the Georgian properties along Melton Street (formerly Euston Street/Easton Crescent). The borehole was therefore cancelled.
ML000-CT020	<ul style="list-style-type: none"> Given the issue of obstructions identified around ML000-CP016 (see above), the proposed CPT borehole ML000-CT020 was relocated where ML000-RC012 was initially proposed (by the Thistle Hotel).

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3.2 Specification and Standards

The investigation was undertaken in accordance with the following specifications:

- UK Specification for Ground Investigation 2nd Edition, Thomas Telford Limited (2012)
- HS2 LTD Ground Investigation Framework Specification for Ground Investigation, Document No. HS2-HS2-GT-SPE-000-000001
- Work Package Specification WPO-HES-001 HS2 Euston Station, Document No. 1G081-HS2-GT-SPE-000-000001

The specifications reference the standards and other documents that have governed the investigation.

3.3 Historical Report

Historical reports were provided to HS2 Ltd by third parties and the factual information requested by HS2 Ltd was digitised and included within the AGS file of the WYG Ground Investigation Works. The two reports are as follows:

- Ian Farmer Associates, Regents Park Estate, London NW1, Report on Ground Investigation, Contract number 52382A, December 2015.
- WSP Limited, 2015 Euston Road, London, Ground investigation Interpretative Report, Ref. 90316L, June 1999

These reports were received by WYG in PDF format and partially in AGS format (for Ian Farmer report only) and are included in Appendix N of this document. Where possible, the factual information was manually converted/digitised by WYG into AGS format as instructed by HS2 Ltd and form part of the AGS file included in Appendix M. The data provided by these two reports should be considered as for information purposes only and WYG cannot take responsibility for their accuracy and or validity. It is understood HS2 Ltd have received approval from all relevant parties to use the information for the reporting requirement.



4 Encountered Ground Conditions

A summary of the ground conditions encountered in the WYG investigation is presented below, with detailed information presented on the exploratory hole logs included in Appendix D.

4.1 Geology

4.1.1 Made Ground/Topsoil

Topsoil was encountered in CP001 located within the Euston Square Gardens. Elsewhere, either asphalt, concrete and/ or cobbles were encountered from ground level.

A variety of potential anthropogenic ground was encountered below all locations within the package beneath the hardstanding cover. The exception to this were ML000-WS002 and ML000-WS003 located within the basement car park of the Ibis Hotel, where the London Clay Formation was encountered directly beneath the concrete.

The inspection pit for borehole CP016 refused at 2.3m below ground level onto some old masonry works. Bricks removed from the pit were shown to an historic brick specialist from EDP Services, who commented that based on colour, composition and size of the bricks removed, the layers of bricks were likely to be late 17th/early 18th century. The brick contained large air holes and impurities so it is unlikely to have been used for facing and may have formed part of the foundations/basement structures associated with the Georgian properties along Melton Street (formerly Euston Street/Easton Crescent).

The inspection pits for ML000-WS001 and WS001A located on each end of the pavement width refused on a concrete slab at 0.85m and 1.2m below ground level. It was considered the slab is likely to be associated with the adjacent building, a disused substation.

4.1.2 Superficial Deposits

Superficial deposits were encountered within the southern end of the site with Made Ground being underlain by orange brown gravelly sand (locally grading to sandy gravel with depth) of the River Terrace Deposits. These were found between 3.7-4.2m bgl in ML000-CP001, 2.7-4.7m in ML000-CP003, 0.8-4.5m in ML000-CP068.

4.1.3 Solid Geology

Anticipated solid geology was encountered in all exploratory borehole locations beneath the Made Ground / Superficial Deposits. The bedrock formations comprised the following in vertical sequence from the shallowest to the deepest:



- London Clay Formation – typically a firm becoming very stiff grey brown clay to 18.0-21.8m bgl weathering grades after Spink and Norbury (1993) have been applied when logging;
- Lambeth Group (Upper Mottled Clay) – typically multi coloured clay to 22.4-27.35m bgl;
- Lambeth Group (Sand Channel) – typically grey sand to 24.0-25.2m bgl (only encountered in ML000-CP001, CP003 and CP068);
- Lambeth Group (Lower Mottled Clay) – very stiff red blue, greyish brown mottled clay to 28.7-34.77m bgl;
- Lambeth Group (Upnor Formation) – very dense greenish grey gravelly sand to 32.5-36.5m bgl
- Thanet Sand Formation – very dense greenish grey sand to 41.95-43.35m bgl
- Bullhead Beds – dark grey Sand with black flint gravel to 42.22-43.55m bgl (only encountered in ML000-CR001 and RO002);
- Upper Chalk (Seaford Formation) – weak medium density closely to medium spaced fractures chalk with flint bands proven up to 70.0m bgl.

4.2 Groundwater

No obvious groundwater strikes were observed in any of the boreholes; however, the following should be noted:

- Small amounts of water were added to help facilitate drilling within the cable percussive boreholes.
- Due to the water flush technique during the rotary drilling operations, it was not possible to determine any water strikes during drilling operations. However, loss of flush was frequent during drilling within the chalk with some significant water supply requirement to enable drilling process to progress.

Additional information is available within the borehole records included within Appendix D. Water levels have been monitored subsequently to installation of the boreholes with the details included in Appendix L.

4.3 Evidence of land contamination

The presence of Made Ground was generally encountered across the site with frequent presence of extraneous material such as brick, concrete fragments and to lesser extent clinker and ceramic. Otherwise, no obvious visual or olfactory evidence of hydrocarbon/chemical contamination was encountered with the Made Ground.

Levels of potential Volatile Organic Compounds (VOCs) were measured with a handheld PID meter, within the Made Ground of generally less than 10ppm (up to a maximum of 350ppm at ML000-CP066), increasing



to about 100ppm within or immediately beneath asphalt hardstanding (although up to 400ppm at ML000-CP035). Full PID readings are included within the logs in Appendix D long with the calibration certificate.

Some potential hydrocarbon contamination was identified whilst drilling the borehole ML000-CP003, within the River Terrace Deposits between 4.0-4.7 m bgl. Moderate potential hydrocarbon odour and surface oily type sheen was identified on the gravelly sand spoil. Below 4.7m, the River Terrace Deposit was underlain by the London Clay Formation stratum, suggesting the contamination sitting over the less permeable formation. Potential Volatile Organic Compounds of up to 1.6ppm were measured with the handheld PID meter within the potential hydrocarbon contaminated stratum.

The contaminated spoil associated with ML000-CP003 was segregated and appropriately stored before being disposed as non-hazardous waste. Waste characterisation results are included in Appendix K.

Clean drilling technique within ML000-CP003 was employed to prevent cross-contamination of the hydrocarbon onto deeper strata. This included the construction of a 1.5m thick bentonite seal between 4.5m and 6.0m depth and reduced casing from 200mm to 150mm.

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5 Laboratory Testing

5.1 Geotechnical Laboratory Testing

Geotechnical tests were scheduled by HS2 Ltd through 4no. specific schedules. The testing was carried out by Professional Soils Laboratories Limited (PSL) at their laboratory in Doncaster, in accordance with their UKAS accreditation. The soil and rock testing is summarised in Table 3 with the results presented as Appendix J and the associated electronic data as Appendix M. Some testing is outstanding and will be submitted as an addendum once completed.

Table 4 – Summary of Geotechnical Testing

Scheduled Tests		Number of Tests scheduled	Number of test completed
Classification Tests	K1.1 Moisture Content	159	159
	K1.2 Atterberg Limits 4 pt	123	123
	K1.4 Shrinkage Linear	18	18
	K1.8 Particle Density by Gas Jar or Pyknometer	25	24
	K1.9 Particle size distribution - Wet Sieving	43	39
	K1.11 Sedimentation - Pipette	38	37
	K2.1 Organic Matter Content	6	6
	K2.2 Mass Loss on Ignition Organic	2	2
Compaction Related Testing	K3.1 Compaction 2.5kg Rammer	4	4
	K3.2 Compaction 4.5kg Rammer	4	4



Scheduled Tests		Number of Tests scheduled	Number of test completed
	K3.5 Dry Density Min Max Granular Soils	2	2
	K3.6 Moisture Condition Value at NMC	3	3
	K3.7 Moisture Condition Value / Moisture Content relationship	2	2
	K3.9 CBR Recompacted Remoulded	6	6
Compressibility, Permeability, Durability Testing	K4.1 One-dimensional Consolidation Properties, Test Period 5 days	9	9
	K4.2 One-dimensional Consolidation Properties, Test Period greater than 5 days	9	8
	K4.3 Measurements of swelling pressure, test period 2 days	15	15
	K4.6.1 Measurement of Swelling Pressure of Stiff Clay, Test Period 7 days	5	5
	K4.6.2 Measurements of expansibility of stiff clay, test period 5 days	5	5
	K5.13 Permeability in a triaxial cell, test period 4 days	2	2
	K5.14 Extra over Item K5.13 for test periods in excess of 4 days	4	
	K6.4 Shear Strength of a set of three 60 mm x 60 mm square specimens by direct shear, test duration not exceeding 1 day per specimen	10	11



Scheduled Tests		Number of Tests scheduled	Number of test completed
	K6.6 Shear Strength of a set of three 300 mm x 300 mm square specimens by direct shear, test duration exceeding 1 day per specimen	1	0
	K6.16 Undrained shear strength of a single 100 mm diameter specimen in triaxial compression without the measurement of pore pressure	51	51
	K7.2 Consolidated undrained triaxial compression test with measurement of pore pressure (100mm specimens), single stage	4	4
Shear Strength (effective) Testing	K7.11 Isotropically consolidated undrained triaxial compression test on 100mm diameter sample with mid-height porewater pressure measurement	7	8
	K7.13 Anisotropically consolidated undrained triaxial compression test on 100mm diameter sample with small strain and shear wave velocity measurements	5	5
Chalk Testing	K1.7 Density Chalk	28	28
	K8.14 Uniaxial Compressive Strength	8	8
	K8.14.1 Uniaxial Compressive Strength with determination of young's modulus and Poisson's ratio	8	4
	K8.21 Measurement of point load strength index of rock specimen (set of ten individual determinations)	9	5



Scheduled Tests		Number of Tests scheduled	Number of test completed
	K8.22 Single measurement of point load strength on irregular rock lump or core sample (either axial or diametral test)	36	40
Ground/Groundwater Aggressivity	K9.4 BRE SD1 D	13	13
Petrographic Analysis	K12.2 X Ray Diffraction	3	3
	K12.3 Optical Microscopy	1	1

Table 5 lists the soil samples scheduled by HS2 that were not tested by the laboratory and any amendments to the testing.



Table 5 – Summary of Amendments to schedule

Schedule number	Sample	Original Scheduled Test affected	Amendments	Communication
2	RC007 – 44.59m	Uniaxial Compressive Strength - K08.14	Sample too short for UCS. Test not undertaken	Email from Franck Baudrain 25/9/2017
2	RC007 – 48.35	Point Load Strength - 3 sets - K08.21.1	Only one determination possible instead of 3 (absence of suitable material for testing)	
3	CR001 – 44.77m	Density Chalk - K01.07 Point Load Strength - 3 sets - K08.21.1 Uniaxial Compressive Strength YMPR - K08.14.1	Sample not available. Tests not undertaken	
3	CP0068 - 3.5m	Direct Shear Strength 300mm - K06.06	Insufficient sample. Test replaced as small shear box (60mm x 60mm)	Email from Ray Dobiecki 10/10/2017
3	CR001 – 44.77m (C5)	Density Chalk - K01.07 Point Load Strength - 3 sets - K08.21.1 Uniaxial Compressive Strength YMPR - K08.14.1	Sample badly fractured. CR001-44.77m split, photographed and chalk density/saturation moisture content and point load test undertaken. Unconfined compressive strength and elastic modulus undertaken on CR001 – 46m (C6)	Email from Ray Dobiecki 16/10/2017

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chedule number	Sample	Original Scheduled Test affected	Amendments	Communication
3	RO002 – 48.23m (C47)	Density Chalk - K01.07 Point Load Strength - 3 sets - K08.21.1 Uniaxial Compressive Strength YMPR - K08.14.1	Sample too short for UCS Original sample replaced by RO002 – 48.98m (C48) for unconfined compressive strength and elastic modulus test	Email from Ray Dobiecki 16/10/2017
3	RO002 – 58.8m (C56)	Density Chalk - K01.07 Point Load Strength - 3 sets - K08.21.1 Uniaxial Compressive Strength YMPR - K08.14.1	Sample too short for UCS Original sample replaced by RO002 – 57.98m (C55) for unconfined compressive strength and elastic modulus test	Email from Ray Dobiecki 16/10/2017
3	CP001 - 5.2m	Particle size distribution - Wet Sieving - K01.09	Insufficient sample. Test not undertaken	
3	CR001 – 43.45m	Particle size distribution - Wet Sieving - K01.09	Sample is not suitable (rock). Test not undertaken	Email from Ray Dobiecki 14/12/2017
3	CR001 -	Uniaxial Compressive Strength YMPR - K08.14.1	Sample badly fractured. Test not undertaken.	
3	RO002 – 44.43m	Particle size distribution - Wet Sieving - K01.09	Sample is not suitable (rock). Test not undertaken	Email from Ray Dobiecki 14/12/2017
3	RO002 – 48.23m	Uniaxial Compressive Strength YMPR - K08.14.1	Sample too short for UCS.	
3	RO002 – 58.80m	Uniaxial Compressive Strength YMPR - K08.14.1	Sample too short for UCS.	

Code 2 - Accepted with Comments
Code 1 - Fit for Implementation



Schedule number	Sample	Original Scheduled Test affected	Amendments	Communication
3	CP0035 – 22.5m	Triaxial 100mm Single Stage - K06.16	Sample collapsed upon extrusion due to brittle nature of the material. Original sample replaced by CP0035 – 21-21.45m	Email from Ray Dobiecki 14/12/2017
4	CR002 – 43.05-43.41	Density Chalk - K01.07 Particle size distribution - Wet Sieving - K01.09 Point Load Strength - 3 sets - K08.21.1 Uniaxial Compressive Strength YMPR - K08.14.1	Sample too short for UCS. PSD not undertaken as sample is not suitable (rock) Original sample proposed to be replaced by CR002 – 45.5-45.8m for unconfined compressive strength and elastic modulus test but normal USC had already been completed on that sample.	Email from Ray Dobiecki 06/11/2017
4	CR002 – 53.4-53.57	Density Chalk - K01.07 Point Load Strength - 3 sets - K08.21.1 Uniaxial Compressive Strength YMPR - K08.14.1	Sample too short for UCS. Original sample proposed to be replaced by CR002 – 51.57-54.71m for unconfined compressive strength and elastic modulus test but normal USC had already been completed on that sample.	Email from Ray Dobiecki 06/11/2017

Code 2 - Accepted with Comments
Code 1 - Fit for Implementation



Schedule number	Sample	Original Scheduled Test affected	Amendments	Communication
4	CR002 – 59.5-59.87	Density Chalk - K01.07 Point Load Strength - 3 sets - K08.21.1 Uniaxial Compressive Strength YMPR - K08.14.1	Sample too short for UCS. UCS test cancelled.	Email from Ray Dobiecki 06/11/2017
4	CR002 – 70.09-70.4	Density Chalk - K01.07 Point Load Strength - 3 sets - K08.21.1 Uniaxial Compressive Strength YMPR - K08.14.1	Sample too short for UCS. Original sample proposed to be replaced by CR002 –69.04-69.25m for unconfined compressive strength and elastic modulus test but sample also too short for testing.	Email from Ray Dobiecki 06/11/2017

Code 2 - Accepted with Comments
Code 1 - Fit for Implementation



5.2 Chemical Laboratory Testing

5.2.1 Soil

Chemical testing was scheduled by HS2 Ltd. The testing was carried out by Jones Environmental at their laboratory in Deeside, in accordance with their UKAS / MCERTS accreditations.

The soil testing is summarised in Table 4 below and the results are presented as Appendix K with the electronic data as Appendix M.

Table 6 – Summary of Soil Chemical Testing

Suite	Scheduled Tests	Number of Tests
Suite E	Arsenic, boron, cadmium, chromium (total), copper, lead, mercury, nickel, zinc, pH, water soluble sulphate as SO ₄ , total petroleum hydrocarbons, speciated Poly Aromatic Hydrocarbons (PAHs), phenols, cyanide (total), organic matter (SOM).	24
Suite E1	Dependant option: phenols	2
Suite E4	Dependant option: PAH in macadam	2
Suite E6	Dependant option: hydrocarbons	1
Suite E9	Dependant option: degreasing agents, odorous or high PID values	4
Suite F	Leachates – general	13
Suite G	Leachates – organic	1
Suite H	Asbestos Screen	5
Suite H1	Asbestos Quantification	3

5.2.2 Groundwater

Chemical testing was scheduled by HS2 Ltd. The testing was carried out by Jones Environmental at their laboratory in Deeside, in accordance with their UKAS/ MCERTS accreditations.



The groundwater testing is summarised in Table 5 below and the results are presented as Appendix K with the electronic data as Appendix M.

Table 7 – Summary of Groundwater Chemical Testing

Suite	Scheduled Tests	Number of Tests
Suite I	Arsenic, boron, cadmium, chromium (total), copper, lead, mercury, nickel, zinc, pH, sulphate as SO ₄ , total petroleum hydrocarbons, PAHs, phenol and cyanide (total)	4
Suite I1	Dependant option: Speciated Hydrocarbons	4
Suite I2	VOCs and SVOCs	4
	Total Iron	4
	Total Manganese	4

5.2.3 Surface Water

No chemical testing was required as part of this works package in the absence of surface water within the site.

5.2.4 Land Gas Testing

Land gas testing was not undertaken as part of this work package.



6 Monitoring

Groundwater/ground gas monitoring standpipes were installed in 9 of the 20 exploratory holes, as detailed in Table 9 below. Groundwater levels were monitored during the fieldwork period and are scheduled to be undertaken monthly for twelve months from completion of the fieldworks. Groundwater sampling on selected monitoring standpipes was undertaken on one occasion, generally completed on the first round of monitoring (where access was available). Groundwater sampling was completed following well development and purging (minimum of 3 wells volume) A full set of monitoring records up to the time of writing, are included as Appendix L. Additional monitoring data will be submitted through an addendum report (report number: 1G081-WYG-GT-REP-000-000002).

**Table 8– Summary of Installation Response Z**

Exploratory Hole	Installation diameter mm/type	Response Zone (Slotted section where applicable) mbgl	Targetted Geological Formation
ML000-CP003	50mm standpipe	2m to 4.5m (2m to 4.5m)	River Terrace Deposits
	35mm piezometer tip	14.5m to 15.5m (14.84m to 14.16m)	London Clay
ML000-CP035	50mm standpipe	34.5m to 37.5m (35m to 37m)	Upnor Formation
	35mm piezometer tip	39m to 40m (39.34m to 39.66m)	Thanet Sand
ML000-CP066	50mm standpipe	2m to 5m (2m to 5m)	Made Ground
	35mm standpipe	35m to 40.5m (35.5m to 40m)	Upnor Formation & Thanet Sand
ML000-CP068	50mm standpipe	1.5m to 4m (2m to 4m)	River Terrace Deposits
	35mm standpipe	22m to 25m (22.5m to 25m)	Lambeth Group – Upper Mottled Beds
ML000-CR001	35mm piezometer tip	14 m to 15m (14.34m to 14.66m)	London Clay
	35mm piezometer tip	29m to 30m (29.34 to 29.66m)	Lambeth Group – Lower Mottled Beds
ML000-CR002	50mm standpipe	4m to 70m (44m to 70m)	Woolwich Chalk Formation
	35mm piezometer tip	2.5m to 23.5m (22.84m to 23.16m)	Lambeth Group – Upper Mottled Beds



Exploratory Hole	Installation diameter mm/type	Response Zone (Slotted section where applicable) mbgl	Targetted Geological Formation
ML000-RC007	50mm standpipe	49.25m to 53.75m (49.25m to 52.25m)	Seaford Chalk Formation
ML000-RO001	Vibrating Wire Piezometer (high entry ceramic tip with a 2.5 litres of water for 3kg of cement and 1 kg of bentonite powder mix)	9m	London Clay
		17m	London Clay
		25m	Lambeth Group – Upper Mottled Beds
ML000-RO002	Vibrating Wire Piezometer (high entry ceramic tip with a 2.5 litres of water for 3kg of cement and 1 kg of bentonite powder mix)	11m	London Clay
		19m	London Clay
		27m	Lambeth Group – Upper Mottled Beds

Code 2 - Accepted with Comments
Code 1 - Fit for Implementation



7 Electronic Data

Electronic data are included as Appendix M as follows:

- AGS 4 data.
- ACAD plans in dwg format.

Code 2 - Accepted with Comments
Code 1 - Fit for Implementation



Notes

1. Standards

All boring operations, sampling of soils, *in situ* testing and geotechnical laboratory testing have been carried out in accordance with the recommendations of the British Standards BS 5930(2015)⁽¹⁾, BS 1377 (1990)⁽²⁾ and BS10175 (2001)⁽³⁾.

Soil and rock descriptions follow the recommendations of BS 593. Where descriptions or classifications are based on other documents (e.g. BS 8004 (1986) or CIRIA Project Report 11 (1993)), this is stated in the report text.

2. Site methods

Unless specifically stated otherwise, the following methods are used for exploratory holes.

- Holes described as cable percussive are bored using a light cable percussive rig. Standard penetration tests are carried out where appropriate, as shown in the logs. Disturbed and undisturbed samples are taken from the exploratory holes at the depths on the records.
- Window sampling generally uses the windowless sampling method, using a tracked Geotool.
- Dynamic probes are usually heavy dynamic probes, using the same tracked Geotool used for window sampling.

3. Definitions and abbreviations

The following terms are used in the exploratory hole logs

Samples

U	Undisturbed 102mm dia. sample
TW	Thin Walled undisturbed 102mm dia. sample
B	Bulk sample
D	Small disturbed sample
W	Water sample
CBR	California Bearing Ratio test or CBR value obtained from Mexiprobe test

In situ tests

S	Standard penetration test (SPT)
N	SPT N value (blows/300mm)
HP	Hand penetrometer – shear strength
SV	Hand shear vane – shear strength
VOC	Volatile organic compounds (ppm)
PID	Photo-ionisation detector – used to detect the presence of VOCs.

Core recovery and rock quality

TCR	Total core recovery (%)
SCR	Solid core recovery (%)
RQD	Rock quality designation (%)
FI	Fracture index
NR	No recovery
NI	Not intact

Rotary drilling sizes

Index letter	Nominal diameter (mm)	
	Borehole	Core
N	75	54
H	99	76
P	120	92
S	146	113

Water strikes

▽	Level of water strike
▼	Water level rose to this level (see Remarks at foot of log for details)

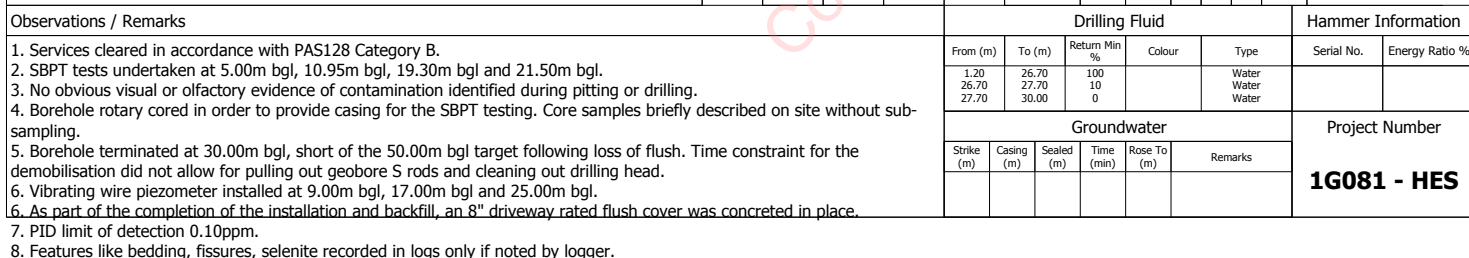
Depth means depth below existing ground level unless otherwise specified. Values specified in soil descriptions given in the exploratory hole logs are depths unless otherwise specified.





Appendices

See separate files.

Code 2 - Accepted with Comments
Code 1 - Fit for Implementation



<div></div> <div>Project: Euston Station Location: London Client: High Speed Two (HS2) Limited</div>						Location Details						Status		Borehole Number				
						Easting: 529304.44 Northing: 182662.30 Level: 24.74mAOD Depth: 30.00m Logger: BK+ST Type: RC Inclination: 90°						Final, monitoring in progress		ML000-RO001				
														Sheet 2 of 3				
Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time					Scale: 1:50				
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)	Checked By:	NPP			
0.00	1.20	Inspection Pit Rotary Core Rotary Open Hole	Hand Excavated T57 Geo T57 Geo	A. Gogea S.Craig, D.Shield S.Craig, D.Shield	1.20	300	8.50	150	12/04	18:00	10.20	5.50	3.3	Approved By:	MH			
1.20	28.20				28.20	146			13/04	16:00	17.70	8.50	0.5					
28.20	30.00				30.00	146			18/04	18:00	26.70	8.50	0.5					
									19/04	13:30	30.00	8.50	0.0	Start Date:	12/04/2017			
														Finish Date:	19/04/2017			
Strata Description						Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring							
											Depth (m)	Ref	Core Run	TCR	SCR	RQD	If	Tests / Results
Very stiff greyish brown CLAY. Weathering Grade Cc (LONDON CLAY FORMATION A3ii) LCAH Assumed zone of core loss. (Possibly LONDON CLAY A2).							10.20	14.54										
Stiff dark grey CLAY. Weathering Grade Ab (LONDON CLAY FORMATION A2) LCAW At 11.20m bgl assumed zone of cone loss At 11.70m bgl assumed zone of core loss							10.85	13.89				10.20 11.70	57			11		
Stiff fissured dark grey CLAY. Weathering Grade Ab (LONDON CLAY FORMATION A2) LCAW At 13.20m bgl assumed zone of core loss							11.90	12.84				11.70 13.20	87			12		
																13		
												13.20 14.70	93			14		
												14.70 16.20	100			15		
												16.20 17.70	100			16		
																17		
At 17.45m bgl medium strong to strong claystone with localised mineral veining																18		
Assumed zone of core loss. (Possibly LONDON CLAY A2).							17.70	7.04				17.70 19.20	27			19		
Stiff laminated dark grey CLAY with some silty/sandy partings and dusting. Weathering Grade Ab (LONDON CLAY FORMATION A2) LCAW							18.80	5.94				19.20 20.70	100			20		
Observations / Remarks										Drilling Fluid				Hammer Information				
1. Services cleared in accordance with PAS128 Category B. 2. SBPT tests undertaken at 5.00m bgl, 10.95m bgl, 19.30m bgl and 21.50m bgl. 3. No obvious visual or olfactory evidence of contamination identified during pitting or drilling. 4. Borehole rotary cored in order to provide casing for the SBPT testing. Core samples briefly described on site without sub-sampling. 5. Borehole terminated at 30.00m bgl, short of the 50.00m bgl target following loss of flush. Time constraint for the demobilisation did not allow for pulling out geobore S rods and cleaning out drilling head. 6. Vibrating wire piezometer installed at 9.00m bgl, 17.00m bgl and 25.00m bgl. 6. As part of the completion of the installation and backfill, an 8" driveway rated flush cover was concreted in place. 7. PID limit of detection 0.10ppm. 8. Features like bedding, fissures, selenite recorded in logs only if noted by logger.										From (m)	To (m)	Return Min %	Colour	Type	Serial No.	Energy Ratio %		
										1.20	26.70	100		Water Water Water				
										26.70	27.70	10						
										Groundwater				Project Number				
										Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks	1G081 - HES		



Project: **Euston Station**

Location: **London**

Client: **High Speed Two (HS2) Limited**

Location Details

Easting: 529304.44

Northing: 182662.30

Level: 24.74mAOD

Depth: 30.00m

Logger: BK+ST

Type: RC

Inclination: 90°

Status

Final, monitoring in progress

Borehole Number

ML000-RO001

Sheet 3 of 3

Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time						Scale: 1:50	
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)	Checked By:	NPP	
0.00	1.20	Inspection Pit Rotary Core Rotary Open Hole	Hand Excavated T57 Geo T57 Geo	A. Gogea S.Craig, D.Shield S.Craig, D.Shield	1.20	300	8.50	150	12/04	18:00	10.20	5.50	3.3	Approved By: MH	Start Date: 12/04/2017	
1.20	28.20				1.20	28.20	12/04	16:00	17.70	8.50	0.5					
28.20	30.00				1.20	28.20	18/04	18:00	26.70	8.50	0.5					
					30.00	146			19/04	13:30	30.00	8.50	0.0	Finish Date: 19/04/2017		

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring										
						Depth (m)	Ref	Core Run	TCR	SCR	RQD	If	Tests / Results			
Stiff laminated dark grey CLAY with some silty/sandy partings and dusting. Weathering Grade Ab (LONDON CLAY FORMATION A2) LCAW																
Stiff brown mottled grey CLAY with some silt dusting. (LAMBETH GROUP - UPPER MOTTLED CLAY) UMCL		21.00	3.74													21
Stiff multicoloured (grey, brown, red) CLAY with some silty dusting. (LAMBETH GROUP - UPPER MOTTLED CLAY). UMCL		21.70	3.04													22
Assumed zone of core loss.		22.20	2.54													
Stiff multicoloured (grey, brown, red) CLAY with some silty dusting. (LAMBETH GROUP - UPPER MOTTLED CLAY). UMCL		22.70	2.04													23
Assumed zone of core loss. (Possibly LAMBETH GROUP - UPPER MOTTLED BEDS)		23.70	1.04													
Stiff multicoloured CLAY with some silt dusting. (LAMBETH GROUP - UPPER MOTTLED CLAY) UMCL		24.10	0.64													24
																25
																26
																27
																28
																29
																30
End of Borehole at 30.00m Terminated		30.00	-5.26													

Observations / Remarks	Drilling Fluid					Hammer Information	
	From (m)	To (m)	Return Min %	Colour	Type	Serial No.	Energy Ratio %
	1.20	26.70	100		Water		
	26.70	27.70	10		Water		
	27.70	30.00	0		Water		
	Groundwater					Project Number	
	Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks	1G081 - HES

- Services cleared in accordance with PAS128 Category B.
- SBPT tests undertaken at 5.00m bgl, 10.95m bgl, 19.30m bgl and 21.50m bgl.
- No obvious visual or olfactory evidence of contamination identified during pitting or drilling.
- Borehole rotary cored in order to provide casing for the SBPT testing. Core samples briefly described on site without sub-sampling.
- Borehole terminated at 30.00m bgl, short of the 50.00m bgl target following loss of flush. Time constraint for the demobilisation did not allow for pulling out geobore S rods and cleaning out drilling head.
- Vibrating wire piezometer installed at 9.00m bgl, 17.00m bgl and 25.00m bgl.
- As part of the completion of the installation and backfill, an 8" driveway rated flush cover was concreted in place.
- PID limit of detection 0.10ppm.
- Features like bedding, fissures, selenite recorded in logs only if noted by logger.



Project: **Euston Station**
Location: **London**
Client: **High Speed Two (HS2) Limited**

Location Details:
Easting: 529304.44 Northing: 182662.30
Level: 24.74 Depth: 30.00
Logger: BK+ST Type: RC

Status
**Final,
monitoring in
progress**

Borehole Number
ML000-RO001

Discontinuity Data Sheet

Discontinuity Set Reference	Top (m)	Base (m)	Type	Dip (Deg)	SSR	MSR	Surface Appearance	Aperture Measurement	Aperture Observation	Infilling Material	Joint Roughness Coefficient	Wall Weathering Grade	Remarks

Code 2 - Accepted with Comments



Exova Jones Environmental

Registered Address : Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian, EH28 8PL

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

WYG
Arndale Court
Arndale Centre
Otley Road
Leeds
LS6 2UJ

Tel: +44 (0) 1244 833780

Fax: +44 (0) 1244 833781



Attention :	Franck Baudrain
Date :	8th May, 2017
Your reference :	A085215
Our reference :	Test Report 17/6883 Batch 2
Location :	HS2 Euston
Date samples received :	12th April, 2017
Status :	Final report
Issue :	1

Four samples were received for analysis on 12th April, 2017 of which two were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Phil Sommerton BSc
Project Manager

Code 2 - Accepted with Comments
Code 1 - Fit for Implementation

				<1	mg/kg	TM30/PM62
				<1	mg/kg	TM30/PM15
				<1	mg/kg	TM30/PM62
				<0.1	mg/kg	TM74/PM32
				<0.1	mg/kg	TM74/PM61
				<5	mg/kg	TM30/PM15
				<5	mg/kg	TM30/PM52

Client Name: WYG
 Reference: A085215
 Location: HS2 Euston
 Contact: Franck Baudrain
 JE Job No.: 17/6883

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	37-42	43-48									Please see attached notes for all abbreviations and acronyms		
Sample ID	R0001	R0001											
Depth	0.15	1.00											
COC No / misc													
Containers	V J T	V J T											
Sample Date	11/04/2017 13:45	11/04/2017 14:00											
Sample Type	Soil	Soil											
Batch Number	2	2											
Date of Receipt	12/04/2017	12/04/2017									LOD/LOR	Units	Method No.
PAH MS													
Naphthalene ^{#M}	<0.40 _{AA}	<0.04									<0.04	mg/kg	TM4/PM8
Acenaphthylene	1.42 _{AA}	<0.03									<0.03	mg/kg	TM4/PM8
Acenaphthene ^{#M}	2.48 _{AA}	<0.05									<0.05	mg/kg	TM4/PM8
Fluorene ^{#M}	2.32 _{AA}	<0.04									<0.04	mg/kg	TM4/PM8
Phenanthrene ^{#M}	24.11 _{AA}	0.12									<0.03	mg/kg	TM4/PM8
Anthracene [#]	10.68 _{AA}	<0.04									<0.04	mg/kg	TM4/PM8
Fluoranthene ^{#M}	52.31 _{AA}	0.17									<0.03	mg/kg	TM4/PM8
Pyrene [#]	40.11 _{AA}	0.15									<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene [#]	22.11 _{AA}	0.12									<0.06	mg/kg	TM4/PM8
Chrysene ^{#M}	19.89 _{AA}	0.11									<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene ^{#M}	32.39 _{AA}	0.16									<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene [#]	19.93 _{AA}	0.10									<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene ^{#M}	12.09 _{AA}	0.07									<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene [#]	3.06 _{AA}	<0.04									<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene [#]	10.69 _{AA}	0.07									<0.04	mg/kg	TM4/PM8
PAH 16 Total	253.6 _{AA}	1.1									<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	23.32 _{AA}	0.12									<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	9.07 _{AA}	0.04									<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	100 _{AA}	106									<0	%	TM4/PM8
EPH >C8-C10 ^{#M}	6	<5									<5	mg/kg	TM5/PM8
EPH >C10-C12 ^{#M}	<10	<10									<10	mg/kg	TM5/PM8
EPH >C12-C16 ^{#M}	41	<10									<10	mg/kg	TM5/PM8
EPH >C16-C21 ^{#M}	535	<10									<10	mg/kg	TM5/PM8
EPH >C21-C40	2824	<10									<10	mg/kg	TM5/PM8
EPH >C8-C40	3406	<30									<30	mg/kg	TM5/PM8
MTBE [#]	<5	<5									<5	ug/kg	TM31/PM12
Benzene [#]	<5	<5									<5	ug/kg	TM31/PM12
Toluene [#]	<5	<5									<5	ug/kg	TM31/PM12
Ethylbenzene [#]	<5	<5									<5	ug/kg	TM31/PM12
m/p-Xylene [#]	<5	<5									<5	ug/kg	TM31/PM12
o-Xylene [#]	<5	<5									<5	ug/kg	TM31/PM12
Total Phenols HPLC	<0.15	<0.15									<0.15	mg/kg	TM26/PM21
Natural Moisture Content	-	24.1									<0.1	%	PM4/PM0
Natural Moisture Content	15.8	-									<0.1	%	PM4/PM0
Hexavalent Chromium [#]	<0.3	<0.3									<0.3	mg/kg	TM38/PM20
Chromium III	NDP	48.5									<0.5	mg/kg	NONE/NONE
Chromium III	21.8	-									<0.5	mg/kg	NONE/NONE

The image shows a blank grid with 10 columns and 20 rows. A large red diagonal watermark is overlaid across the grid. The watermark text reads "Code 2 - Accepted with Comments" and "Code 1 - Fit for Implementation".

Note:

Opinions, including ACM type and Asbestos level, lie outside the scope of our UKAS accreditation.

Signed on behalf of Jones Environmental Laboratory:

[illegible]

Client Name: WYG
Reference: A085215
Location: HS2 Euston
Contact: Franck Baudrain

Matrix : Solid

[illegible]

Code 2 - Accepted with Comments

Code 1 - Fit for Implementation

Matrix : Solid

[illegible]

Code 2 - Accepted with Comments

Code 1 - Fit for Implementation

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 17/6883

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS) accredited - UK.
SA	ISO17025 (SANAS) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x10 Dilution

Code 2 - Accepted with Comments
Code 1 - Fit for Implementation

JE Job No: 17/6883

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.				
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	Yes
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes	Yes	AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes	Yes	AR	Yes
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid or water samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes

JE Job No: 17/6883

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes	Yes	AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM62	Acid digestion of as received solid samples using Aqua Regia refluxed at 112.5 °C.			AR	Yes
TM31	Modified USEPA 8015B. Determination of Methylterbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.			AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM61	Modified US EPA methods 245.7 and 200.7. Determination of Mercury by Cold Vapour Atomic Fluorescence.	PM38	Samples are brominated to reduce all mercury compounds to Mercury (II) which is analysed using method TM061.			AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.			AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.			AR	

JE Job No: 17/6883

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.			AR	Yes
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes	Yes	AR	No
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes	Yes	AD	Yes
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM61	As received solid samples are extracted with hot water in a 20:1 ratio of water to soil ready for analysis by ICP.			AR	Yes
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM0	No preparation is required.			AR	Yes
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide and Thiocyanate analysis.			AR	Yes
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide and Thiocyanate analysis.	Yes	Yes	AR	Yes
NONE	No Method Code	NONE	No Method Code			AR	Yes
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.			AR	