

High Speed 2 - 1MC06 - Stage One C2 - MWCC –
North Portal of Chiltern Tunnels to Brackley

**Twyford Embankment Landscape Earthworks
Conceptual Site Model**

1MC06-CEK-EV-NOT-CS06_CL10-000005

Rev	Date	Author	Checked by	Approved by	Revision Details	EKFB Reviewer
C01	11/09/2025	J.Spalding	A.Watts	J.Cassidy	Updated for EA Comments	Zara Rostance
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Stakeholder review required (SRR)	Purpose of SRR
☐ County / District / London Borough Council	☐ Acceptance
☐ LOV	☐ Approval
☐ LUL	☐ No Objection
☐ NRL	☐ Consent
☐ TFL	
☐ Utilities Company	
☐ Other (please specify)	

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Environment Agency Queries and Response

The following comments have been raised by the Environment Agency Environmental Permitting Office) on the 19/08/2025 for the Twyford Embankment DfR submission (reference EPR/EP3426SB/A001) which utilises information presented within the Twyford Embankment Landscape Earthworks Conceptual Site Model Report (prepared by ASC), revision C01.

EA queries (*italics*) and ASC responses are listed below in the order presented and this CSM report has been updated in the corresponding sections. From the 15 comments raised by the EA on the DfR submission, comments 1-5 are relevant to this CSM report and are discussed below.

1. **Conceptual Model Cross-Sections** – *Amend the conceptual site model cross-sections to present (a) the receptors, (b) the geological, hydrogeological or hydrological setting of the site, and (c) any engineering/mitigation measures potentially required under The Environmental Permitting (England and Wales) Regulations 2016 (EPR2016). Reason: The current conceptual model cross-sections are based solely on the engineering details required.*

An asset-specific Conceptual Site Model (CSM) for the Twyford Embankment Landscape Earthworks is already presented within Section 5 of this report; in written form (Section 5.2, Table 5-2) and diagrammatic cross section (Section 5.2, Figure 5-1). This CSM has been amended to include a clearer definition / labelling of the site and site conditions on Figure 5-1.

The CSM has been based on the environmental setting information (geology, hydrogeology, hydrology presented in Section 2.3), site-specific ground investigation data (presented in Section 2.4 and 2.5) and the proposed engineering design and mitigation measures for the asset (presented in Section 1.5). The CSM identifies the relevant sources, receptors and pathways, and the proposed engineered design to mitigate against these risks, which addresses comment 1.

2. **Conceptual Model Source Term** – *Amend the conceptual site model source term by providing evidence that the waste deposited for recovery (post any treatment) will meet the requirements of Schedule 22 of The Environmental Permitting (England and Wales) Regulations 2016 (legislation.gov.uk), which states:*

“take all necessary measures—

(a) to prevent the input of any hazardous substance to groundwater, and

(b) to limit the input of non-hazardous pollutants to groundwater so as to ensure that such inputs do not cause pollution of groundwater”

Reason *The waste material has been characterised as non-hazardous under WM3 whilst acknowledging that a number of samples exceed the threshold and are hazardous. It does not follow that non-hazardous materials are inert. Additionally, the conceptual site model for Twyford differs significantly from that of Chetwode. At Chetwode, a site-specific conceptual model—supported by borehole logs—demonstrated that no aquifer units or groundwater were present beneath the proposed development. In contrast, this site partially overlays the River Terrace Deposits which is classified as a secondary A aquifer. This is a significant difference, and the current application provides no evidence to support the assumption that conditions of Twyford are comparable to those at Chetwode. Therefore, it cannot be assumed that the site meets the requirements of EPR2016 schedule 22.*

There are 2 parts to this query (i and ii), and for ease we have split them out as follows.

- i) *The waste material has been characterised as non-hazardous under WM3 whilst acknowledging that a number of samples exceed the threshold and are hazardous. It does not follow that non-hazardous materials are inert.*

RPS, as part of the DfR has undertaken waste classification and have confirmed the majority of samples are non-hazardous with some exceeding the hazardous waste threshold but the classification was carried out prior to remediation. 2/109 samples were classified as hazardous (1 on the basis of ecotoxicity, 1 due to Corrosiveness/pH) and 22/109 samples were forced (reclassified) as non-hazardous as free product was not recorded and flammability was not considered viable within soils. It is acknowledged that the non-hazardous classification does not mean that a waste would automatically be considered inert, and waste recovery activities are not restricted to inert waste only.

- ii) *the conceptual site model for Twyford differs significantly from that of Chetwode. At Chetwode, a site-specific conceptual model—supported by borehole logs—demonstrated that no aquifer units or groundwater were present beneath the proposed development. this site partially overlays the River Terrace Deposits which is classified as a secondary A aquifer. This is a significant difference, and the current application provides no evidence to support the assumption that conditions of Twyford are comparable to those at Chetwode. Therefore, it cannot be assumed that the site meets the requirements of EPR2016 schedule 22.*

A site-specific CSM is presented specifically for Twyford in Section 5.2, which demonstrates that the Site is directly underlain by cohesive Alluvium and in turn, by Oxford Clay. River Terrace Deposits (RTD); referred to above, has not been encountered within the Site itself and was only identified locally off-site; as part of the development of the ground model and CSM, logs within 50m of the site were reviewed, and limited RTD was confirmed within 4/20 off-site exploratory logs. RTD has been encountered adjacent to the site boundary, off-site.

Although RTD has not been recorded within the Site, the proposed area of reuse for the treated waste has been reduced in size so that the northern part of the Site boundary (north of Chainage 81+400) will not be used, to add another degree of conservatism, in relation to the reuse of the treated waste, as shown in Figure 2.4. In addition, the re-use area will be >175m from the offsite RTD.

In addition, the treated waste has also been screened against the more conservative Zone 2B screening criteria (Section 4.3.1), which is protective of groundwaters at >4m bgl. Groundwater strikes have not been encountered on-site, however groundwater within the RTD in the vicinity of the site was encountered at >5m bgl, and therefore screening against the 2B criteria was appropriate.

The potential impacts to groundwater from the treated waste are considered very low given the proposals (engineering design and mitigation) and the underlying unproductive strata (>4m of OXC+ALV), i.e. absence of a viable pathway to controlled waters, and therefore meets the requirements of Schedule 22 of EPR 2016.

3. Waste Source Term- *Provide an assessment of the waste as a source term with respect to the potential discharge of hazardous substances, or the potential for non-hazardous pollutants to cause pollution.*

The Made Ground re-use screening criteria (presented in Appendix V) utilised within C2/C3 of the HS2 route was derived on the assumption that the placed Made Ground (e.g. treated waste) is the source (conservatively modelled as continuous) (Section 3).

Section 2 of this report has assessed that the Site falls within Zone 3 of the Made Ground re-use screening criteria, and therefore the treated waste has been assessed against this criteria (Section 4.3).

In addition to this, given the presence of the RTD adjacent to the site (an aquifer unit), the treated waste has also been conservatively assessed against the Zone 2B criteria (protective of deeper groundwater encounters as exhibited within the ground investigation), this screening confirms the suitability of the treated waste against this more conservative screening criteria which is protective of the groundwater conditions on-site; Section 4.3.1.

In addition, the design of the landscape earthworks (in addition to the wastes being assessed as suitable for the site reduces the likelihood of potential pollution as follows:

- The engineering design will minimise the potential infiltration/leaching (Section 1.5 and 5)
- Placement of the restoration layer specific for plant growth and the engineered material overlying the landscape earthworks (Section 1.5 and 3)
- Presence of thick low-permeability, unproductive strata underlying the Site (Section 2.5)
- The contaminant linkage to groundwater, runoff to surface water and human health direct contact receptors are not considered viable (Section □).

4. Mitigation Measures- *Provide an assessment of any mitigation measures, subject to the requirements of question 2 (ii) above.*

Mitigation measures (Section 5-2) have previously been presented, and the main mitigation measures is the landscape earthworks engineering design itself (Section 1.5) and re-use strategy/criteria (Section 3) which are protective of groundwater receptors relevant to the site.

Furthermore, the treated waste will be remediated, and the Site is underlain by >4.0m of unproductive strata (ALV +OXC). We have screened the treated waste against a more conservative Zone 2B rather than Zone 3 (which would be acceptable for the Site), and results pass the more conservative Zone 2B criteria. A reduced re-use area has been implemented (Figure 2-4), some >175m from the RTD (north, off-site) and this reduced re-use area is now presented in the CSM Figure 5-1.

5. Surface Water Risks- *Provide an assessment of the risk to surface water from contaminated runoff, supported by evidence on the leachability quality of the proposed waste materials.*

The CSM (Section 5.2) has demonstrated the absence of a viable pathway between the treated waste and surface runoff due to the engineering design of the landscape earthworks (Section 1.5):

- The treated waste to be emplaced within compacted cohesive, low permeability OXC.
- The treated waste is to be placed within the landscape earthworks embankment beneath a restoration layer, preventing direct interaction with the waste.

Suitability of the material for re-use on site (Section 3 and 4.3):

- Although there is limited leachate testing, the post-remediation treated waste will be suitable for Zone 2B and Zone 3.
- The agreed reuse criteria is based on conservative Consim modelling [1], which models the leaching of a continuous source (in this instance, the source being the treated waste) and migration to surface water receptors, and adopting the agreed reuse criteria demonstrates that there is not a need for further remedial measures when considering surface water receptors due to the absence of a potential pollution linkage.

1 Introduction

1.1 Terms of Reference

The Arcadis/Setec and COWI Design Joint Venture (ASC) has been appointed by Eiffage/Kier/Ferrovial Agroman and BAM Nuttall (EKFB) to prepare an asset-specific conceptual site model (CSM) in support of the Deposit for Recovery Permit (DfR) application for the re-use of remediated waste within a portion of the Twyford Embankment Landscape Earthworks (the “Site”) within section C2, of the Phase 1 High Speed 2 (HS2) development, as shown in Figure 1-1 below.

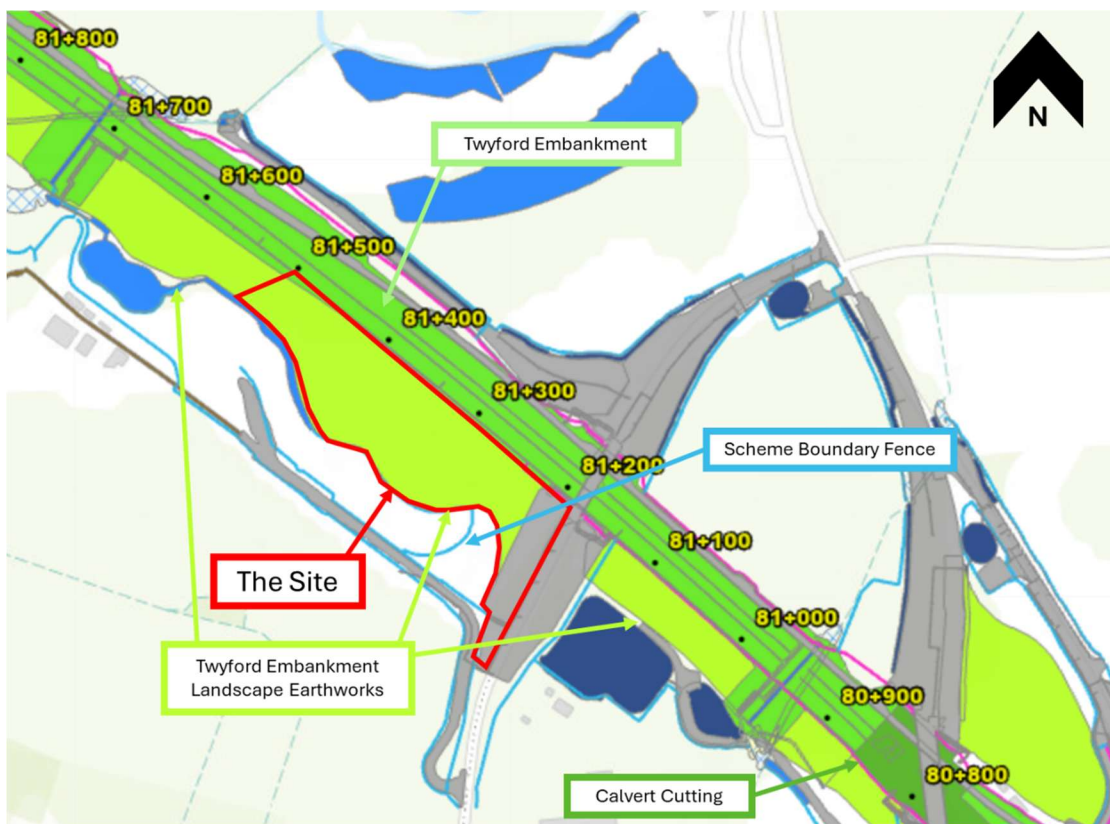


Figure 1-1 Site and HS2 Scheme

The Site is located at Twyford Embankment, east of the town of Twyford, Buckinghamshire, MK18 4ES. Planning permission has been granted by Buckinghamshire Council for the development of Twyford Embankment (24/02763/HS2 (awaiting decision), 21/03691/HS2 (approved)).

1.2 Aims/Scope

This document has been prepared to provide an asset specific conceptual site model (CSM) in support of the submission of the DfR Permit for the Site within the Twyford Embankment Landscape Earthworks (TELE) as outlined within the Employer's Instruction, EI-1609, comprising the following:

- The geological, hydrogeological, and hydrological Site setting (published and from ground investigation)- *Section 2*
- The material re-use strategy and criteria with an overview of the derivation of the re-use criteria (which is on the basis of modelling of the waste as a source term)- *Section 3*
- An assessment of the landfill waste (pre- and post- remediation) against the re-use criteria- *Section 4*
- The mitigation measures incorporated into the landscape earthworks design- *Section 5*
- The Conceptual Site Model to demonstrate the suitability of the treated waste (post-remediation) for re-use at the Site- *Section 5*

This document has been produced in accordance with the Land Contamination Risk Management (LCRM) guidance [1], EA guidance for Deposit for Recovery permit applications [2] and the HS2 Technical Standard for Land Quality (LQ) [3] and is based on the EA comments received for an earlier submission of a separate EKFB DfR application at the Chetwode Embankment.

1.3 Project Background Information

At Barton to Mixbury Cutting, the scheme intercepts a historical landfill Finmere Railway Cutting Landfill (LQ 14-02) southwest of the village of Finmere in Oxfordshire. The geotechnical design of Barton to Mixbury Cutting requires the removal of the landfill waste to enable the construction of the cutting; the land quality assessment of LQ 14-02 is presented within the Finmere Quarry Landfill and Railway Cutting Landfill Geoenvironmental Assessment Report [5].

HS2 has set high sustainability standards for the project which include the aim to re-use 100% of excavated materials, therefore, excavated landfill material from LQ 14-02 will be re-used within landscape earthworks following remediation (see Section 4.2). A total of ~100,00m³ of landfill waste will be excavated and remediated from LQ 14-02 of which ~40,000m³ of treated waste will be re-used within the Site.

The Site is considered a suitable re-use location for the treated waste due to the design need, its proximity to LQ 14-02 and based on the site-specific ground conditions i.e. low permeability Oxford Clay Formation (unproductive stratum) underlying the Site and surrounding area.

1.4 Information Sources

The following information sources have been utilised in the preparation of this report:

- Finmere Railway Cutting Landfill Remediation Implementation Plan (Duo) [4]
- Jackson Mobile Treatment Plant Deployment Supporting Information- Finmere Quarry and Railway Cutting Landfill [5]- Agreed to in communication reference JB3101MS/W0007 from the Environment Agency
- Preliminary post-remediation landfill waste chemical testing data (Duo) – provided as PDF copies of laboratory certificates.
- Aylesbury Link and Great Central Railway Geoenvironmental Assessment Report [6]
- Aylesbury Link and Great Central Railway Remediation Outline Strategy [7]

- Aylesbury Link and Great Central Railway Remediation Verification Plan [8]
- Finmere Quarry Landfill and Railway Cutting Landfill Geoenvironmental Assessment Report [9]
- Finmere Quarry Landfill and Railway Cutting Landfill Remediation Outline Strategy [10]
- Finmere Quarry Landfill and Railway Cutting Landfill Remediation Verification Plan [11]
- Derivation of Made Ground Assessment Criteria for the Protection of Controlled Waters [12]
- Calvert Cutting to Twyford Embankment: Hydrogeological Assessment Report [13]
- Twyford Embankment Geotechnical Design Report [14]
- IDR 218 Specification [15]
- Twyford Embankment Asset Specific Cross Section [16]

1.4.1 Remediation Strategies

The DfR permit application relates to two separate Land Quality Reporting areas as follows:

- The source materials are reported within the Finmere Quarry Landfill (LQ 14-02) and Railway Cutting Landfill Remediation Outline Strategy [10] where it summarises the geo-environmental assessment and the outline remedial measures required during excavation and handling.
- The re-use area is within Twyford Embankment and re-use of the material is detailed within the Aylesbury Link and Great Central Railway Remediation Outline Strategy [8]; i.e. handling of waste, remediation prior to re-use (as presented in Appendix III-1).

1.5 Proposed Development

The Twyford Embankment Landscape Earthworks (TELE) (HS2-00002BVH1) - the proposed location of re-use, is located on the south-western side of the Twyford Embankment and Calvert Cutting between chainages Ch. 81+175 to Ch. 81+520 and is designed to be a visual and audible screen between HS2 and the town of Twyford, located approximately 550m west. The TELE will be constructed of both treated waste (from LQ 14-02) and natural materials (as outlined below); the treated waste will be re-used within the southern section of the TELE (not across the entire Landscape Earthwork).

1.5.1 Design of Landscape Earthworks

The TELE is shown on *Figure 1-2* below (adapted from [16])

Typical Twyford Embankment Section

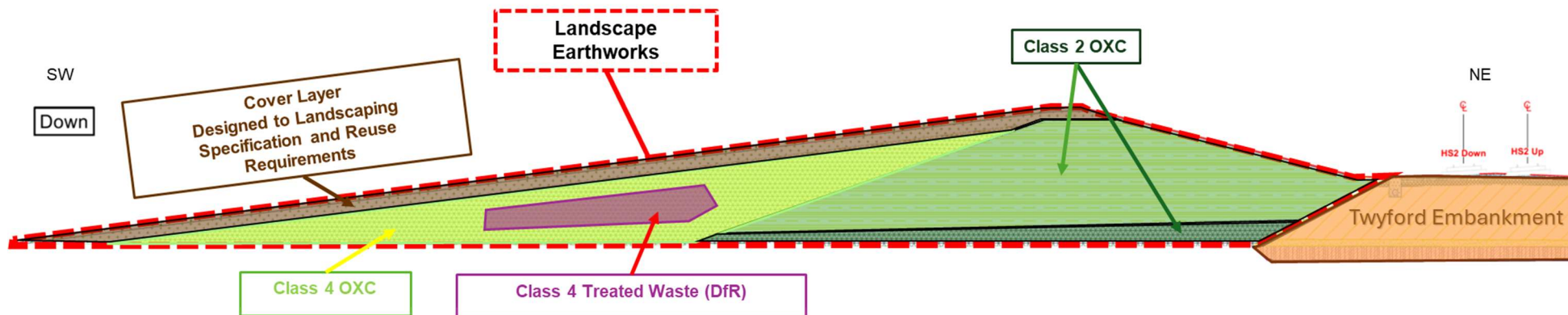


Figure 1-2 Annotated and Adapted Generalised Cross Section through Twyford Embankment and Landscape Earthworks

*Figure is for indicative purposes and not to scale.

1.5.2 Geotechnical Design Report

The design of the TELE (including the Site) is presented within the Twyford Embankment Geotechnical Design Report (GDR) [14] and summarised as follows:

- **Maximum height:** +5.5m above track level.
- **Thickness:** Variable up to 10.5m above existing ground level.
- **Slope:** 1v:4H.
- **Source of Natural Material:** Site won materials, to be sourced from Barton to Mixbury Cutting, Finmere Quarry Borrow Pit, Chetwode Cutting, Twyford Cutting, Twyford Viaduct and Calvert Cutting
- **Fill classification:** High plasticity clays(Class 2 and 4 natural clays) and the treated waste.

1.5.3 Earthworks Specification

The IDR 218 earthworks specification [15] states:

- The Made Ground (treated waste) can be re-used within the LOD / LLAU as landscape/engineering fill within the landscape earthworks subject to determination of acceptability against the appropriate material re-use criteria [12] (which are detailed in Appendix 6/14 & 6/15 of the earthworks specification).
- Material that exceeds the appropriate Material Re-use Criteria (Class U1B) can still be re-used if placed in an appropriate zone and depth within the works (in-line with the Material Re-use Zoning System, the proposed end-use of the land, and as previously agreed with the EA – October 2020) or managed by treatment and processing to meet suitability requirements under a permit (where applicable).
- Natural excavated arisings will be classified as inert when segregated from Made Ground materials and free from cross-contamination. Hence, once characterised they will be considered chemically suitable without the need for further chemical testing and classification. All materials will need to be tested to ensure they are geotechnically suitable. Arisings will be stored in an appropriate manner to prevent leaching from the material.
- Visible discrete asbestos-containing materials and fibrous materials shall be removed and disposed off-site to an appropriately licenced facility in accordance with the protocols set out in CAR-SOIL™ Control of Asbestos Regulations 2012 [17] and is in line with the DUO Remediation Implementation Plan [4].
- Within the works in the Limit of Deviation (LOD) and in areas of ecological mitigation planting within the LLAU, only, trace asbestos fibres (<0.001% v/v) within soils may be placed at appropriate depths (>600 mm in LOD, below landscaping requirements in ecological planting areas, min. >300mm), separated by an orange demarcation layer (not for protective measures). Soils containing ACM or detectable asbestos fibres cannot be used in the cover layer.

1.6 Limitations

- All chainages referred to are approximate with regards to the HS2 route and are based on the ASC Ground Engineering Viewer [17]. The Limit of Deviation (LOD) and Limits for Land Acquired and Used (LLAU) boundaries are based on information available at the time of writing.
- This document has been prepared for HS2 in accordance with the terms and conditions of the appointment. The Technical Note has been produced on behalf of EKFB for the sole purpose of supporting the DfR Permit application. The only third parties to review and/or utilise the information within the Technical Note are assumed to be Tetratech (EKFBs chosen consultant) and HS2 Ltd (the ultimate Client) only.
- The production and technical expertise in relation to the DfR permit is the sole responsibility of Tetratech (EKFBs chosen consultant). ASC are to provide specialist contaminated land support to Tetratech for this task only.
- This assessment has been based on data available at the time of writing. ASC does not warrant, nor does it accept any responsibility or liability for, the accuracy or completeness of the content or for any loss which may arise from reliance on information provided in the reports and any other third-party information on which this report is based.
- This assessment has been based on the asset design drawings and information available at the time of writing. Should significant variations be made to the asset design as described, then further consideration or assessment is likely to be required.
- The assessment has been undertaken based on the design of HS2 assets and also considered the construction and post-construction operational phases.
- Ground investigations, by nature only reveal a small percentage of the ground conditions present beneath the Site. The possibility of significant variation in ground conditions existing between sampling locations cannot be discounted.
- Groundwater conditions are based on observations made at the time of the investigation and during monitoring visits and may be subject to significant variation due to seasonal, or other effects. Depths stated are based on levels at the time of the individual ground investigations.
- Duo (remediation contractor) scheduled the post-remediation laboratory chemical testing.
- This report has been prepared, in part, based on the Environment Agency (EA) comments on the Chetwode Embankment Landscape Earthworks earlier EKFB DfR Application.

2 Setting

2.1 Site Setting

Table 2-1 Summary of Site Setting

Site Details [6] [17] [18] [19]	
Site Location	The Site (proposed re-use area) is located within the Twyford Embankment Landscape Earthworks situated between chainages Ch. 81+175 to Ch. 81+520, approximately 375m in length. The Site covers an area of approximately 2.5 Ha. The Site is situated within Buckinghamshire, approximately 550m east of the town of Twyford.
National Grid Reference	Ch.81+400: 467215, 226440 for the approximate centre.
Site Description & Surrounding Area	The Site is situated within an area of agricultural farmland. The Dismantled Rugby to Quanton Railway Land Quality (LQ) area (LQ 13-07) identified in the Environmental Statement [20] [21] crosses the southern extreme of the Site where the TELE follows West Street realignment. LQ 13-06 Sewage works is located approximately 10m west of the northern extent of the Site. The surrounding area is generally arable farmlands separated by hedgerows and treelines. Directly to the east of the Site is West Street, a road. An unnamed tributary of Padbury Brook crosses the TELE and will be redirected into the Twyford East Culvert (HS2-000001428) at approximate chainage Ch. 81+715 (approximately 150m northwest of the Site), and Portway Stream crosses the TELE and will be redirected into the Portway Culvert (HS2-000001373) at approximate chainage Ch. 80+945 (approximately 200m southeast of the Site).
Topography	The Site is generally flat in the northwest with elevations between ~82-84m AOD, and then gently rises to the southeast in a series of undulations, to a maximum elevation of ~86m AOD.

2.2 Site History

The history of the Site and surrounding area has been summarised from the information reviewed as part of the Geoenvironmental Assessment Report [6] [17] [18] [19] [22] which shows the Site and surrounding areas to be predominantly agricultural.

Table 2-2 Summary of Site History

Year	Details
1880	The Site and surrounding areas are largely agricultural. The Portway Stream, Padbury Brook and an unnamed tributary to Padbury Brook are present. A road crossing is present to the south/east of the Site and is noted to be the present-day, West Street.
1888	Great Central Railway (LQ 13-07) mapped to the south and southwest of the Site.
1945	No significant changes.
2004	A sewage works (LQ 13-06) is now present immediately to the west of the Site.

Year	Details
2022	A HS2 access track is mapped to the north of the Site.

2.3 Physical Setting

2.3.1 Published Geology

The published Geology has been summarised from the Geoenvironmental report [6]

Table 2-3 Summary of Published Geology

Published Geology	
Artificial Ground	Not mapped within the Site. Made Ground associated with the Great Central Railway (LQ 13-07) is present adjacent to the Site and Made Ground is anticipated within the sewage works (LQ 13-06) situated off-site.
Superficial Deposits	On-Site River Terrace Deposits (RTD), between approximate chainage Ch. 81+300 to Ch. 81+500. Off-Site Alluvium (ALV) is mapped offsite to both the north and south and is associated with the Padbury Brook tributary and Portway Stream.
Bedrock	The following sequence of strata is recorded underlying the Site: <u>Ancholme Group</u> - Oxford Clay (OXC) (at surface). - Kellaways Formation (KLB). <u>Great Oolite Group</u> - Cornbrash Formation (CB). - Forest Marble (FMB). - White Limestone (WHL).

2.3.2 Hydrogeology

The hydrogeological setting has been summarised from the Geoenvironmental Assessment Report [6] and Hydrogeological Appraisal Report [13]

Table 2-4 Summary of Hydrogeology

Hydrogeology	
Superficial Deposits	<u>Secondary A Aquifer</u> • River Terrace Deposits (RTD)- Off-Site. • Alluvium (ALV)- Off-Site.
Bedrock	<u>Unproductive Aquifer (Aquitard)</u> Oxford Clay (OXC)- On-site. <u>Secondary A Aquifer</u> • Kellaways Sand Formation (KLB)- On-site. • Cornbrash Formation (CB) - Off-Site. • Forest Marble Formation (FMB) - Off-Site. <u>Principal Aquifer</u> White Limestone Formation (WHL) - Off-Site.
Source Protection Zones (SPZ's)	No SPZ's identified within 2km of the Site.

2.3.3 Hydrology

The hydrological setting has been summarised from the Geoenvironmental Assessment Report [6] and Hydrogeological Appraisal Report [13]

Table 2-5 Hydrological Features

Hydrology	
Surface Water Features	None mapped within the Site. Padbury Brook – Padbury Brook is located 250m north of the Site, flowing east. – A tributary of Padbury Brook is noted 200m northwest of the Site. WFD Compliance – Overall Moderate • Chemical – Fail • Ecological – Moderate HS2 C2.L.69 Catchment and Floodplain Compensation Area (FCA) – The C2.L.69 Catchment pond is located 120m west of Site. – The FCA is located 95m north of the site, on the opposing side of the Twyford Embankment. Portway Stream – Located 200m southeast of the Site, flowing north.
Flooding	The Site is outside of flood risk zones.

2.3.4 Ecology

For ecological receptors we have reviewed the available satellite imagery, ASC Ground Engineering Viewer [17], and MAGIC Maps [23] (which includes environmental receptors), to identify potential receptors within 1km of the Site. This screening has noted protected habitats within the 1km radius of the site (the closest being a deciduous woodland, situated 400m east of the site), however given the distance to the site these are not considered further.

Within the close vicinity of the site (within a 50m radius), the Site is predominantly agricultural fields, with a hedgerow following a road to the southwest. Given the site setting (distance, topography etc.) and the engineered design of the landscape earthworks, there is not considered to be a viable pathway to the potential ecological receptors identified and therefore will not be considered further.

2.4 Ground Investigation Data

Three phases of Ground Investigation (GI) have been carried out between 2017-2023 [5] and the following 29 locations are available for the Site and in the immediate vicinity (within 50m) (Figure 2-1).

- 4 Cable percussion boreholes, with rotary coring follow on (CR), to depths of between 10.70mbgl to 25.00mbgl
- 4 Cable percussion boreholes (CP), to depths of between 7.35mbgl to 12.23mbgl
- 6 windowless sampling boreholes (WS), to depths of between 4.00mbgl to 5.00mbgl
- 5 Cone penetration test boreholes (CT), to a depth of between 6.88mbgl to 9.64mbgl
- 10 hand dug/ machine excavated trial pits (TP/HP), to depths of between 1.50mbgl to 4.00mbgl

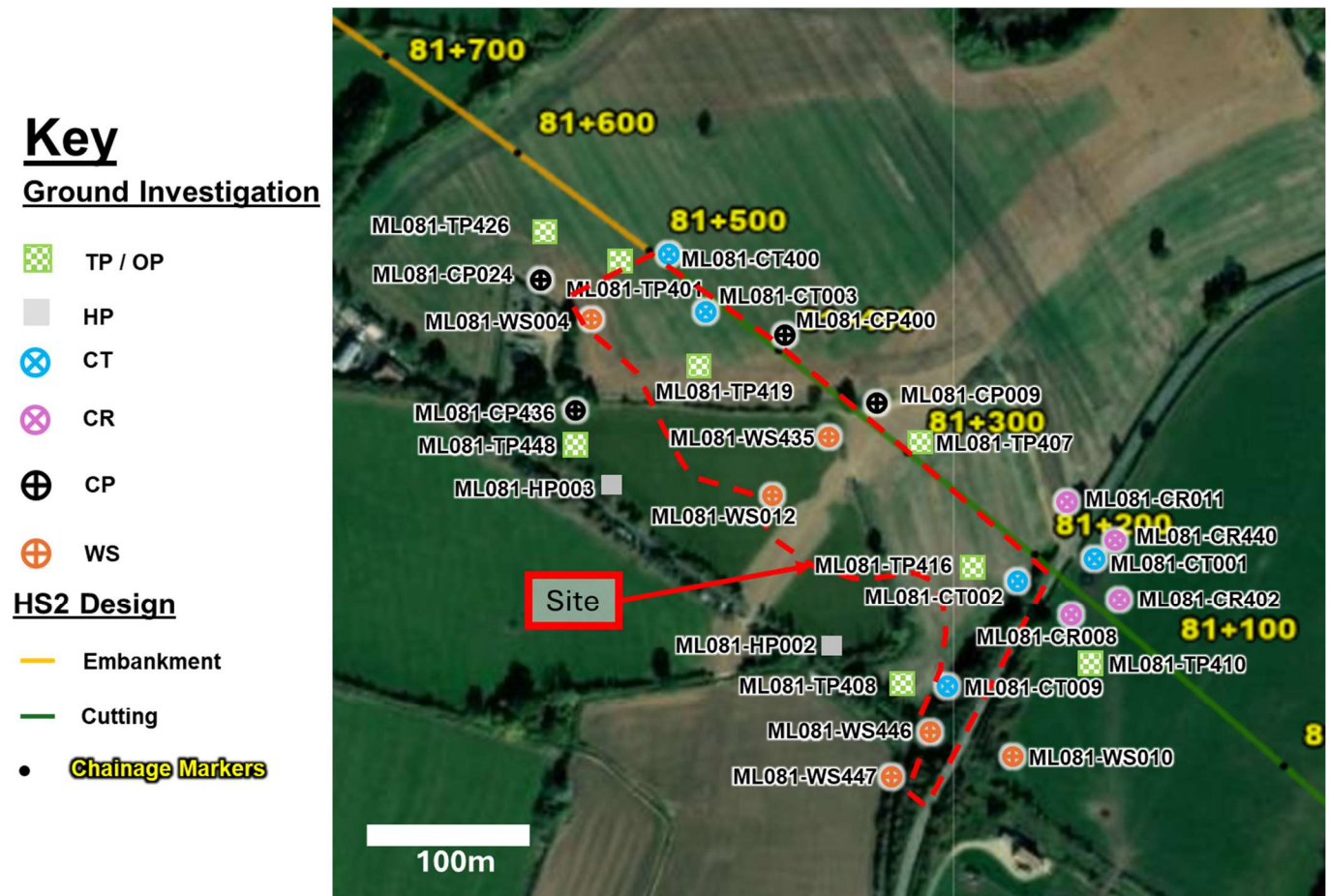


Figure 2-1 Exploratory Hole Location Plan (within 50m of Site)

For the purposes of this assessment, the 9 on-site exploratory holes (ML081-CT002, ML081-CT003, ML081-CT009, ML081-TP416, ML081-TP419, ML081-WS004, ML081-WS012, ML081-WS435 and ML081-WS446) are considered. 8 of the locations have demonstrated similar ground conditions, with variation noted in one location (ML081-WS004). ML081-WS004 is located on the western boundary of the earthworks and encountered a significantly thinner band of OXC than the remainder of the Site. GI conducted within the proposed re-use location terminates between 3.20mbgl and 9.48mbgl. An additional 20 borehole locations, situated within 50m of the Site have also been considered. Within the 5 cone penetration test locations, the geological formation was not recorded within bedrock strata, and therefore these positions have been used to only inform on topsoil thicknesses and the superficial deposits present.

Glaciofluvial Deposits and Mid Pleistocene Till were recorded in three locations (ML081-TP401, ML081-TP403 and ML081-TP419) however these are considered to have been mislabelled (not shown on BGS mapping or encountered in nearby GI). As such, these encounters have been re-classified as River Terrace Deposits based on similar geological descriptions and results of the particle size distribution tests.

The ground conditions encountered [6] are summarised below in Table 2.6 and geological model is discussed in Section 2.5. Generalised geological cross sections and the exploratory hole logs are presented in Appendix II.

Table 2-6 Summary of Encountered Geology within 50m of the Site

Stratum	No. Exploratory Holes Encountered	Depth Top. (Range) mbgl	Depth Base. (Range) mbgl**	Proven Thickness (Average) m	Description
On-site (within the re-use location boundary)					
Made Ground (MGR)	1/9	0.00	1.95	1.95	Recorded within the southeastern end of the proposed TELE (where it transitions into the West Street Alignment), associated with LQ 13-07. Described as brown sandy gravel, and brown sandy, gravelly clay with occasional pockets of medium to high cobble content. Cobbles are angular of brick and concrete.
Topsoil (TOP)	8/9	0.00	0.20–0.40	0.20–0.40 (0.32)	Grass over topsoil. Generally described as a brown slightly sandy clay with some rootlets.
Alluvium (ALV)	7/9	0.30–0.40	1.00–2.80	0.70–2.40 (1.30)	Underlying TOP across the Site at all 7 locations. Depth proven in 7 locations. Generally described as a soft to firm brown mottled grey, slightly silty, slightly sandy, slightly gravelly clay. Gravels were comprising flint and limestone, with occasional mudstones noted.
Oxford Clay Formation (OXC)	6/6*	0.20–2.80	3.00–9.48	1.05	Underlying MGR, TOP and ALV in 9/9 exploratory hole locations. Depth proven in 1/9 locations . Generally described as a firm to stiff greyish/bluish brown and dark grey slightly sandy clay. Occasional shell fragments were noted. Rare small fissuring noted.
Kellaways Formation (KLB)	1/6*	3.85	5.00	>1.15 Depth proven not	Recorded at the far west boundary of the Site in WS081-WS004. Underlying OXC. Depth has not been proven. Described as medium dense grey clayey fine sand with some shell fragments.
Off-site (within a 50m radius of the Site)					
Topsoil (TOP)	20/20	0.00	0.10–0.50	0.1–0.50 (0.30)	Grass over topsoil. Generally described as a brown slightly sandy gravelly clay with occasional rootlets.
Alluvium (ALV)	12/20	0.10–0.40	1.20–6.20	0.90–5.80 (2.35)	Encountered across the entire Site area. Depth proven in 9/12 locations encountered. Generally described as soft to firm slightly sandy gravelly clay and slightly sandy clay. Gravel comprising chert, quartzite, limestone, and mudstone.
River Terrace Deposits (RTD)	4/20	0.30–6.20	2.90–9.65	2.50–3.45 (3.12)	Encountered to the west and northwest of the Site. Depth proven in 3/4 locations encountered. Generally described as Firm light orangish brown mottled bluish grey slightly gravelly sandy clayey clay and clayey fine to coarse sand.
Oxford Clay Formation (OXC)	14/18*	0.20–9.65	4.00–12.23	4.45–8.75 (6.42)	Underlying the entire Site. Generally described as a firm to stiff fissured thinly laminated bluish grey/brown clay. Rare gravel, sand and silt inclusions were noted locally.
Kellaways Formation (KLB)	5/18*	8.20–11.30	9.83–13.59	5.30–5.59 (5.45)	Encountered within the east and northeast of the Site (where confirmed) Generally described as a stiff to very stiff, very dense dark grey very sandy clay, and dark grey mudstone.
Cornbrash Formation (CB)	3/18*	12.72–13.59	14.48–19.22	1.76–5.63 (3.54)	Encountered primarily in the east and northeast of the Site. Generally described as a strong light grey/dark grey fossiliferous limestone with thin bedding of very stiff sandy clays.
Forest Marble Formation (FMB)	3/18*	14.48–19.22	15.40–20.44	1.22–4.14 (2.94)	Encountered primarily in the east and northeast of the Site. Generally described as a medium-strong to strong thinly and medium bedded grey fine-grained limestone. Bedding is of mudstones. Discontinuities noted.
White Limestone Formation (WHL)	3/18*	18.62–20.44	Base not proven	>4.83 (unproven)	Encountered primarily in the east to northeast of the Site. Generally described as a medium-strong to strong grey fossiliferous limestone and mudstone discontinuities noted throughout.

* CT exploratory holes have been discounted where a factual bedrock geology code has not been provided ** where proven

2.5 Discussion

2.5.1 Geology

2.5.1.1 Made Ground

The Site history confirms agricultural usage since the earliest mapping (1880). A review of the GI logs encountered Made Ground at 1 location (ML081-WS446) out of the total 29 exploratory holes on-site and nearby (within 50m) to a depth of 1.95mbgl described as a brown sandy, gravelly clay with frequent anthropogenic inclusions of concrete and brick and was considered to be associated with LQ 13-07, the Dismantled Rugby to Quainton Railway, at the southeastern end of the proposed re-use area (i.e. limited interaction ~550m²).

As part of the construction of the West Street Overbridge/realignment, Made Ground associated with LQ 13-07 (where interaction occurs) will be excavated and replaced with a geotechnically suitable fill material [6] [14]. Therefore, the impact of Made Ground associated with LQ 13-07 is not considered further. Visual and/or olfactory evidence of contamination was not encountered and results of PID (Photoionization detector) screening were below the limit of detection (<1ppm) for all MGR samples taken.

2.5.1.2 Superficial Deposits and Bedrock Geology

The published geology and ground investigation data shows the topsoil is underlain by superficial ALV, and was highly variable in thickness, ranging between 0.70m to 2.40m on-site and 0.9m to 5.8m off-site. ALV was not recorded at two locations (ML081-WS435 on-site and ML081-TP470 off-site), however, surrounding GI did record its presence. Due to the significant variation in thicknesses of ALV recorded on-site, there is potential that the ALV has been incorrectly logged and is instead weathered OXC, due to the similarities in their composition.

RTD was not recorded on-site, however has been recorded directly underlying topsoil in 2 GI locations off-site to the west of the re-use area (ML081-TP426 and ML081-CP436), and below the Alluvium at 2 location ML081-CP024 and ML081-CP400) (between 3.8-9.65mbgl) (off-site to the northwest of the re-use area). RTD is encountered as either a soft to firm slightly sandy clay or as medium dense to dense clayey fine to coarse sand. The RTD is confined to the northwestern end of the asset, north of Ch. 81+400.

OXC underlying the ALV or MGR (locally) was encountered across the entirety of the Site. The depth of the OXC across the Site was only proven in one location in the northwest (ML081-WS004), overlying KLB, however, this location is considered to be unrepresentative of the Site, as this encountered a thin band of OXC, 1.05m thick. Across the remaining GI undertaken on site, 2/5 locations encountered OXC at a thickness of >4.00m, whilst the remaining locations encountered the OXC between 0.8m and 2.05m thick, however, the base of the OXC was not proven at these locations due to the GI terminating at a shallow depth (<4.00m).

When considering the nearby off-site locations (within 50m), the thickness of the OXC has been proven to be between 4.45m to 8.75m (unproven thickness ranges from 0.15m to 9.23m). Spatially across the Site and the surrounding area, GI indicates that OXC is thickest in the southeast (adjacent to the proposed West Street Overbridge/realignment) and thins towards the northwest.

The OXC encountered on Site is described as fissured or thinly laminated, greyish brown, sometimes slightly sandy and/or silty clay. The ALV and OXC are considered to be roughly similar in composition and are considered to have high plasticity and have a low permeability (see 2.5.1.3). When considering the ALV and OXC as a single cohesive unit, the combined thickness underlying the Site ranges from 2.05m to 9.18m, however, this is conservative, on the basis of 8/9 locations that have not confirmed the base of the OXC. The following strata are encountered underlying the OXC on/adjacent to the Site but are not discussed further given the thickness of the OXC:

- KLB (on-Site)
- CB (off-Site)
- FMB (off-Site)
- WHL (off-Site)

Groundwater strikes were not recorded on-site; however, they were recorded off-site within 50m and are discussed further in Section 2.6. A generalised geological cross-section is presented below (Figure 2-2).

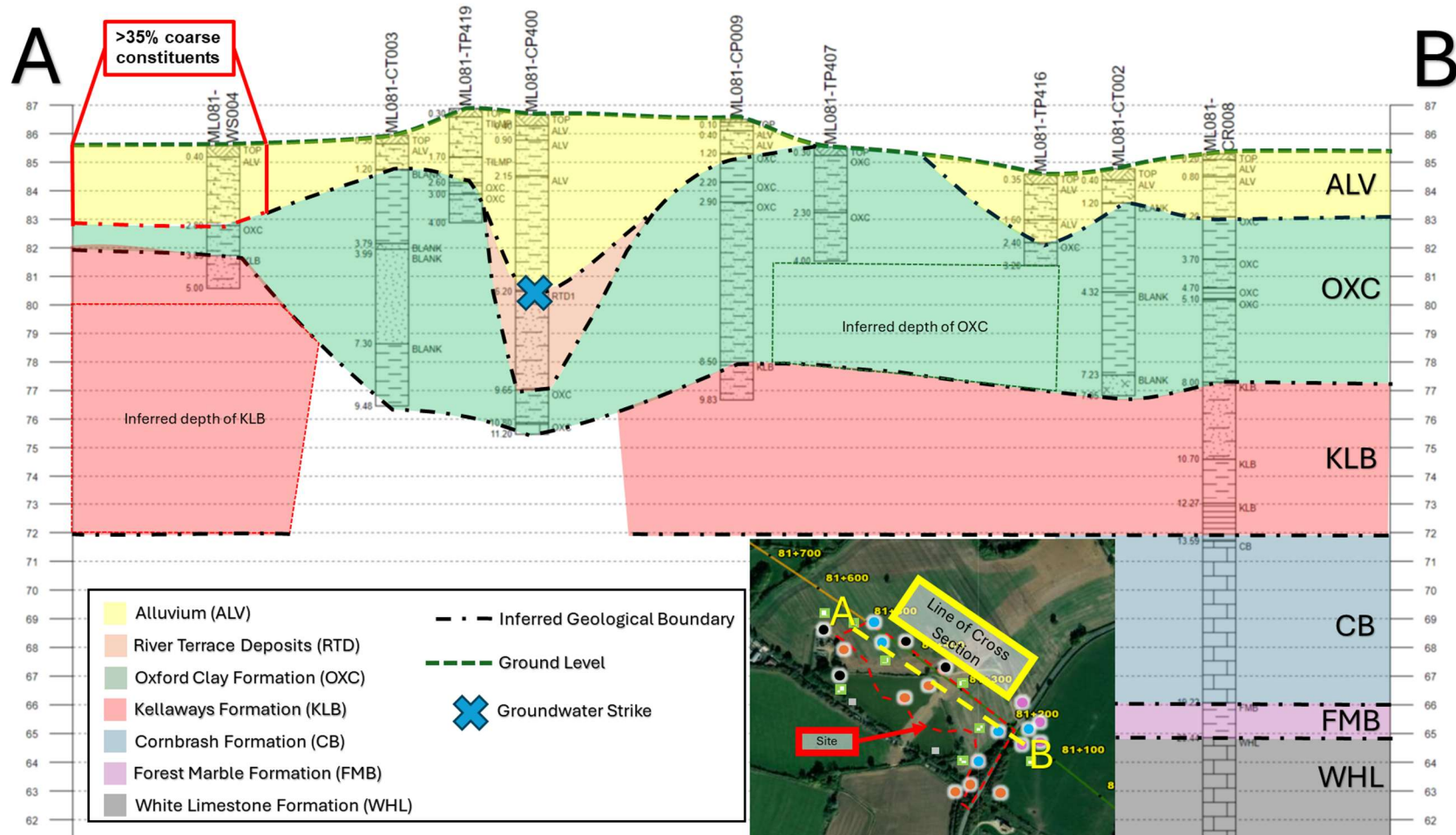


Figure 2-2 Generalised Geological Cross Section

This cross section was taken with a buffer of 20m either side, as such the Groundwater strike appears to be on-site however is situated off-site to the north of the re-use area

2.5.1.3 Physical Parameters

The results of the available geotechnical laboratory testing are summarised below and on the basis of the testing and descriptions on the logs, the majority of ALV and OXC are similar in composition and are considered likely to behave similarly as a cohesive, low permeability unit (with 4 samples exhibiting coarser soils). RTD is shown to be generally less cohesive with a greater proportion of coarse constituents than OXC and ALV. The summarised results of Particle Size Distribution Testing and Atterberg Limit testing are presented below in Table 2-7 and 2-8.

Particle Size Distribution

- The logs show the ALV and OXC are described as slightly sandy to sandy and slightly gravelly clay. Occasional, discontinuous pockets of sand are recorded in the ALV. As shown in Table 2-7. Particle size distribution (PSD) testing undertaken show that the ALV and OXC are both a sandy (locally very sandy, locally gravelly) silt/clay and are likely to be low overall permeability.
- Three samples of ALV from two boreholes (ML081-CP024 and ML081-WS004) contained greater than 35% coarse constituents and are likely to be of low to moderate permeability.
- All five samples of RTD contained greater than 35% coarse constituents and are likely to be of moderate permeability (and therefore unlike the properties displayed of the ALV/OXC). See Figure 2-3 below.

Atterberg Limit Testing

- The average plasticity index recorded for both strata is 35% for ALV and 32% for OXC, as shown in Table 2-8, with similar average liquid limit and plastic limits also recorded. This indicates both strata are formed primarily of a high-plasticity clay with a high degree of cohesiveness and are likely to both have a low overall permeability.
- The plasticity of five samples (1 ALV, 2 RTD and 2 OXC) plotted as low plasticity clays. Four of the samples (1 ALV, 1 OXC, 2 RTD) were taken from the northwestern area from exploratory holes ML081-TP401, ML081-CP436, ML081-CP024, ML081-TP426, which are mapped as cohesive soil with coarse constituents or coarse soil on Figure 2-3 Indicative Location of Soils Grouped by Particle Size Distribution. Due to the lower plasticity, it is anticipated that these clays will be more permeable than the cohesive clays found underlying the majority of the Site.

PSD and Atterberg limits laboratory data is presented in Appendix II-2.

Table 2-7 Particle Size Distribution Testing Summary

Strata	Number of Samples Tested	Clay (%) Avg (range)	Silt (%) Avg (range)	Sand (%) Avg (range)	Gravel (%) Avg (range)	Cobble (%) Avg (range)
ALV	20	34 (10 – 59)	49 (13 – 97)	24 (2 – 55)	10 (0.1 – 44)	0.07 (0 – 1.4)
ALV (Coarse Samples Removed*)	16	38 (10 – 59)	55 (13 – 97)	23 (2 – 55)	6 (0.1 – 28)	0 (0 – 0)
OXC	18	45 (26 – 58)	46 (24 – 96)	16 (2 – 46)	4 (0 – 12)	0 (0 – 0)
RTD	5	18 (4 – 27)	22 (7 – 30)	46 (30 – 68)	17 (2 – 55)	0 (0 – 0)

* Criteria for coarse ALV samples is detailed in Table 2-9

Table 2-8 Atterberg Limit Testing Summary

Strata	Number of Samples Tested	Liquid Limit (%) Avg (range)	Plastic Limit (%) Avg (range)	Plasticity Index (%) Avg (range)
ALV	21	57 (26 – 68)	23 (10 – 32)	34 (14 – 43)
OXC	38	54 (28 – 68)	23 (12 – 34)	32 (15 – 44)
RTD	7	37 (25 – 63)	17 (13 – 21)	24 (10 – 42)

Given the potential variability of the physical properties within a geological unit, the soils on site have been categorised (as per the BS5930 particle grading guidance [24]) into three units based on their PSD results. These categories are shown below in Table 2-9. Grouping the soils by particle size distribution rather than geological group allows for the Site to be divided into areas of anticipated greater permeability, for a better understanding of the potential risks to groundwater.

Table 2-9 Soil Categorisation Criteria

Category Name	% Fines (Clay and Silt)	% Coarse (Sand, Gravel, Cobbles)	Assumed Permeability
Cohesive soil	Greater than 62%	Less than 35%	Negligible
Cohesive soil with coarse constituents	Between 35% and 62%	Less than 35%	Low
Coarse soil	Less than 35%	Greater than 62%	Medium

The geology directly below the surface, excluding topsoil has been mapped to show the distribution of soils across the Site, shown in Figure 2-3.

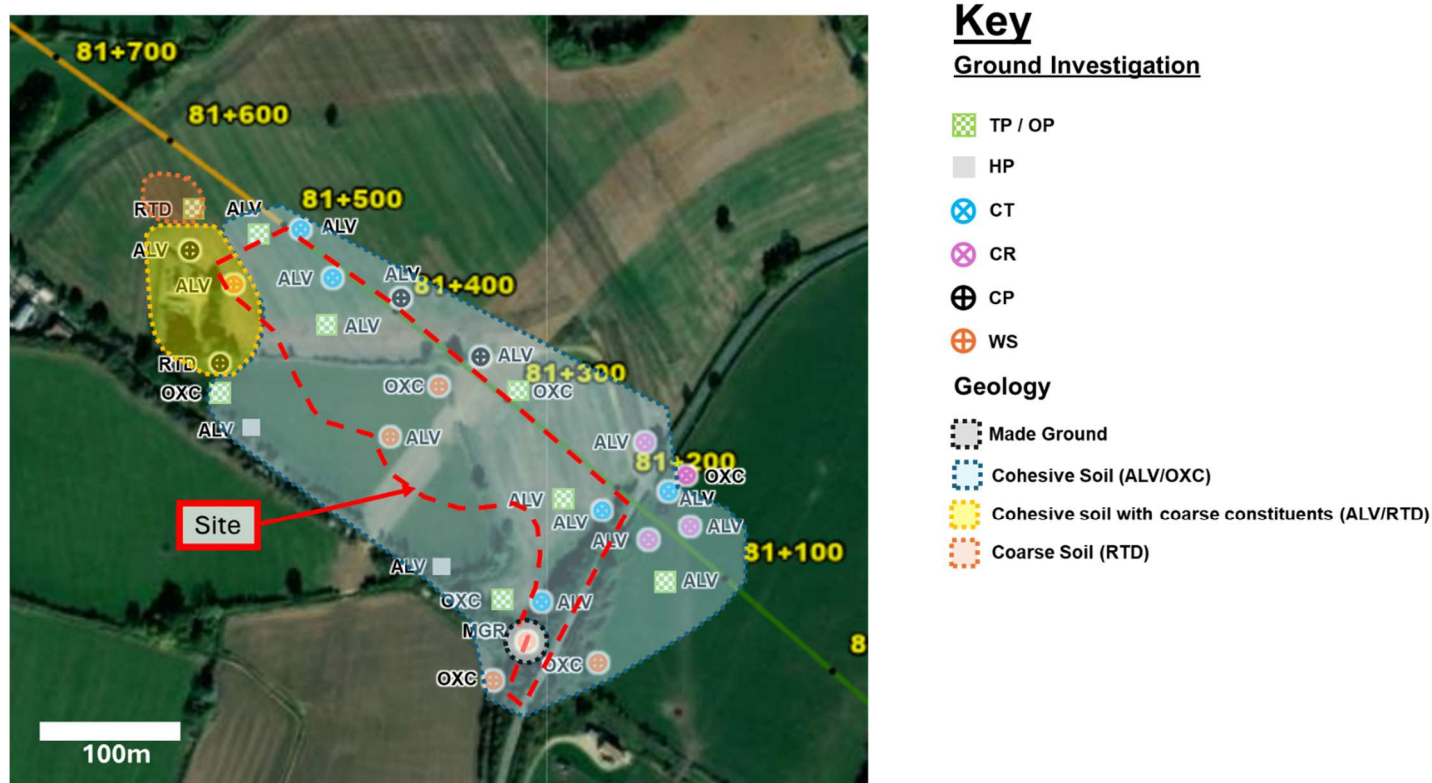


Figure 2-3 Indicative Location of Soils Grouped by Particle Size Distribution

2.5.1.4 In-situ Permeability Testing

In-situ permeability tests were not conducted within the Site; however, 17 tests were conducted within 2km of the Site which have been reviewed. The results of the tests conducted show that the ALV, OXC and KLB have a **low permeability** (k) in the order of $\sim 10^{-7}$ to 10^{-9} m/s as shown in Table 2-10 In-situ Permeability Testing Summary.

Table 2-10 In-situ Permeability Testing Summary

Strata	Number of Tests	Min. k (m/s)	Max. k (m/s)	Average k (m/s)
ALV	2	3.00E-09	6.00E-07	3.02E-07
OXC	11	3.00E-09	3.70E-07	1.12E-07
KLB	4	2.00E-09	1.40E-08	6.25E-09

2.5.1.5 Summary of Ground Conditions - Advised Re-use Area.

Coarse soils and cohesive soil with coarse constituents are likely to be more permeable than cohesive soil, and as such, are less protective of underlying groundwater. These potentially more permeable soils are confined to the northwest of the Site, where the thin band of OXC was recorded in ML081-WS004 as well as the RTD found at depth off-site. These three features may increase the permeability of the soils in the northwest of the Site, and as such, to add another degree of conservatism, it is recommended that treated waste is not reused in areas to the north of Ch. 81+400. Figure 2-4 below indicates the suggested acceptable re-use area to the south of chainage Ch.81+400.

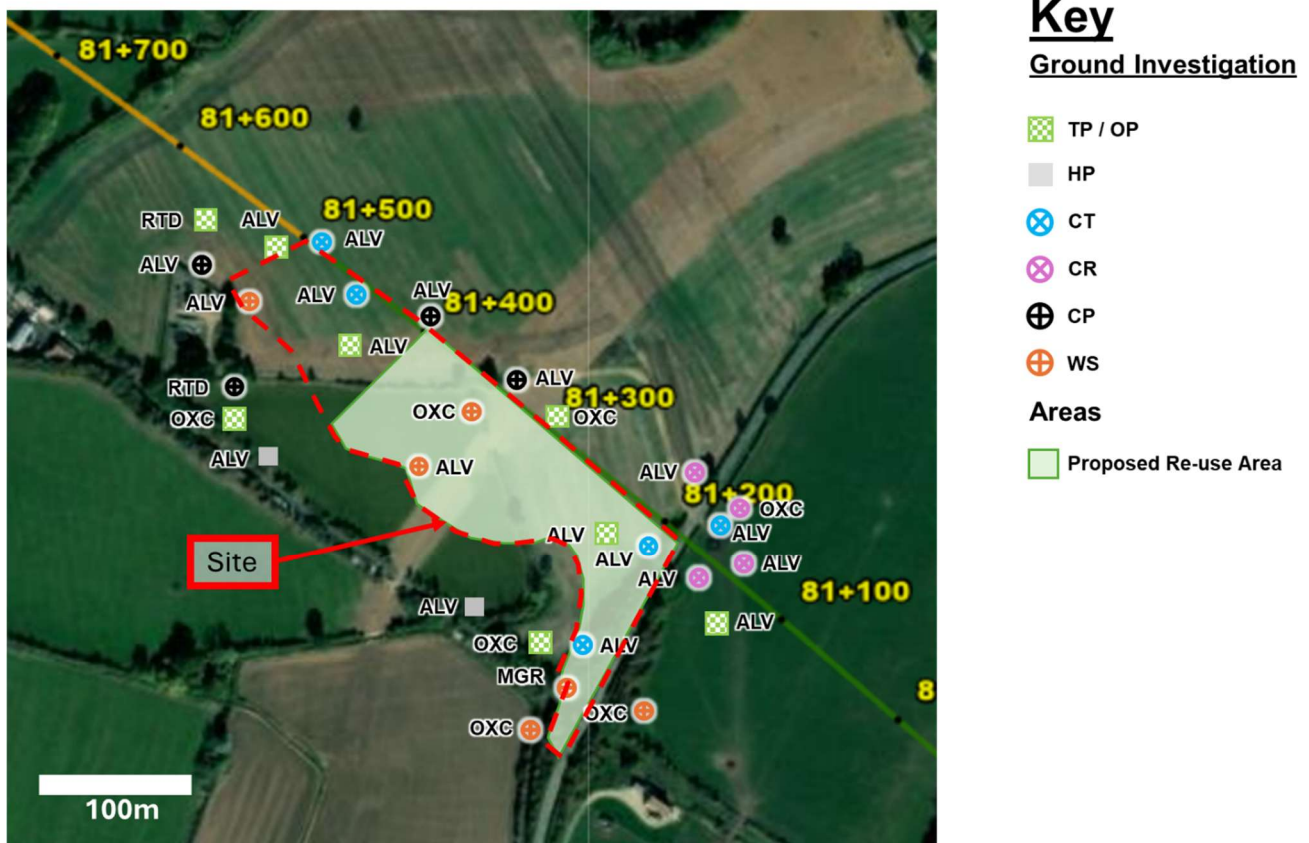


Figure 2-4 Proposed Treated Waste Re-use Area.

2.6 Hydrogeology

To assess the potential risks to Controlled Waters receptors (Groundwater) we have assessed the groundwater strikes encountered, and groundwater monitoring undertaken, to understand the hydrogeological characteristics of the Site (and surrounding area).

Groundwater has not been encountered on-site, with groundwater strikes and monitored levels noted adjacent to the site (within 50m of the site)

2.6.1.1 Groundwater Strikes

Groundwater strikes were not recorded in the ALV or OXC within the 9 locations on-site. Groundwater strikes were recorded off-site in 4/20 locations within RTD (2 locations), OXC (1 location) and KLB (1 location).

Table 2-11 Groundwater Strikes encountered (On-site and within 50m buffer)

Location ID	Geology	Depth	Change over time (20 Minutes)
On-Site (9 Exploratory Holes)			
Not encountered			
Off-Site (within 50m of the Site) (20 Exploratory Holes)			
ML081-CP024	RTD	5.1	0.5m rise
ML081-CP400	RTD	6.2	0.40m rise
ML081-CP436	OXC	9.15	1.15m rise
ML081-CR402	KLB	8.20	No change (seepage)

It is considered that the groundwater within the RTD (situated off-site) is perched on top of the underlying OXC, and not representative of a continuous groundwater table.

Figure 2-5 below shows that groundwater within the RTD was struck between 80.56mAOD and 79.67mAOD and rose by 0.5m and 0.4m over a 20-minute observation period. The rise recorded indicates the groundwater within the RTD is confined by the ALV under relatively low hydrostatic pressure.

Groundwater within the OXC was struck at 78.26mAOD and rose by 1.15m over a 20-minute observation period. The rise recorded suggests the groundwater within the OXC is restricted to sandy/gravelly lenses within the clay formation and confined by the clay-rich layers under relatively low hydrostatic pressure.

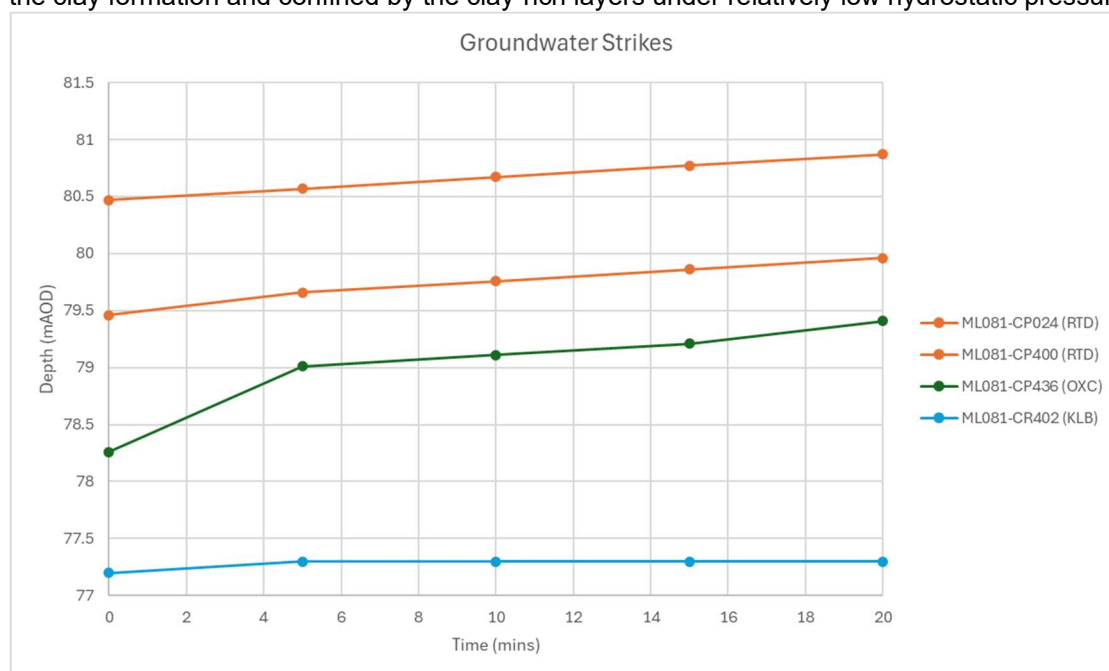


Figure 2-5 Groundwater Strike Elevation Readings over 20-Minute Observation Period

2.6.1.2 Groundwater Monitoring

Groundwater elevation monitoring has been conducted in standpipes in the vicinity of the Site (none on-site, 7 off-site). Monitoring was conducted monthly over a 1-year period between May 2017 to September 2018 (ML081-CP009, ML081-CP024 and ML081-CR011), between June 2019 to July 2021 (ML081-CP400) or September 2020 to December 2021 (ML081-CP436 [2 standpipes] and ML081-CR440). The standpipe installations are detailed in Table 2-12 below.

Table 2-12 Groundwater Monitoring Installations

Location ID	Strata	Ground Level (mAOD)	Response Zone Top (mAOD)	Response Zone Base (mAOD)
ML081-CP400	RTD	86.67	80.67	77.17
ML081-CP436 Shallow	RTD/OXC	87.41	84.91	81.91
ML081-CP436 Deep	OXC	87.41	80.91	77.41
ML081-CR440	OXC/KLB	85.97	81.47	75.47
ML081-CP009	OXC/KLB	86.5	79	77
ML081-CR011	FMB/WHL	85.07	65.57	64.57
ML081-CP024	ALV/RTD	84.56	83.06	78.06

Boreholes ML081-CP024 and ML081-CR011 were only successfully dipped for 4 rounds before being destroyed, and as such have not been included in this assessment.

Monitoring standpipes primarily within the OXC (ML018-CP436 Shallow and Deep) indicates there is limited groundwater present, with limited seasonal changes in elevation. This is considered likely to be perched groundwater present in pore spaces and discontinuous sand pockets noted rarely in the OXC. It is considered that groundwater flow through the OXC will be limited due to the overall cohesive nature of the deposits [13].

The monitoring standpipe primarily within the RTD (ML081-CP400) generally recorded groundwater at ~83mAOD, approximately 3m above the top of the RTD, and is considered to represent the piezometric head of perched groundwater within the RTD.

The monitoring standpipes within the OXC/KLB (ML081-CP009 and ML081-CR440) generally recorded groundwater at ~83mAOD, approximately 4.5-5.5 m above the top of the KLB, and is considered to represent the piezometric head of groundwater within the KLB. For the purposes of this assessment, it is considered that the shallowest groundwater aquifer underlying the Site is the KLB (Secondary A Aquifer), with the RTD not encountered on-site and not considered to be a significant groundwater unit, with water within the unit being perched and discontinuous.

Annotated groundwater elevation graphs are presented in Appendix II-3.

2.7 Hydrology

2.7.1 Surface Watercourses

Two watercourses are recorded within the vicinity of the Site; an unnamed tributary of Padbury Brook located 200m northwest of the Site, and Portway Stream located 200m southeast of the Site [17], and these are both considered receptors.

Both the unnamed tributary and Portway Stream will be partially diverted by the HS2 scheme, as shown on Figure 2-6. The unnamed tributary will be diverted ~100m southeast from the existing watercourse and will be culverted under the Twyford Embankment. The Portway Stream will be diverted ~30 northwest from the existing watercourse and will be culverted under the Twyford Embankment.

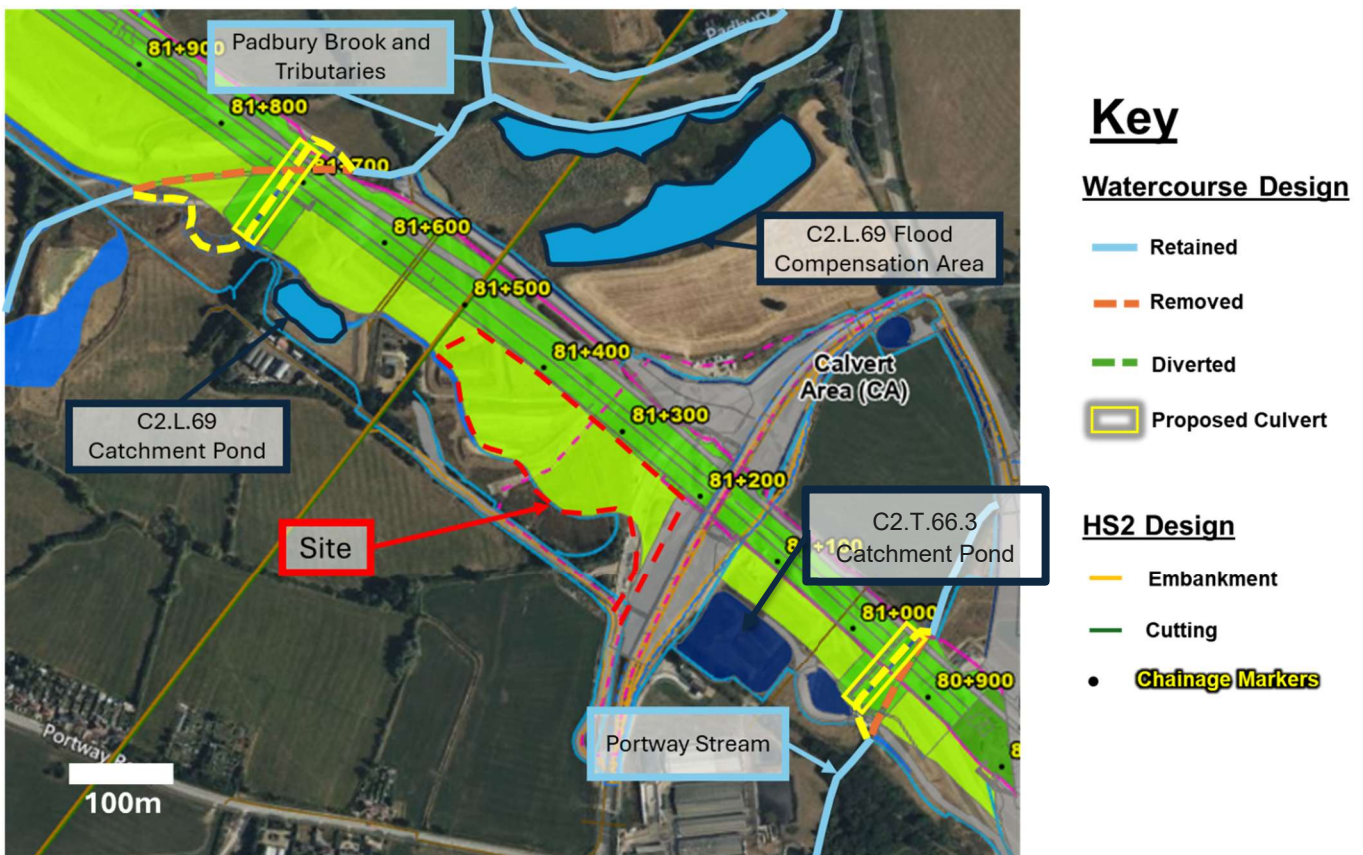


Figure 2-6 Proposed Surface Watercourse Diversions

2.7.2 Catchment Ponds/Settlement Ponds

HS2-constructed catchment ponds are located within the vicinity of the Site, with C2.L.69 Catchment located 85m west, and the C2.L.69 Flood compensation area located 95m north on the opposite side of the HS2 trace (when built), show on Figure 2-6. The catchment and flood compensation area and their associated ponds are in place for track drainage and to prevent flooding due to HS2 structures impacting the local hydrology.

The closest catchment pond to the proposed re-use area is the C2.T.66.3 (located 90m east), which is a catchment pond designed for track drainage. Although being the closest surface water receptor to the Site, there is not considered to be a viable pathway to the receptor as it is on the opposing side of the earthworks for the West Street overbridge and road realignment.

3 Made Ground Re-use Criteria.

3.1 Derivation of the Re-use Criteria

Materials re-use criteria has been derived by ASC (using ConSim modelling) for Made Ground (which includes the treated waste) material [12] protective of controlled waters and summarised below:

- Derived for the re-use of Made Ground across 6 Zones within Section C23 of the HS2 route (Zones 1A, 1B, 2A, 2B, 2C, and 3) based on geology, aquifer classification, depth to groundwater, proximity to surface water and proposed thickness of clay cover.

Table 13-1 Material Re-use Classification Zones

Zone	Situation
1A	Soil chemical assessment criteria protective of the underlying aquifer in Zone 1 (chalk aquifer units) where groundwater is encountered at <10m below ground level (bgl)
1B	Soil chemical assessment criteria protective of the underlying aquifer in Zone 1 (chalk aquifer units) where groundwater is consistently encountered at 10m bgl or more
2A	Soil chemical assessment criteria protective of the underlying aquifer in Zone 2 (non-chalk aquifer units), where groundwater is encountered < 4mbgl and the distance between the LE and surface water features is > 50m
2B	Soil chemical assessment criteria protective of the underlying aquifer in Zone 2 (non-chalk aquifer units) where groundwater is consistently encountered at 4m bgl or more and the distance between the LE and surface water features is > 50m
2C	Soil chemical assessment criteria protective of surface water features located within 5 to 50m of a LE in Zone 2 (non-chalk aquifer units). Where the derived Zone 2c criteria is higher than Zone 2a/2b, the lower of the Zone 2a/2b criteria is adopted.
3	Zone 3 comprises bedrock geologies which are considered as non-aquifers (unproductive aquifers). Screening criteria is driven by Human Health factors.

- Zone 1 is the most sensitive (e.g. chalk aquifer, Source Protection Zones with groundwater recorded <10mbgl (1A) or >10mbgl (1B)) and Zone 3 is the least sensitive (non-aquifer areas).
- In Zone 3 areas, the assessment will then be driven by human health risk (S4UL [25]/C4SL [26] screening values), as sensitive aquifer receptors are not present. Human health re-use criteria are also assessed within Zone 1A/B and 2A/B/C.

The human health re-use criteria consider the following 3 scenarios:

- >1.2m in parts of the LLAU to be returned to agriculture (S4UL/C4SL – Allotment criteria).
- ≤ 300mm in Ecological Planting Area (S4UL/C4SL – Public Open Space (park) criteria).
- ≤ 600mm in the LOD (S4UL/C4SL – Commercial / Industrial criteria).

In Zone 3, re-use below 300mm/600mm in planting areas/the LOD there are no derived screening criteria due to unproductive stratum and being below the depth which human health receptors are likely to interact with.

3.2 Testing Requirements

Made Ground materials will be tested at a rate of a minimum of 1 sample per 1,000m³ (in accordance with the approved strategy). Samples will be collected under the chain of custody and tested in a suitable laboratory which is UKAS-accredited and MCERTS-compliant.

3.3 Site Specific Requirements

The Site (and wider area) was originally classified as suitable for re-use Zones 2A, 2B (due to the presence of RTD) and 3. However, upon review of the site-specific information provided within Section 2, the Site has been reclassified to Zone 3, and therefore, the treated waste can be re-used within the Site (within LOD and LLAU) and shall meet the chemical acceptance criteria for Zone 3. Given the presence of the RTD geologies adjacent to the site, the treated waste has also been conservatively screened against the Zone 2B screening criteria, to ensure the wastes are protective of potential groundwater adjacent to the site.

The re-use criteria for Zone 3 (and the more conservative zones) is presented within Appendix V.

4 Waste Assessment- Remediation and Verification Results

The following summarises the remediation works and results of the verification testing of the treated waste assessed against the re-use criteria (confirming suitability for re-use within the Site).

Assessment of the treated waste (Section 4.3) demonstrates the treated waste shows lower concentrations and a significant reduction in exceedances of contaminants following remediation and is suitable for re-use within the Site. Therefore, the treated waste is suitable for re-use within the Site as structural fill below the restoration layer in the LOD (>600mm thick), in ecological planting areas (>300mm thick) and in areas to be returned to agriculture (>1,200mm thick).

4.1 Pre-Remediation Chemical Data Summary

82 landfill waste samples (40 exploratory holes) from LQ 14-02 were tested for a general suite of heavy metals, Polycyclic Aromatic Hydrocarbons (PAH), Total Petroleum Hydrocarbons (TPH), Volatile and Semi-Volatile Organic Hydrocarbons (VOC/SVOC), and inorganic determinands [9]. Not all samples were tested for the full suite. The available assessed data is presented in Appendix III-1, confirming that remediation is required prior to re-use.

4.2 Remediation Strategy and Implementation Plan

An outline remediation strategy for Finmere [10] developed by ASC identified mechanical sorting and removal of deleterious materials for the excavated landfill materials. EKFB appointed a specialist remediation contractor (Duo) who further developed the remediation strategy and prepared a Remediation Implementation Plan (RIP) [4] and deployment form [5]. The RIP/deployment form is summarised further below and in Figure 4-1 [4].

The remediation is ongoing at the time of writing and Duo have provided ASC with the initial laboratory testing results for the treated waste.

- The excavation works will generate approximately 100,000m³ of arisings (of which approximately 40,000m³ to be re-used at the Site).
- Remediation has been/will continue to be carried out under a mobile treatment licence issued by the Environment Agency for mechanised sorting/processing of material as detailed below:
 - Excavation and segregation of landfill waste into its different components (e.g., soils, aggregate, plastics, glass, brick, timber, fabric etc.). The segregation has been achieved by utilising a combination of soil screening (size separation) and complex manual sorting/hand picking to remove deleterious materials.
 - Materials such as concrete, rubble, and brick have been processed as necessary by (i.e. by crushing or shredding etc) and, where possible, re-used within the scheme to infill excavations or recycled at a suitable licensed facility if required.
 - Visually identifiable Asbestos Containing Materials (ACM) has been picked by suitably trained operatives and disposed of at a suitable licensed facility.
 - Note: it is considered that not all free fibres can be removed from the waste, but trace-free fibres of <0.001% v/v will be acceptable given the location of the treated waste as structural fill.
 - Any recoverable metal, glass and plastics has been segregated and, where possible, recycled at a suitable licensed facility.
 - Materials that are not suitable for recycling or re-use (such as some types of plastics, fabrics, paint tins, wood) have been disposed of offsite at a suitable licensed facility.

- The treated waste has been stockpiled, tested and assessed against the material re-use criteria to inform suitability for re-use within the scheme.
- For the duration of the remediation, stockpiles of the segregated materials have and will be managed appropriately, in accordance with the EKFB Construction Environmental Management Plan (CEMP) for the Twyford to Greatworth Area (T2G) [27] and Calvert Area (CA) [28]. Stockpiles are suitably lined, bunded and covered to prevent the mobilisation of contaminants due to rainfall ingress and/ or the generation of dust and not located within 5m of watercourses.

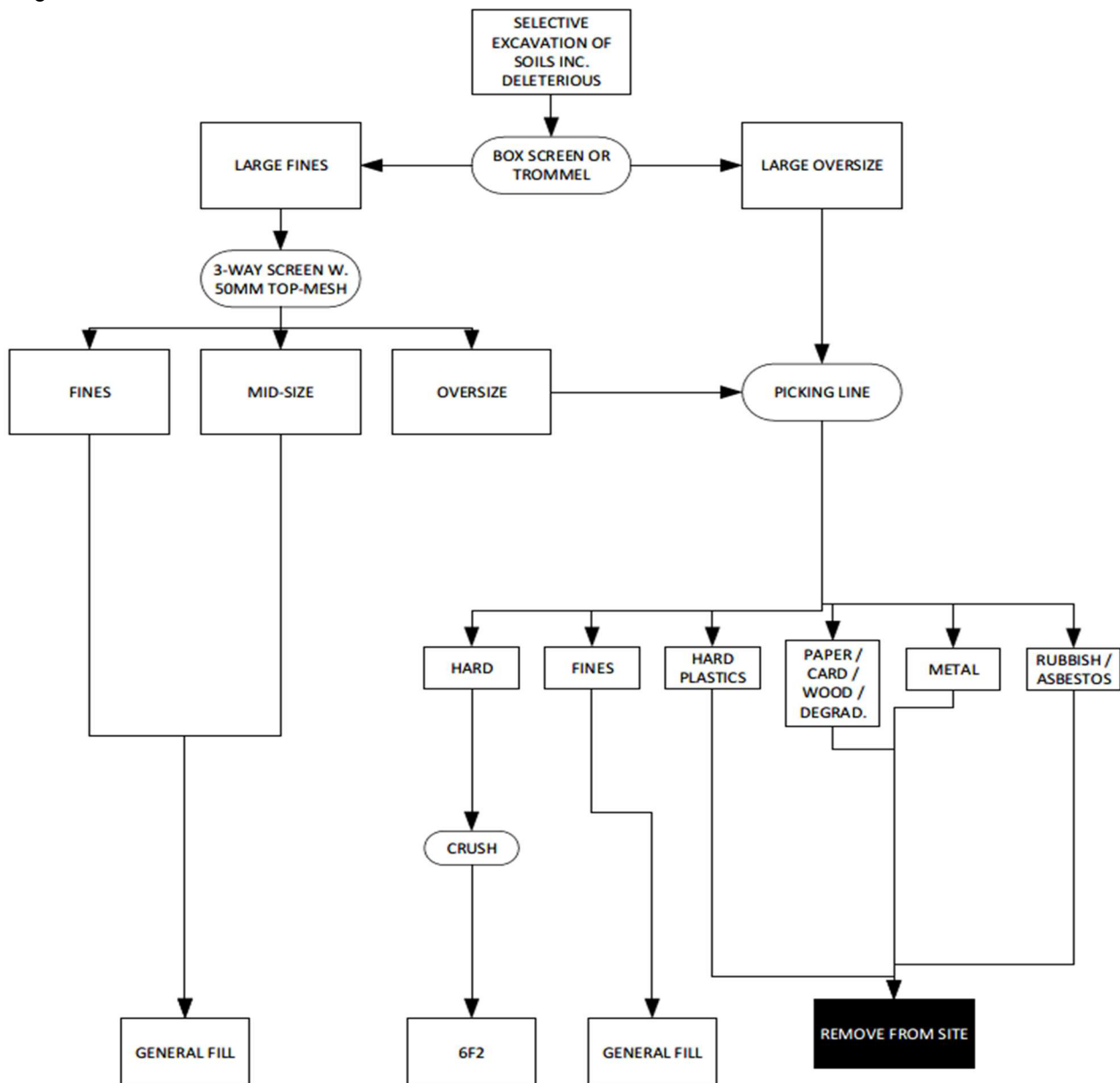


Figure 4-1 Duo Treatment Activities and Acceptance Procedures Summary Flow Diagram

4.3 Treated Waste Chemical Data Summary

The remediation of the excavated landfill waste is ongoing. The available verification results provided to ASC are summarised below. 40 validation results will be required (based on 40,000m³ of excavated waste), and additional re-use suitability testing will be undertaken by EKFB on the treated waste directly prior to deposition to confirm suitability. 25 samples are currently available for review.

Assessment of the 25 samples shows that they pass the commercial/industrial and Public Open Space (park) re-use criteria, and the majority of the results are suitable for re-use within Zone 3, with the following notes, which will have an impact on the re-use recommendations of the treated waste:

- 1/17* samples – slightly exceeded the screening value of the Allotment end-use for 2 PAH compounds (benzo(a)pyrene and benzo(b)fluoranthene). *8 samples deviated and will be re-tested.
- Trace chrysotile asbestos-free fibres were identified in 3/25 samples (12% of samples), but quantification testing recorded values of <0.001% v/v.

Therefore, the treated waste is considered suitable for re-use as structural fill within the Site below the restoration layer (and utilising a demarcation layer) in the LOD (>600mm), within ecological planting below the landscaping cover (minimum >300mm), and below the agricultural land cover (>1.2m). This is discussed further in Section 5.

4.3.1 Zone 2B Assessment

Given the presence of the RTD (a secondary aquifer unit) adjacent to the Site, the treated wastes have been assessed, conservatively, against the Zone 2B re-use criteria, on the basis of deeper (>4m bgl) groundwater being encountered within the RTD located adjacent to the Site.

The treated waste when screened, generally passes the re-use criteria for Zone 2B. Minor exceedances of naphthalene was noted in 3/25 samples but was not considered significant on the basis that;

- PAHs are considered to be hydrophobic, i.e. they do not readily dissolve in water but tend to sorb to organic matter in the soil. Their low mobility in groundwater, therefore, considerably reduces the risk to Controlled Water; and
- The proposed re-use of the materials will be within the landscape earthworks bund (placement within low-permeability OXC below a restoration layer).

Therefore, the wastes are considered suitable for re-use when screened against both Zone 2B and Zone 3 screening criteria.

5 Updated Conceptual Site Model

Based on the assessment of the Site setting, asset design, and chemical testing of the post-remediation treated waste, the potential risk to the identified receptors has been evaluated in accordance with the Land Contamination Risk Management (LCRM) Guidance [3] to identify the 'plausible contaminant linkages' (contaminant source-pathway relationships) that may be present at the Site.

The site-specific CSM assumes the use of the treated waste (placed as specified within the design of the landscape earthworks) and following the completion of the **construction of the landscape earthwork**.

5.1 CSM Risk Assessment

Risk assessment is the process of collating known information on a hazard or set of hazards (to determine the potential severity of any impact) along with details on the likelihood of impact on identified receptors. Risks are generally managed by isolating the sensitive receptor or by intercepting or interrupting the exposure pathway, thus no pollutant linkages are formed and there is no risk. The following risk assessment focuses on the potential contaminants identified on the Site and the proposed development.

CIRIA guidance (C552) [29] states that the designation of risk is based upon a consideration of both:

- The likelihood of an event (probability); (takes into account both the presence of the hazard and the receptor and the integrity of the pathway)
- The severity of the potential consequence (takes into account both the potential severity of the hazard and the sensitivity of the receptor).

Under such a classification system the following categorisation of risk has been developed and the terminology adopted as presented in Table 5-1 below.

Table 5-1 Summary of risk classification categories

Term	Description
Very High Risk	There is a high probability that significant harm could arise to a designated receptor from an identified hazard at the Site without appropriate remedial action.
High Risk	Significant harm is likely to arise to a designated receptor from an identified hazard at the Site without appropriate remedial action.
Moderate Risk	It is Possible that without appropriate remedial action, harm could arise to a designated receptor, but it is relatively unlikely that any such harm would be severe and if any harm were to occur, it is likely that such harm would be relatively mild.
Low Risk	It is Possible that significant harm could arise to a designated receptor from an identified hazard, but it is likely that at worst this harm if realised would normally be mild.
Very Low Risk	There is a low Possibility that harm could arise to a receptor. In the event of such harm being realised, it is not likely to be severe.

5.1.1 Sources

Based on the information presented in Section 4, for the purposes of this assessment the contaminative source is the remediated treated waste from LQ 14-02 is considered suitable for re use.

The screening of chemical testing results provided to date has indicated that the post-remediation treated waste (the source) is suitable for re-use as structural fill within the Site (re-use Zone 3) below the restoration layer given the lack of viable contaminant linkages present.

5.1.2 Pathways

Based on the information presented in Sections 1.5, 2.5, 3, and 4, viable pathways (contaminant linkages) to the receptors outlined below have not been identified.

5.1.3 Receptors

5.1.3.1 Human Health

Based on the design of TELE the potential future human health receptors for the Site are as follows:

- Farmers and uptake from crops, within land returned for agricultural use within the LLAU.
- Visitors (recreational users e.g. walkers), within agricultural land or planting areas.
- Employees/maintenance workers, within the LOD.

However, given the proposals to re-use the treated waste within the landscape bund and given the proposed engineering design (emplacement of the treated waste within low permeability OXC clay, below the proposed restoration layer) there is not considered to be a viable contaminant linkage to human health.

In the LOD the restoration layer will be of a minimum 600mm thickness, in landscaped areas of the LLAU, a minimum of 300mm, and in agricultural areas a minimum of 1200mm. In addition, a demarcation layer will be installed at the top of the treated material to indicate the presence of the waste in case of future excavation into the bund.

The placement of the deposited and treated waste will be recorded on an as built drawing for inclusion within the Health and Safety file for the landscape earthworks.

Risks to workers during the construction of the TELE are considered to be low if appropriate mitigation measures (such as the use of suitable PPE where necessary) are employed.

5.1.3.2 Controlled Waters

Groundwater

The groundwater table is at depth, at the top of the KLB aquifer which underlies the ALV and OXC (typically >4m thick).

Surface water

The nearest surface water receptors to the Site are the:

- Portway Stream, which, once diverted (lined and partially culverted), will be located approximately 200m away from the Site, on the opposing side of the West Street realignment.
- C2.L.69 Catchment (specifically the catchment pond), which will be lined, and located 120m northwest of the Site.

- C2.L.69 Floodplain Compensation Area, located approximately 95m north of the Site on the opposing side of the Twyford Embankment.
- A tributary of the Padbury Brook, which, once diverted (lined and partially culverted), will be located approximately 200m away from the Site.
- The C2.T.66.3 Track drainage catchment pond is situated 90m east of the proposed re-use site, however, it will be situated on the opposing side of the West Street Overbridge/realignment earthworks.

5.2 Tabulated CSM and Cross Section

A CSM table and cross-section are presented below; however, viable S-P-R contaminant linkages have **not** been identified.

Table 5-2 Conceptual Model Table

Contaminant Source	Sensitive Receptor	Pathway	Comments
S1 Treated Waste (DfR) Remediated Landfill Waste recovered from Finmere Railway Cutting Landfill (LQ 14-02)	R1 Human Health (future site users)	No linkage	There is no viable contamination linkage. The treated waste will be placed in compacted layers within low-permeability OXC clay below the “clean” restoration layer and will be subject to the proposed engineering design. Within the LOD, the restoration layer will be of a minimum 600mm thickness, in landscaped areas of the LLAU, a minimum of 300mm, and in agricultural areas a minimum of 1200mm. A demarcation layer will be placed between the treated waste and overlying soils, and the re-use location will be recorded on an as-built drawing in the asset Health and Safety file. Management and re-use of the treated waste and soils are to be undertaken in accordance with the measures and re-use criteria outlined within the relevant Remediation Outline Strategies (as agreed with the Environment Agency) [7] [10], and Earthworks Specification [15] including testing and appropriate placement of materials within the works.
	R2 Controlled Waters (underlying aquifers – KLB below OXC onsite & RTD offsite)	No linkage	There is no viable contamination linkage. The Site is identified as re-use Zone 3 [12], and the treated waste is suitable for re-use within this zoning (and within the more conservative Zone 2B rather than Zone 3). A review of the ground investigation information has confirmed that the Site is underlain by >4m of low permeability, cohesive soils (ALV + OXC) which overlie the shallowest aquifer within the KLB. The RTD identified is located off-site adjacent to the re-use area, however, as it is a water-bearing unit in the vicinity of the site, to add another degree of conservatism, the re-use area has been reduced to help mitigate against the groundwater that may be encountered within the unit. The design of the landscape earthworks, constructed from compacted low-permeability high-plasticity clays, will further mitigate the risk to the underlying KLB aquifer. Furthermore, the treated waste will be placed on compacted emplaced OXC and not on in-situ soils, further reducing potential infiltration.

Contaminant Source	Sensitive Receptor	Pathway	Comments
	R3 Controlled Waters (Portway Stream, Padbury Brook and tributaries, C2.L.69 Catchment)	No linkage	There is no viable contamination linkage. The CSM has demonstrated that there is no contaminant linkage between the treated waste and surface runoff into surface waters, due to the design of the landscape earthworks, constructed from compacted low-permeability high-plasticity clays, which will greatly reduce infiltration. Although there is limited leachate testing, the treated waste will be suitable for Zones 2b and 3. This is based on conservative Consim modelling [12], which models the leaching of a continuous source (treated waste) and migration to surface water receptors, which does not consider remediation and the absence of the linkage. The nearest surface water receptor to the Site is the Portway stream to the south and, a HS2 Catchment Pond (C2.T.66.3) located to the east. These assets will either be diverted and lined or given the topographical setting and their distance from the Site, no viable linkage is present.

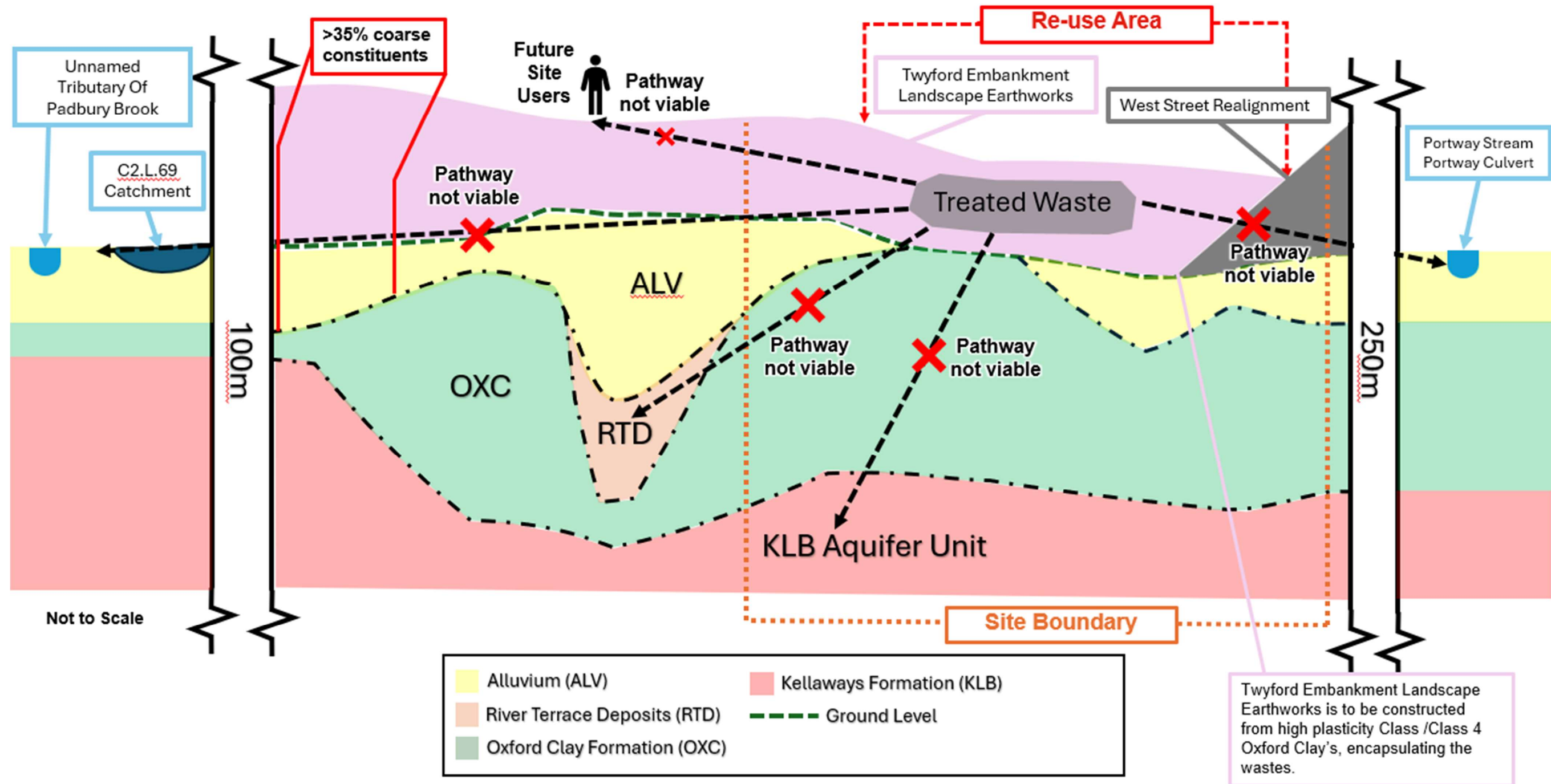


Figure 5-1 Conceptual Site Model Cross Section

5.3 Notes

The remediation of Finmere Railway Cutting Landfill (LQ 14-02) is ongoing, and additional sampling and testing will be required to be undertaken to satisfy the requirement for a testing frequency of 1 sample per 1,000m³ (a total of 40 samples will be required based on the proposed re-use of 40,000m³). Once the samples have been tested EKFB will screen the results against the re-use criteria in line with this report. If the screened results indicate significant variation to the 25 samples assessed in this report, then further assessment will be required. Where the results demonstrate similar properties to those described in this report, then further assessment will not be required.

During the construction of the Twyford Embankment Landscape Earthworks, should ground conditions vary from the geological model and assumptions within this report, further assessment (e.g. updated CSM) may be required.

6 References

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APPENDIX I

Drawings

Number of Pages: 1

APPENDIX II

II-1 Exploratory Hole Logs

II-2 ALV, RTD and OXC Physical Laboratory Testing Figures

II-3 Annotated Groundwater Elevation Graphs

Number of Pages: 45

Appendix II-1

Exploratory Hole Logs

37 pages

HS2 Trial Pit Log

FINAL-MON

ML081-TP416

Project
ASC C2 & C3 Controlled Data
Client
HS2

Project No.
C2-C3-CONT-ASC
Easting (OSGB)
467370.57

Ground Level (mAOD)
84.58
Northing (OSGB)
226339.71

GI Phase
ASC Scheme GI
Asset Group
Calvert Cutting Group

Chainage (SG Grid)
Start Date
17/04/2019
End Date
17/04/2019

Offset
-27

Scale
1:25
Sheet 1 of 1

SAMPLES		TESTS				Water Strikes	STRATA			Depth (Thickness)	Level	Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results	PI		Description	Legend	Geol Code1			
0.00 - 0.35	LB1						TOPSOIL: Dark brown slightly sandy slightly gravelly clay with occasional rootlets (<1mm x 30mm). Sand is fine to medium. Gravel is subrounded to rounded fine to medium of mudstone and limestone. Factual Geolcode [TOP] Factual Geolcode 2 [C] Geology Code 3 [TOP-C Z]			(0.35)		
0.20 - 0.30	D2						Firm greenish grey and orangish brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subrounded to rounded fine of mudstone and limestone. Factual Geolcode [TILMP] Factual Geolcode 2 [C] Geology Code 3 [ALV-C Z]			0.35	84.23	
0.50 - 0.60	D3	0.50	HV(1)	72(21)kPa	PL 20							
0.60 - 0.90	LB4	0.50	HV(2)	75(30)kPa	LL 53							
		0.50	HV(3)	87(27)kPa	PI 33							
					NMC 28							
0.90 - 1.00	D5						from 0.90m to 1.60m greenish grey mottled orangish brown			(1.25)		
		1.00	HV(1)	69(27)kPa								
		1.00	HV(2)	75(27)kPa								
		1.00	HV(3)	81(24)kPa								
1.40 - 1.50	D6											
		1.50	HV(1)	63(27)kPa	PL 26							
		1.50	HV(2)	69(24)kPa	LL 64							
1.60 - 1.90	LB7	1.50	HV(3)	72(21)kPa	PI 38							
					NMC 42							
1.90 - 2.00	D8						Soft greyish brown and brown mottled yellowish brown slightly sandy slightly gravelly CLAY with occasional partially decomposed rootlets (<1mm x 30mm) and rare lenses (<30mm x 30mm) of yellowish brown clayey fine to medium sand. Sand is fine to medium. Gravel is subangular to rounded fine of limestone and mudstone. Factual Geolcode [TILMP] Factual Geolcode 2 [C] Geology Code 3 [ALV-C Z]			1.60	82.98	
		2.00	HV(1)	63(18)kPa								
		2.00	HV(2)	72(21)kPa								
		2.00	HV(3)	75(21)kPa								
2.40 - 2.50	D9											
2.50 - 3.00	LB10	2.50	HV(1)	102(36)kPa			Firm to stiff bluish grey slightly sandy CLAY. Sand is fine. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			2.40	82.18	
		2.50	HV(2)	96(30)kPa			at 2.50m slightly gravelly					
		2.50	HV(3)	99(30)kPa						(0.80)		
3.10 - 3.20	D11						from 3.00m to 3.20m locally thinly laminated					
		3.00	HV(1)	111(42)kPa								
		3.00	HV(2)	117(39)kPa								
		3.00	HV(3)	135(45)kPa								
										3.20	81.38	

PLAN DETAILS						Remarks	
Long Axis Orientation: 340 Shoring / Support: None Stability: Faces A and B unstable Groundwater (description):						1. PAS 128 Type B survey conducted over position. 2. Water seepage observed at 1.30m. THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG. Termination Depth: 3.20m Excavation terminated due to side wall collapse.	



Unless otherwise stated:
Depth (m), Diameter (mm), Time (hhmm),
Thickness (m), Level (MOD).

Equipment Used
JCB Excavator

Contractor

Logged By
JP

Checked By

Scale
1:25

Sheet 1 of 1

Depth	Type No.	Depth	Type No.	Remarks	Water Strike	Excavation	Legend	Depth (Feet/meters)	Level	Initial/Block
PLAN DETAILS					Remarks					
 Long Axis Orientation: 340 Shoring / Support: None Stability: All faces stable Groundwater (description):					1. PAS 128 Type B survey conducted over position. 2. No groundwater encountered.					
					THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.				Termination Depth: 4.00m Achieved Scheduled Depth.	



Dynamic Sample Borehole Log

FINAL
ML081-WS004

Project ASC C2 & C3 Controlled Data Client HS2	Project No. C2-C3-CONT-ASC Easting (OSGB) 467132.26	Ground Level (mAOD) 85.58 Northing (SnakeGrid) 226491.78	GI Phase HS2 Main GI Asset Group Twyford Embankment Group	Chainage (Snake grid) Offset -55	Start Date 06/07/2017 End Date 07/07/2017	Scale 1:50 Sheet 1 of 1
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SAMPLES	TESTS			PROGRESS		STRATA				Depth (Thickness)	Level	Install/Backfill
	Type + Depth	Results	PI	Water Depth	Date & Time	Casing & Water Depth	Description	Legend	Geol Code1			
(D1) 0.10							TOPSOIL: Dark brown slightly sandy clay with some rootlets. Factual Geolcode [TOP] Factual Geolcode 2 [C] Geology Code 3 [TOP-C Z]			(0.40)		
(D2) 0.40 (LB3) 0.50-0.80							Firm orangish brown mottled grey slightly sandy gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of flint and limestone. Factual Geolcode [ALV] Factual Geolcode 2 [C] Geology Code 3 [ALV-C Z]			0.40	85.18	
(LB4) 0.80-1.20			PL 28 LL 65 PI 37 NMC 34									
(D5) 1.20-1.65 (D6) 1.25-2.30 (B7) 1.30-2.35	SPT(S) 1.20	N=10 (2,2,2,2,3,3)			06/07/2017 18:00 07/07/2017 07:30	0.00 Dry 0.00 Dry				(2.40)		
(D8) 2.20-2.65	SPT(S) 2.20	N=16 (2,3,3,4,4,5)										
(D9) 2.85-2.90 (B10) 2.90-2.95			PL 25 LL 58 PI 33 NMC 26				from 2.60m to 2.63m 1. No bed of black carbonaceous material Firm to stiff thinly laminated bluish grey slightly sandy CLAY. Sand is fine. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z] from 3.10m to 3.30m selenite (up to 10mm)			2.80	82.78	
(D11) 3.20-3.65	SPT(S) 3.20	N=15 (2,3,3,3,4,5)								(1.05)		
(D12) 3.90-3.95 (B13) 3.95-4.00							Medium dense grey clayey fine SAND with some shell fragments (up to 5mm). Factual Geolcode [KLB] Factual Geolcode 2 [S] Geology Code 3 [KLB-S V SV]			3.85	81.73	
(D14) 4.20-4.65	SPT(S) 4.20	N=16 (2,3,3,4,4,5)								(1.15)		
					07/07/2017 11:00	0.00 Dry				5.00	80.58	

Type		Type	Results			Water	Date Time	Casing Water	Description						Legend		Depth (Thickness)	Level	Install/Backfill
DRILLING TECHNIQUE				CHISELLING			WATER OBSERVATIONS						HOLE/CASING DIAMETER				WATER ADDED		
From	To	Type		Hard Strata From	To	Duration	Date/Time	Depth Strike	Duration (min)	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)
0.00	1.20	Inspection Pit											95	3.20					
1.20	5.00	Dynamic Sample											90	4.20					
													70	5.00					

Remarks
1. PAS 128 Type B survey conducted over position. 2. Where structure is not described, such features were not observed in the available samples. 3. No groundwater observed.

THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.

Termination Depth:	5.00m
Achieved Scheduled Depth	



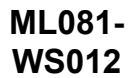
Unless otherwise stated:
Depth (m), Diameter (mm), Time (hhmm),
Thickness (m), Level (MOD).

Equipment Used
Insulated Hand Tools

Contractor

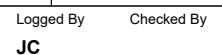
Logged By
JC

Checked By



Sheet 1 of 1

Achieved Scheduled Depth	
--------------------------	--





Dynamic Sample Borehole Log

FINAL**ML081-WS435****Project**

ASC C2 & C3 Controlled Data
Client
HS2

Project No.

C2-C3-CONT-ASC
Easting (OSGB)
467280.28

Ground Level (mAOD)

86.10
Northing (SnakeGrid)
226418.34

GI Phase

ASC Detailed GI
Asset Group
Calvert Cutting Group

Chainage (Snake grid)

Offset
-22

Start Date

04/08/2021
End Date
12/08/2021

Scale

1:50

Sheet 1 of 1

SAMPLES		TESTS			PROGRESS		STRATA				Depth (Thickness)	Level	Install/Backfill
Type + Depth	Type + Depth	Results	PI	Water Depth	Date & Time	Casing & Water Depth	Description	Legend	Geol Code1				
(D1) 0.00-0.10 (B2) 0.20-0.50	HP (1) 0.15 HV(1) 0.15	343kPa 80(20)kPa			04/08/2021 17:30 12/08/2021 07:30		TOPSOIL: Grass over brown slightly sandy slightly gravelly clay with frequent roots. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of flint and chert. Factual Geolcode [TOP] Factual Geolcode 2 [C] Geology Code 3 [TOP-C Z]			(0.20) 0.20	85.90		
(D3) 0.70 (B4) 0.80-1.20 (D5) 1.00				Firm brown and grey slightly sandy slightly gravelly CLAY with occasional rootlets. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of flint. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]					(0.60) 0.80 (0.40)	85.30			
(B12) 1.20-1.70 (D6) 1.20-1.65	SPT(S) 1.20	N=4 (1,1,1,1,1,1)		from 0.40m to 0.80m gravel content decreases from 0.50m to 0.80m no roots					1.20				84.90
(D13) 1.80-2.00				Firm mottled orangish brown and grey CLAY. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]					(1.70)				
(B14) 2.20-2.70 (D8) 2.20-2.65	SPT(S) 2.20	N=11 (1,2,2,2,3,4)			12/08/2021 17:30		from 1.00m to 1.20m stiff				83.20		
(D15) 2.90-3.10				Firm light brown mottled orange brown and yellowish brown slightly sandy CLAY with rare orange brown iron nodules (5mm x 5mm). Sand is fine. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]					2.90				
(B16) 3.20-3.70 (D10) 3.20-3.65	SPT(S) 3.20	N=11 (2,2,2,3,3,3)		from 1.70m to 2.90m no iron nodules. Rare orange brown fine to medium sand lenses (30-40mm)					(1.30)				
(D17) 3.80-4.00				from 2.20m to 2.90m orange brown mottled yellowish brown					4.20	81.90			

Remarks														
1. PAS 128 Type B survey conducted over position.														
THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.													Termination Depth:	4.20m
													Achieved Scheduled Depth	

Remarks

1. PAS 128 Type B survey conducted over position.

THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.

Termination Depth: 4.20m

Achieved Scheduled Depth



Unless otherwise stated:
Depth (m), Diameter (mm), Time (hhmm),
Thickness (m), Level (mOD).

Equipment Used
Dando Terrier

Contractor

Logged By

Checked By

SP



Dynamic Sample Borehole Log

FINAL

ML081-WS446

Project ASC C2 & C3 Controlled Data Client HS2	Project No. C2-C3-CONT-ASC Easting (OSGB) 467338.87	Ground Level (mAOD) 85.79 Northing (SnakeGrid) 226225.75	GI Phase ASC Detailed GI Asset Group Calvert Cutting Group	Chainage (Snake grid) Offset -135	Start Date 09/09/2021 End Date 09/09/2021	Scale 1:50 Sheet 1 of 1
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SAMPLES	TESTS				PROGRESS		STRATA			Depth (Thickness)	Level	Install/ Backfill
Type + Depth	Type + Depth	Results	PI	Water Depth	Date & Time	Casing & Water Depth	Description	Legend	Geol Code1			
(D1) 0.05 (ES2) 0.05 (B3) 0.10-0.40	PID (1) 0.05	<1ppm					MADE GROUND: Dark brown sandy subangular to subrounded fine to coarse gravel. Sand is fine to coarse. Factual Geolcode [MGR] Factual Geolcode 2 [V] Geology Code 3 [MGR-S V SV] from 0.20m to 0.45m gravel with high cobble content. Cobbles sized fragments are angular of concrete.			(0.45)		
(D4) 0.45 (B6) 0.50-1.00 (ES5) 0.50	PID (1) 0.50	<1ppm	PL 25 LL 64 PI 39 NMC 34				MADE GROUND: Yellowish brown slightly sandy slightly gravelly clay. Sand is fine to coarse. Gravel sized fragments are angular to subangular fine to coarse of brick. Factual Geolcode [MGR] Factual Geolcode 2 [C] Geology Code 3 [MGR-C Z] from 1.50m to 1.95m becoming gravelly with medium cobble content. Cobble sized fragments are angular of brick.			0.45	85.34	
(ES7) 1.00	PID (1) 1.00	<1ppm								(1.50)		
(B18) 1.20-1.95 (D8) 1.20	SPT(S) 1.20	N=16 (1,3,5,5,3,3)	NMC 40									
(D17) 1.95-2.00 (D10) 2.00-2.45 (ES14) 2.00 (D15) 2.30	SPT(S) 2.00 PID (1) 2.00	N=5 (1,1,1,1,1,2) <1ppm	PL 23 LL 48 PI 25 NMC 33 PL 22 LL 59 PI 37 NMC 32 NMC 14				Firm to stiff grey and yellowish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular fine to medium of mudstone. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z] from 1.95m to 2.00m frequent black specs and slight organic odour.			1.95	83.84	
(B16) 2.60-3.00												
(D12) 3.00-3.45 (ES19) 3.00 (D20) 3.30	SPT(S) 3.00 PID (1) 3.00	N=11 (1,2,2,3,3,3) <1ppm	PL 23 LL 56 PI 33 NMC 28							(2.05)		
(B21) 3.60-4.00												
					09/09/2021 18:00		from 3.85m to 4.00m becoming stiff.			4.00	81.79	
									</			

Type	Type	Results	Water		Date Time	Casing Water	Description						Legend	Depth (Thickness)	Level	Install/Backfill		
DRILLING TECHNIQUE			CHISELLING			WATER OBSERVATIONS						HOLE/CASING DIAMETER				WATER ADDED		
From	To	Type	Hand Strata		Duration	Date/Time	Depth Strike	Duration (min)	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)
0.00	1.20	Inspection Pit Dynamic Sample										100	3.00	100	3.00			
1.20	4.00											87	4.00					

Remarks
1. PAS 128 Type B survey conducted over position.

THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.

Termination Depth:	4.00m
Achieved Scheduled Depth	



Unless otherwise stated:
Depth (m), Diameter (mm), Time (hhmm),
Thickness (m), Level (mOD).

Equipment Used
Insulated Hand Tools

Contractor

Logged By
SP

Checked By



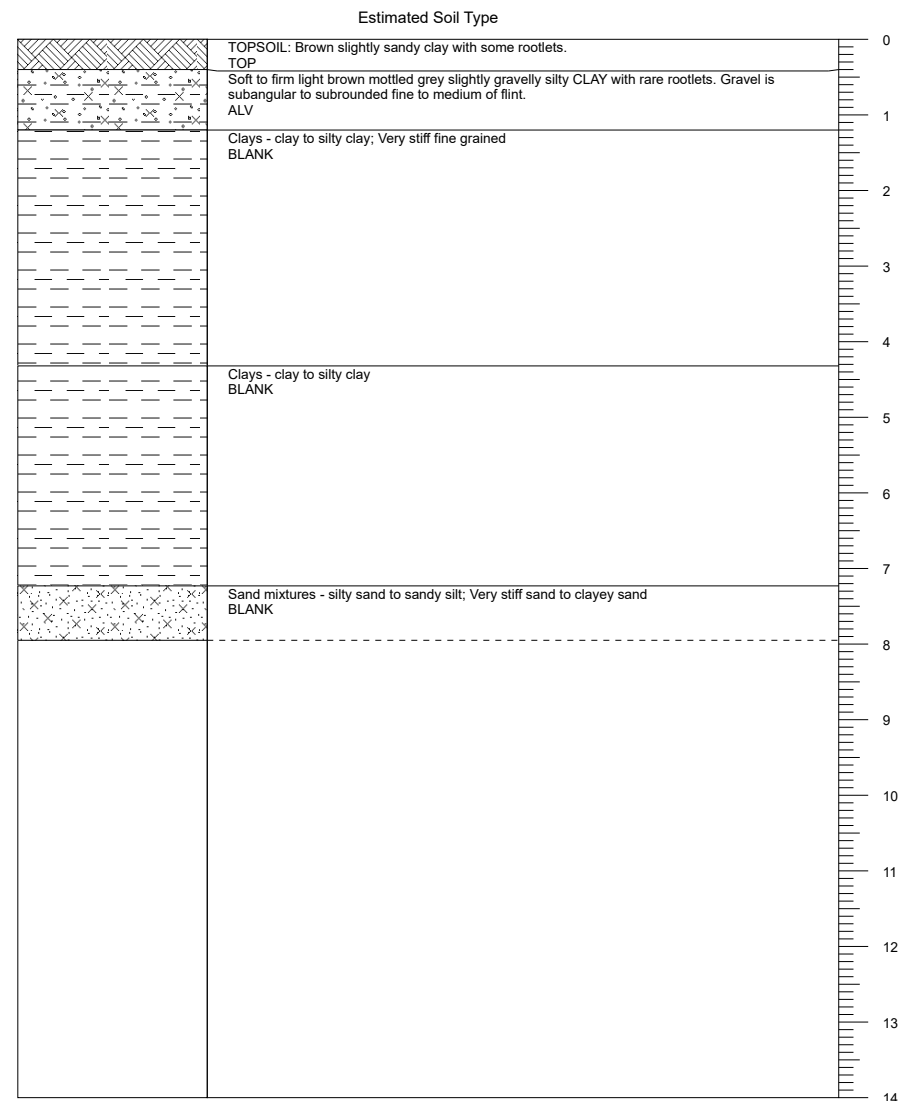
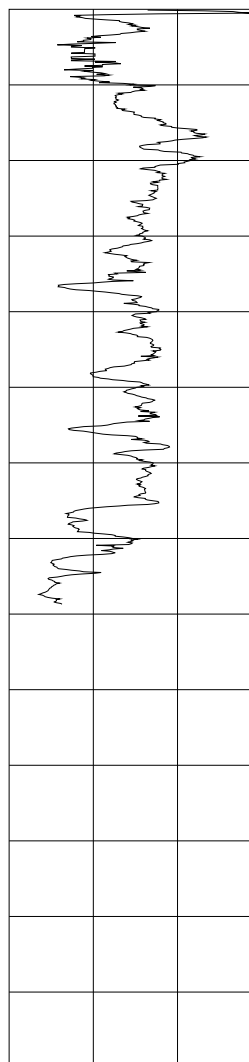
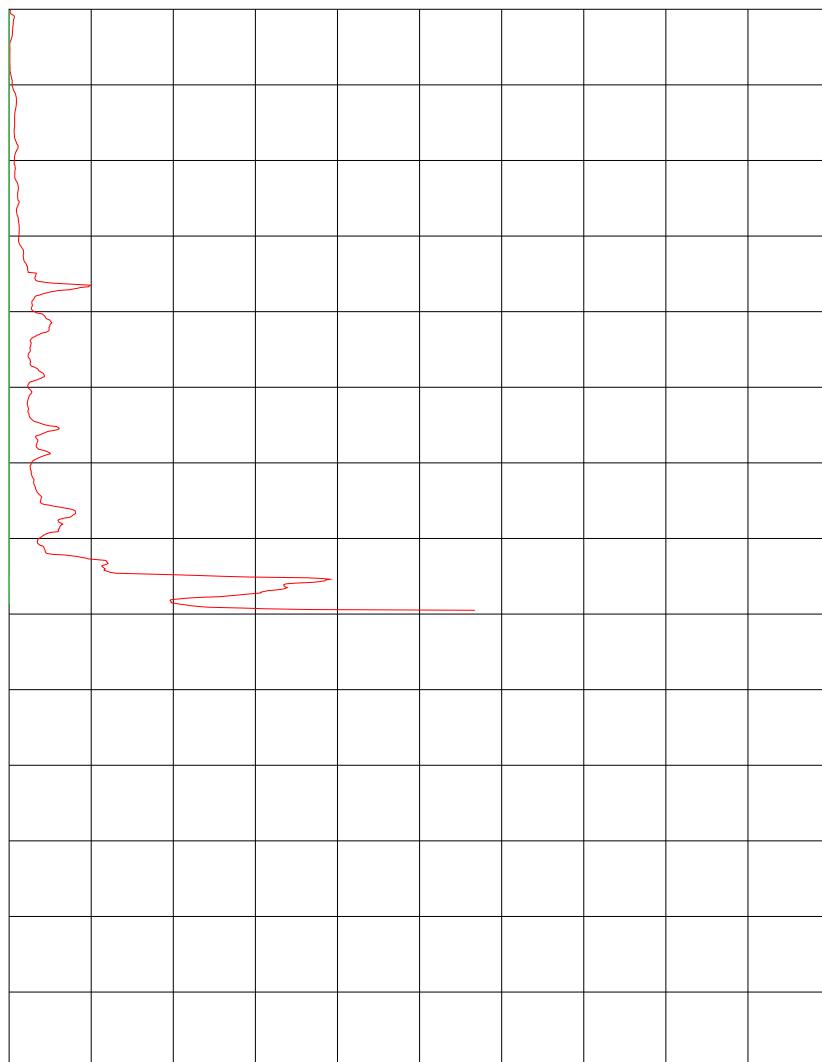
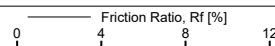
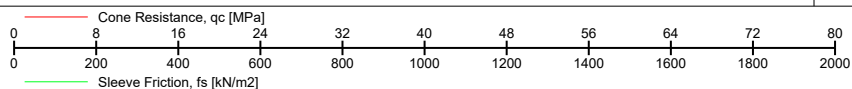
Twyford Embankment Landscape Earthworks Conceptual Site Model
1MC06-CEK-EV-NOT-CS06_CL10-000005
Rev.C01

CPT Geology Log

Borehole No
ML081-CT002

Sheet 1 of 1

Project Name ASC C2 & C3 Controlled Data	Project No C2-C3-CONT-ASC	Co-ords: 467396.94 - 226330.99	Cone Used: S15-CFIP.0915	Hole Type IP+CPT
Location: 1MC06 North Portal of Chiltern Tunnels to Brackley & 1MC07 Brackley to Long Itchington Wood Green Tunnel South Portal	Level: 84.77 m AOD	CPT Rig: Insulated Hand Tools+20.5 Tonne Track-Truck Mounted CPT Unit	Scale 1:100	Logged By DF
Client: HS2	Dates: 14/06/2017 - 22/06/2017	Operator: Danny Cundill+UK15		





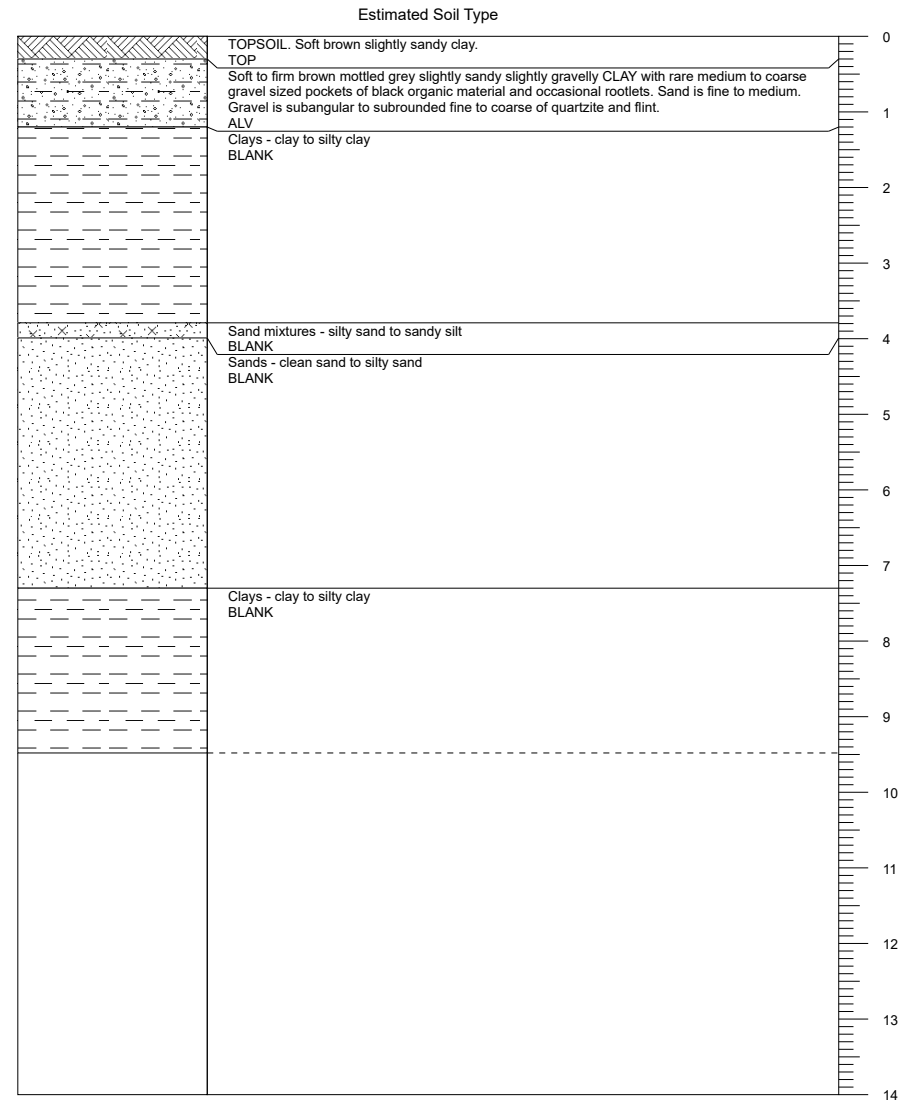
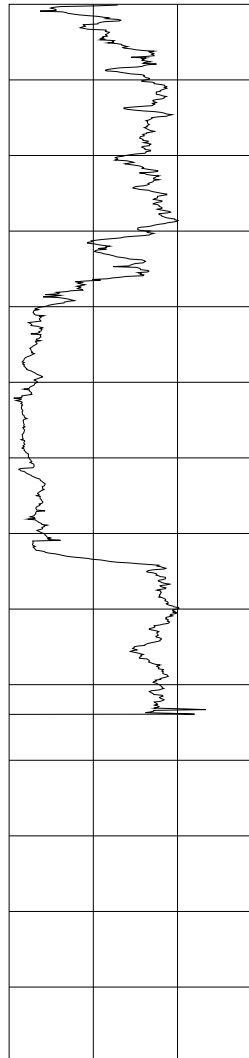
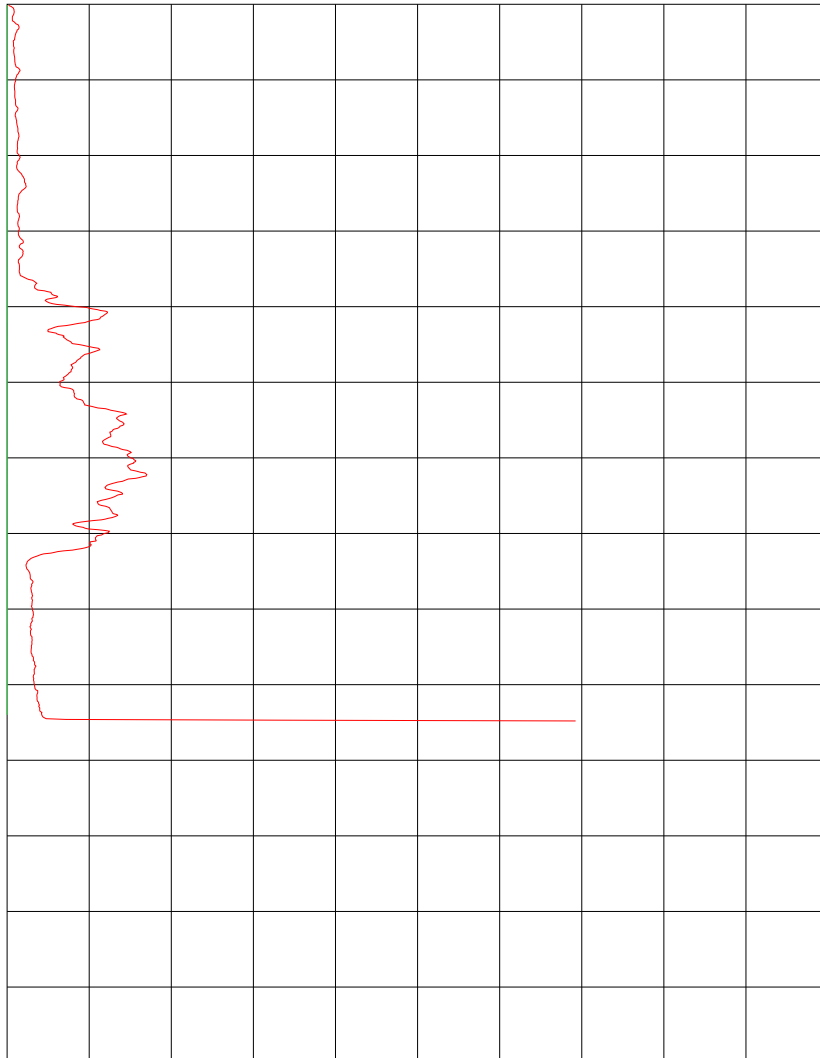
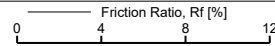
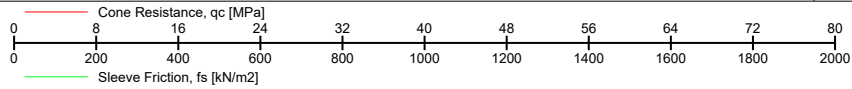
Twyford Embankment Landscape Earthworks Conceptual Site Model
1MC06-CEK-EV-NOT-CS06_CL10-000005
Rev.C01

CPT Geology Log

Borehole No
ML081-CT003

Sheet 1 of 1

Project Name ASC C2 & C3 Controlled Data	Project No C2-C3-CONT-ASC	Co-ords: 467203.08 - 226494.04	Cone Used: S15-CFIP.0915	Hole Type IP+CPT
Location: 1MC06 North Portal of Chiltern Tunnels to Brackley & 1MC07 Brackley to Long Itchington Wood Green Tunnel South Portal		Level: 85.94 m AOD	CPT Rig: Insulated Hand Tools+20.5 Tonne Track-Truck Mounted CPT Unit	Scale 1:100
Client: HS2		Dates: 15/06/2017 - 22/06/2017	Operator: Danny Cundill+UK15	Logged By PS





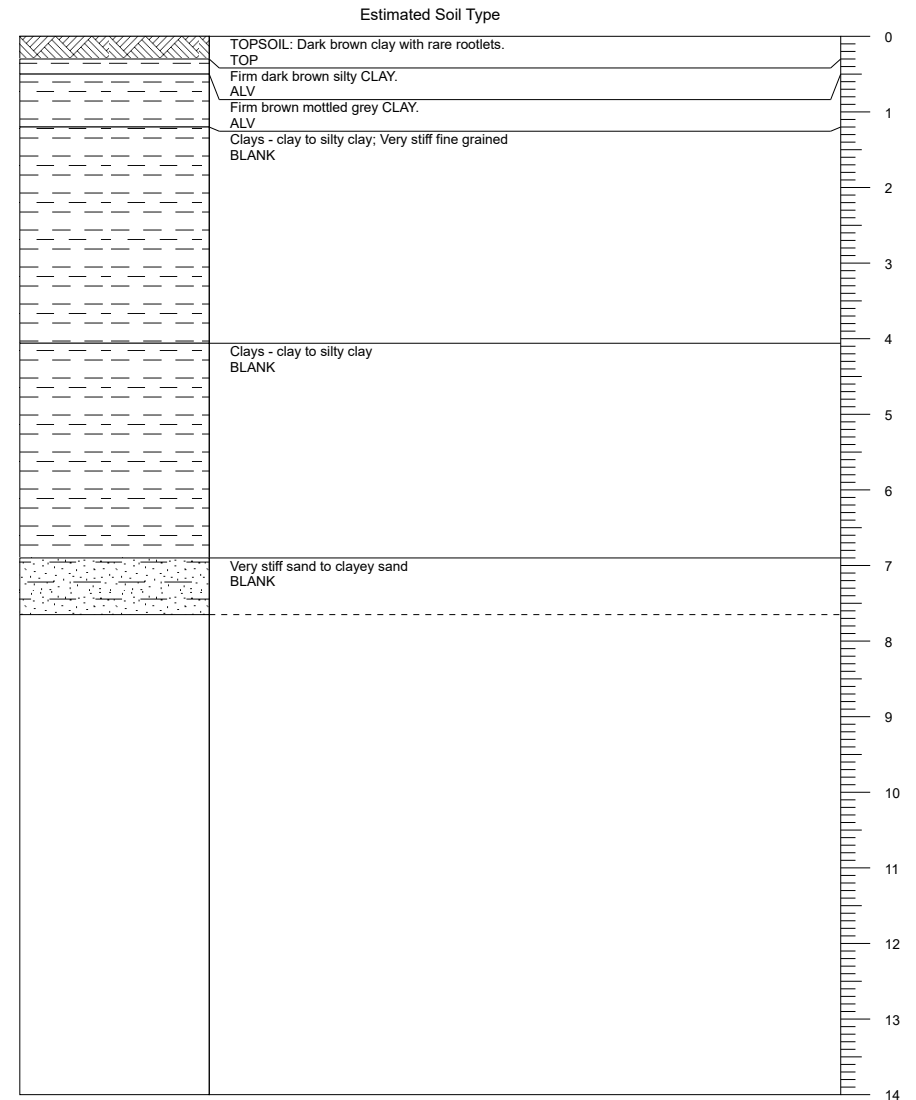
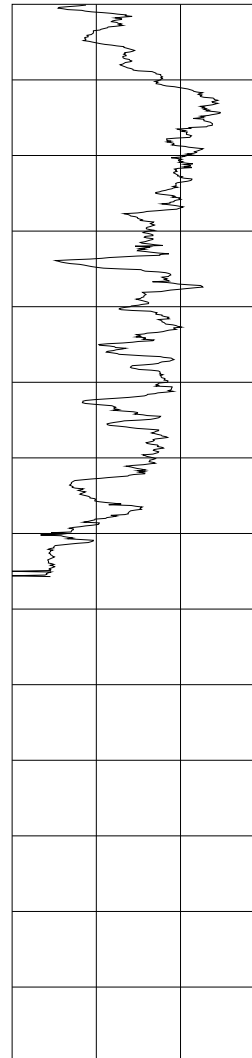
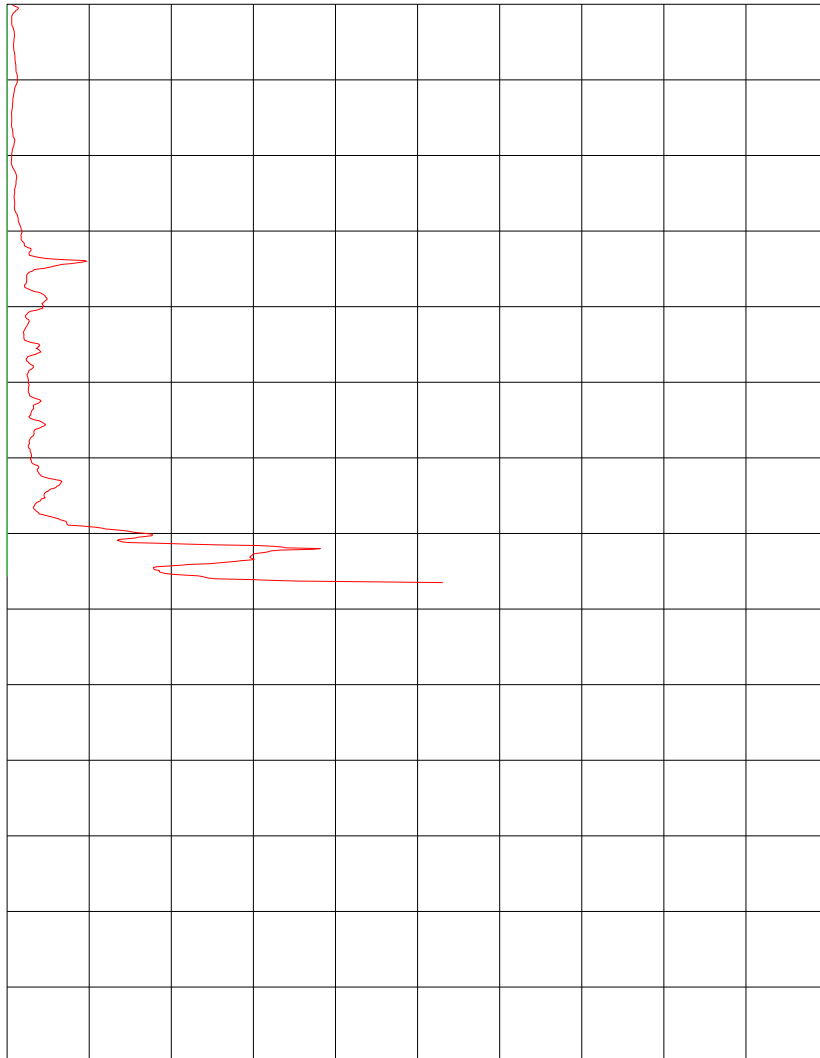
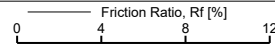
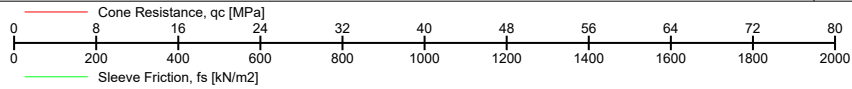
Twyford Embankment Landscape Earthworks Conceptual Site Model
1MC06-CEK-EV-NOT-CS06_CL10-000005
Rev.C01

CPT Geology Log

Borehole No
ML081-CT009

Sheet 1 of 1

Project Name ASC C2 & C3 Controlled Data	Project No C2-C3-CONT-ASC	Co-ords: 467352.85 - 226267.01	Cone Used: S15-CFIP.0915	Hole Type IP+CPT
Location: 1MC06 North Portal of Chiltern Tunnels to Brackley & 1MC07 Brackley to Long Itchington Wood Green Tunnel South Portal	Level: 84.48 m AOD	CPT Rig: 20.5 Tonne Track-Truck Mounted CPT Unit +Insulated Hand Tools	Scale 1:100	Logged By JC
Client: HS2	Dates: 16/06/2017 - 22/06/2017	Operator: UK15+Craig Blackett		





Cable Percussive Borehole Log

Final data

ML081-CP009

Project
ASC C2 & C3 Controlled Data
HS2

Project No.
C2-C3-CONT-ASC
Easting (OSGB)
467308.61

Ground Level (mAOD)
86.50
Northing (SnakeGrid)
226437.76

GI Phase
HS2 Main GI
Asset Group
Calvert Cutting Group

Chainage (SG Grid)
11 m

Start Date
30/05/2017
End Date
31/05/2017

Scale
1:50
Sheet 1 of 1

SAMPLES		TESTS			PROGRESS		STRATA				Depth (Thickness)	Level	Install/ Backfill					
Type + Depth	Type + Depth	Results	PI	Water Depth	Date & Time	Casing & Water Depth	Description	Legend	Geol Code1									
(D1) 0.10							TOPSOIL: Brown slightly sandy clay with rootlets. Factual Geolcode [TOP] Factual Geolcode 2 [C] Geology Code 3 [TOP-C Z]			0.10	86.40							
(D2) 0.40 (LB3) 0.50-0.80							Firm brown mottled orange slightly sandy slightly gravelly CLAY with rare rootlets. Sand is fine to medium. Gravel is subangular fine to coarse of carbonaceous material and flint. Factual Geolcode [ALV] Factual Geolcode 2 [C] Geology Code 3 [ALV-C Z]			(0.30) 0.40	86.10							
(D4) 0.80 (LB5) 0.80-1.20			PL 21 LL 63 PI 42 NMC 22				Firm to stiff orangish brown slightly sandy slightly gravelly CLAY with rare rootlets. Sand is fine to medium. Gravel is angular to subrounded fine to coarse of flint. Factual Geolcode [ALV] Factual Geolcode 2 [C] Geology Code 3 [ALV-C Z]			(0.80)								
(U6) 1.20-1.65		U6 20 blows 100%rec.			30/05/2017 17:30 31/05/2017 07:30	0.00 Dry 0.00 Dry	Firm thinlaminated light brown mottled orange CLAY. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z] at 1.70m occasional pockets (up to 30mm) with abundant orange staining			1.20	85.30							
(D7) 1.70 (D8) 1.70-2.15	SPT(S) 1.70	N=10 (1,2,2,2,3,3)								(1.00)								
(D9) 2.20 (U10) 2.40-2.85		U10 15 blows 100% rec.					Firm brown mottled grey and orange CLAY with rare locally some shell fragments (up to 5mm) and rare partings of light brown silt. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			2.20 (0.70)	84.30							
(D11) 2.90 (D12) 2.90-3.35	SPT(S) 2.90	N=12 (1,1,3,3,3,3)	NMC 25				Firm to stiff thinlaminated dark grey slightly sandy CLAY with occasional shell fragments (up to 5mm). Sand is fine. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z] from 2.90m to 3.35m with rare reddish brown staining along laminations			2.90	83.60							
(B13) 3.50-4.00 (UT-NR) 3.50-3.95		UT-NR 25 blows 0% rec.					from 3.05m to 3.45m 2 No subangular medium gravel sized crystals of selenite											
(D14) 4.00-4.45 (UT15) 4.50-4.95	SPT(S) 4.00	N=19 (2,2,4,4,5,6)	PL 25 LL 58 PI 33 NMC 22															
(D16) 5.00 (D17) 5.00-5.45	SPT(S) 5.00	N=26 (4,5,6,6,7,7)	NMC 19															
(D18) 5.75 (UT19) 6.00-6.45		UT19 50 blows 100% rec.					at 5.75m fissured. Fissures are randomly orientated extremely closely spaced planar smooth.			(5.60)								
(D20) 6.50 (D21) 6.50-6.95	SPT(S) 6.50	N=24 (4,5,5,6,6,7)					at 6.50m 2 No subangular to subrounded medium to coarse gravel sized fragments of pyritised shell and 1 No belemnite (12mm diameter by 30mm)											
(D22) 7.25 (UT23) 7.50-7.95		UT23 65 blows 78% rec.	PL 26 LL 62 PI 36 NMC 21															
(D24) 8.00 (D25) 8.00-8.39	SPT(S) 8.00	50/240mm (5,8,12,17,17,4/15)					from 8.00m slightly sandy and indistinctly laminated											
(D26) 8.50 (B27) 9.00-9.50 (UT-NR) 9.00-9.25		UT-NR 65 blows 0% rec.					Very stiff dark grey sandy CLAY with occasional shell fragments (up to 4mm). Sand is fine. Factual Geolcode [KLB] Factual Geolcode 2 [C] Geology Code 3 [KLB-C Z]			8.50 (1.33)	78.00							
(D28) 9.50-9.83	SPT(S) 9.50	50/175mm (8,15,20,20,10/25)	LL 26 NMC 10		31/05/2017 17:30	2.00 Dry	from 9.70m to 9.83m some gravel sized fragments of shell			9.83	76.67							
Type	Type	Results		Water	Date Time	Casing Water	Description	Legend		Depth (Thickness)	Level	Install/Backfill						
DRILLING TECHNIQUE			CHISELLING			WATER OBSERVATIONS				HOLE/CASING DIAMETER				WATER ADDED				
From	To	Type	From	To	Duration	Date/Time	Strike At	Time Elapsed (mins)	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)
0.00	1.20	Inspection Pit Cable Percussion										200	9.83	200	2.00			
Remarks 1. PAS 128 Type B survey conducted over position. 2. Where structure is not described, such features were not observed in the available samples. 3. No groundwater observed.											SPT Hammer:		58					
											Energy Ratio (%):		61					
											Termination Depth:		9.83m					
											SPT Refusal							
THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.																		



Unless otherwise stated:
Depth (m), Diameter (mm), Time (hhmm),
Thickness (m), Level (mOD).

Equipment Used
Insulated Hand Tools

Contractor

Logged By
JC
Checked By



Cable Percussive Borehole

Log

Final data

ML081-CP024

Project
ASC C2 & C3 Controlled
Data
HS2

Project No.
C2-C3-CONT-ASC
Easting (OSGB)
467101.62

Ground Level (mAOD)
84.56
Northing (SnakeGrid)
226512.79

GI Phase
HS2 Main GI
Asset Group
Twyford Embankment Group

Chainage (SG Grid)
-56 m

Start Date
15/06/2017
End Date
16/06/2017

Scale
1:50

Sheet 1 of 1

SAMPLES		TESTS			PROGRESS		STRATA				Depth (Thickness)	Level	Install/ Backfill
Type + Depth	Type + Depth	Results	PI	Water Depth	Date & Time	Casing & Water Depth	Description	Legend	Geol Code1				
(ES1) 0.05 (D2) 0.20 (ES3) 0.20 (LB4) 0.50-0.80	PID (1) 0.05 PID (1) 0.20	<1ppm <1ppm					TOPSOIL: Brown slightly sandy gravelly clay. Factual Geolcode [TOP] Factual Geolcode 2 [C] Geology Code 3 [TOP-C Z] Soft brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of flint and quartzite. Factual Geolcode [ALV] Factual Geolcode 2 [C] Geology Code 3 [ALV-C Z]			(0.20) 0.20	84.36		
(D5) 0.80 (ES6) 0.80 (LB7) 1.00-1.20 (UT8) 1.20-1.65	PID (1) 0.80	<1ppm UT8 15 blows 100% rec.	PL 19 LL 55 PI 36 NMC 24				Soft to firm thinly laminated brown mottled grey slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of flint. Factual Geolcode [ALV] Factual Geolcode 2 [C] Geology Code 3 [ALV-C Z]			0.80	83.76		
(B11) 1.70-2.20 (D10) 1.70-2.15 (D9) 1.70 (D12) 2.20 (UT13) 2.20-2.65	SPT(S) 1.70	N=8 (1,2,2,2,2,2) UT13 19 blows 100% rec.	PL 17 LL 51 PI 34 NMC 21							(1.90)			
(B16) 2.70-3.20 (D14) 2.70 (D15) 2.70-3.15	SPT(S) 2.70	N=8 (1,0,1,2,2,3)					Soft to firm light brown sandy CLAY. Sand is fine to medium. Factual Geolcode [KLB] Factual Geolcode 2 [C] Geology Code 3 [ALV-C Z]			2.70	81.86		
(B19) 3.20-3.70 (D17) 3.20 (D18) 3.20-3.65 (D20) 3.80 (UT21) 4.20-4.65	SPT(S) 3.20	N=13 (2,2,3,3,4,3) UT21 19 blows 100% rec.	PL 17 LL 27 PI 10 NMC 23				Medium dense grey clayey fine to coarse SAND. Factual Geolcode [KLB] Factual Geolcode 2 [S] Geology Code 3 [RTD-S V SV]			(1.10)			
(B24) 4.70-5.20 (D22) 4.70 (D23) 4.70-5.15 (W25) 5.10 (D26) 5.20 (UT27) 5.20-5.65	SPT(S) 4.70	N=18 (4,4,3,4,5,6) UT27 23 blows 100% rec.	PL 21 LL 63 PI 42 NMC 26				Soft to firm very thinly bedded slightly sandy CLAY. Sand is fine. Factual Geolcode [KLB] Factual Geolcode 2 [C] Geology Code 3 [RTD-C Z]			3.80	80.76		
(B30) 5.70-6.20 (D28) 5.70 (D29) 5.70-6.15	SPT(S) 5.70	N=19 (2,2,3,4,5,7)								(1.40)			
(D31) 6.70 (UT32) 6.70-7.10 (D33) 7.20	SPT(S) 7.30	UT32 70 blows 100% rec. 50/30mm (25/20,50/30 mm)					Medium strong light grey LIMESTONE. Factual Geolcode [CB] Factual Geolcode 2 [LMST] Geology Code 3 [OXC-LMST]			5.20	79.36		
										(2.00)			
										7.20 (9.15) 7.35	77.36 77.21		



Unless otherwise stated:
Depth (m), Diameter (mm), Time (hhmm),
Thickness (m), Level (mOD).

Equipment Used
Insulated Hand Tools

Contractor

Logged By
JC

Checked By



Cable Percussive Borehole Log

Final, Monitoring in Progress

ML081-CP400

Project
ASC C2 & C3 Controlled Data
HS2

Project No.
C2-C3-CONT-ASC
Easting (OSGB)
467251.86

Ground Level (mAOD)
86.67
Northing (SnakeGrid)
226480.44

GI Phase
ASC Scheme GI
Asset Group
Calvert Cutting Group

Chainage (SG Grid)
9 m
Offset

Start Date
06/06/2019
End Date
10/06/2019

Scale
1:50
Sheet 1 of 2

SAMPLES			TESTS			PROGRESS		STRATA							Depth (Thickness)	Level	Install/ Backfill	
Type + Depth	Type + Depth	Results	PI	Water Depth	Date & Time	Casing & Water Depth	Description	Legend	Geol Code1									
(B1) 0.00-0.40 (D2) 0.10-0.20 (ES3) 0.10-0.20 (B4) 0.40-0.90 (D5) 0.40-0.50 (ES6) 0.50-0.60							TOPSOIL: Crop over dark brown locally reddish brown slightly sandy slightly gravelly clay with frequent rootlets (<1mm x 30mm). Sand is fine to medium. Gravel is subangular to rounded fine to medium of mudstone and limestone. Factual Geolcode [TOP] Factual Geolcode 2 [C] Geology Code 3 [TOP-C Z] Soft to firm greyish brown and orangish brown slightly sandy slightly gravelly locally gravelly CLAY. Sand is fine. Gravel is subangular to rounded fine to medium of mudstone and limestone. Factual Geolcode [ALV] Factual Geolcode 2 [C] Geology Code 3 [ALV-C Z] Firm grey and brownish grey locally mottled orangish brown slightly sandy CLAY. Sand is fine. Factual Geolcode [ALV] Factual Geolcode 2 [C] Geology Code 3 [ALV-C Z]			(0.40)								
(B7) 0.90-1.20 (D8) 0.90-1.00			PL 24 LL 60 PI 36 NMC 25							0.40	86.27							
(UT9) 1.70-2.15		UT9 13 blows 78% rec.								(0.50)								
(D10) 2.15-2.20 (B12) 2.20-2.70 (D11) 2.20-2.65	SPT(S) 2.20	N=7 (1,1,1,2,2,2)					Firm dark grey mottled orangish brown slightly sandy CLAY with rare shell fragments (<2mm x 2mm). Sand is fine to medium. Factual Geolcode [ALV] Factual Geolcode 2 [C] Geology Code 3 [ALV-C Z] from 2.20m to 4.40m locally thinly laminated with yellowish brown and greyish brown fine to medium sand			0.90	85.77							
(UT13) 2.70-3.15		UT13 25 blows 100% rec.								(1.25)								
(D18) 3.15-3.20																		
(D14) 3.40-3.50			PL 25 LL 63 PI 38 NMC 25				from 3.15m to 4.70m greenish grey with occasional shell fragments (<4mm x 5mm)											
(B16) 3.70-4.20 (D15) 3.70-4.15	SPT(S) 3.70	N=14 (1,2,2,3,4,5)								(4.05)								
(D17) 4.40-4.50																		
(UT19) 4.70-5.15		UT19 29 blows 100% rec.					from 4.40m to 4.70m with rare to occasional lenses (<20mm x 30mm) of grey fine to medium sand from 4.70m to 6.20m stiff and thinly laminated											
(D20) 5.15-5.20																		
(D21) 5.60-5.70																		
(B23) 6.20-6.70 (D22) 6.20-6.65	SPT(S) 6.20	N=36 (3,4,5,7,9,15)					Dense to very dense greenish grey and dark grey slightly clayey fine to medium SAND. Factual Geolcode [RTD1] Factual Geolcode 2 [S] Geology Code 3 [RTD1-S V SV]			6.20	80.47							
(D24) 6.90-7.00																		
(B26) 7.20-7.70 (D25) 7.20-7.65	SPT(S) 7.20	N=57 (6,8,10,13,16 ,18)	LL 25 NMC 22	6.50			from 7.20m to 9.20m very dense grey and light grey slightly clayey fine to medium sand											
(D27) 7.90-8.00										(3.45)								
(B29) 8.20-8.70 (D28) 8.20-8.65	SPT(S) 8.20	N=61 (7,9,11,13,16 ,21)		7.60			from 8.20m to 9.20m with rare fossilised shell fragments (<2mm x 2mm)											
(D30) 8.90-9.00																		
(B32) 9.20-9.70 (D31) 9.20-9.65	SPT(S) 9.20	N=38 (6,7,8,9,10,1 1)		8.80			from 9.20m to 9.65m grey and greenish grey and locally clayey											
(UT33) 9.70-10.15		UT33 39 blows 100% rec.					Stiff to very stiff thinly laminated grey and greenish grey slightly sandy CLAY. Sand is fine. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			9.65	77.02							
Type	Type	Results		Water	Date Time	Casing Water	Description	Legend		Depth (Thickness)	Level	Install/Backfill						
DRILLING TECHNIQUE			CHISELLING			WATER OBSERVATIONS				HOLE/CASING DIAMETER				WATER ADDED				
From	To	Type	From	To	Duration	Date/Time	Strike At	Time Elapsed (mins)	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)
0.00	1.20	Inspection Pit Cable Percussion	10.80	10.90	01:00	06/06/2019 12:40:00	6.20	20	5.80	2.70	9.70	150	11.20	150	10.20			
								15	5.90									
								10	6.00									
Remarks										SPT Hammer: 69								
1. PAS 128 Type B survey conducted over position.										Energy Ratio (%): 73								
THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.										Termination Depth: 11.20m								
										Encountered Bedrock.								



Unless otherwise stated:
Depth (m), Diameter (mm), Time (hhmm),
Thickness (m), Level (mOD).

Equipment Used
Dando 3000

Contractor

Logged By
JP
Checked By



Cable Percussive Borehole Log

Final, Monitoring in Progress

ML081-CP400

Project
ASC C2 & C3 Controlled Data
HS2

Project No.
C2-C3-CONT-ASC
Easting (OSGB)
467251.86

Ground Level (mAOD)
86.67
Northing (SnakeGrid)
226480.44

GI Phase
ASC Scheme GI
Asset Group
Calvert Cutting Group

Chainage (SG Grid)
9 m
Offset

Start Date
06/06/2019
End Date
10/06/2019

Scale
1:50

Sheet 2 of 2

SAMPLES		TESTS			PROGRESS		STRATA				Depth (Thickness)	Level	Install/ Backfill					
Type + Depth	Type + Depth	Results	PI	Water Depth	Date & Time	Casing & Water Depth	Description	Legend	Geol Code1									
(D34) 10.15-10.20 (B36) 10.20-10.70 (D35) 10.20-10.65	SPT(S) 10.20	N=31 (3,5,6,7,9,9)	PL 23 LL 61 PI 38 NMC 23		06/06/2019 17:30 10/06/2019 08:00	9.70 Dry 9.70 Dry	Stiff to very stiff thinly laminated grey and greenish grey slightly sandy CLAY. Sand is fine. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z] from 10.20m to 10.70m very stiff grey locally dark bluish grey sandy clay			(1.15)								
	SPT(C) 10.90 SPT(C) 11.05	100/85mm (25/60,70,30/10) 100/95mm (25/50,65,35/20)			10/06/2019 17:30	10.20 Dry	Grey LIMESTONE. (Driller's description) Factual Geolcode [OXC] Factual Geolcode 2 [LMST] Geology Code 3 [OXC-LMST]			10.80 (0.40) 11.20	75.87 75.47							
Type	Type	Results		Water	Date Time	Casing Water	Description	Legend		Depth (Thickness)	Level	Install/Backfill						
DRILLING TECHNIQUE		CHISELLING			WATER OBSERVATIONS				HOLE/CASING DIAMETER			WATER ADDED						
From	To	Type	From	To	Duration	Date/Time	Strike At	Time Elapsed (mins)	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)
0.00	1.20	11.20	Inspection Pit			06/06/2019	6.20	20	5.80	2.70	9.70	150	11.20	150	10.20			
			Cable Percussion	10.80	10.90	01:00	12:40:00	15	5.90									
								10	6.00									
Remarks														SPT Hammer: 69				
1. PAS 128 Type B survey conducted over position.														Energy Ratio (%): 73				
THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.														Termination Depth: 11.20m				
														Encountered Bedrock.				



Unless otherwise stated:
Depth (m), Diameter (mm), Time (hhmm),
Thickness (m), Level (mOD).

Equipment Used
Dando 3000

Contractor

Logged By

Checked By

JP



Cable Percussive Borehole

Log

Final data

ML081-CP436

Project
ASC C2 & C3 Controlled
Data
HS2

Project No.
C2-C3-CONT-ASC
Easting (OSGB)
467127.48

Ground Level (mAOD)
87.41
Northing (SnakeGrid)
226425.59

GI Phase
ASC Detailed GI
Asset Group
Calvert Cutting Group

Chainage (SG Grid)
Offset
-110 m

Start Date
24/09/2020
End Date
25/09/2020

Scale
1:50
Sheet 1 of 2

SAMPLES		TESTS		PROGRESS		STRATA		Legend	Geol Code1	Depth (Thickness)	Level	Install/ Backfill
Type + Depth	Type + Depth	Results	PI	Water Depth	Date & Time	Casing & Water Depth	Description					
(B3) 0.10-0.50 (D1) 0.10 (ES2) 0.20-0.25	PID (1) 0.20	<1ppm	NMC 14				TOPSOIL: Grass over dark brown slightly gravelly sandy clay with occasional rootlets. Sand is fine to medium. Gravel is subangular to rounded fine of limestone and mudstone. Factual Geolcode [TOP] Factual Geolcode 2 [C] Geology Code 3 [TOP-C Z]			(0.50)		
(D4) 0.60 (ES5) 0.70-0.75 (B6) 0.80-1.20	HV(1) 0.60 HV(2) 0.60 HV(3) 0.60 PID (1) 0.70	65(18)kPa 68(18)kPa 71(25)kPa <1ppm	NMC 8 PL 18 LL 48 PI 30 NMC 18				Firm orange brown and bluish grey slightly gravelly sandy locally sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of limestone, sandstone and mudstone. Factual Geolcode [RTD] Factual Geolcode 2 [C] Geology Code 3 [RTD-C Z]			0.50	86.91	
(D7) 1.20							from 1.20m to 1.70m orange brown and brown clay.					
(UT8) 1.70-2.15		UT8 21 blows 100% rec.					from 1.70m to 3.00m greyish brown mottled orange brown and yellowish brown clay.			(2.50)		
(D9) 2.15-2.20 (B11) 2.20-2.70 (D10) 2.20-2.65	SPT(S) 2.20	N=10 (1,2,1,2,3,4)					from 2.15m to 3.00m rare partially decomposed rootlets (<1mm). from 2.20m to 3.00m locally thinly laminated.					
(D12) 3.00 (UT13) 3.20-3.65		UT13 30 blows 89% rec.			24/09/2020 17:30 25/09/2020 07:30	1.50 Dry 1.50 Dry	Firm to stiff dark grey slightly gravelly sandy CLAY with rare to occasional fossilized shell fragments (2x2mm). Sand is fine. Gravel is subangular to subrounded fine to medium of mudstone. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			3.00	84.41	
(D14) 3.65-3.70 (D15) 4.00			PL 27 LL 67 PI 40 NMC 25									
(B17) 4.20-4.70 (D16) 4.20-4.65	SPT(S) 4.20	N=13 (2,1,2,3,4,4)										
(D18) 5.00 (UT19) 5.20-5.65		UT19 44 blows 100% rec.										
(D20) 5.65-5.70												
(EWMW1 (P1)) 6.00 (EWMW1 (P2)) 6.00 (D21) 6.20			PL 34 LL 67 PI 33 NMC 32									
(B23) 6.70-7.20 (D22) 6.70-7.15	SPT(S) 6.70	N=46 (3,7,11,12,11,12)										
(D24) 7.50 (B26) 7.70-8.20 (D25) 7.70-8.15	SPT(S) 7.70	N=62 (6,8,9,12,18,23)	PL 13 LL 28 PI 15 NMC 22									
(D27) 8.50 (B29) 8.70-9.20 (D28) 8.70-9.15	SPT(S) 8.70	N=77 (6,11,14,19,21,23)										
(D30) 9.50 (B32) 9.70-10.20 (D31) 9.70-10.15	SPT(S) 9.70	N=35 (6,8,9,8,9,9)	PL 21 LL 49 PI 28 NMC 32				Stiff dark grey and dark bluish grey slightly sandy CLAY with rare fossilized shell fragments (4x4mm). Sand is fine. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			9.80	77.61	

DRILLING TECHNIQUE			CHISELLING			WATER OBSERVATIONS				HOLE/CASING DIAMETER				WATER ADDED			
From	To	Type	From	To	Duration	Date/Time	Strike At	Time Elapsed (mins)	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To
0.00	1.20	Inspection Pit Cable Percussion	12.20	12.20	01:00	25/09/2020 11:30:00	9.15	20 15 10	8.00 8.20 8.30	8.70	9.50	150	12.23	150	9.50		

Remarks 1. PAS 128 Type B survey conducted over position.	SPT Hammer: 58
	Energy Ratio (%): 62
THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.	Termination Depth: 12.23m
	Achieved Scheduled Depth



Cable Percussive Borehole Log

Final data

ML081-CP436

Project
ASC C2 & C3 Controlled Data
HS2

Project No.
C2-C3-CONT-ASC
Easting (OSGB)
467127.48

Ground Level (mAOD)
87.41
Northing (SnakeGrid)
226425.59

GI Phase
ASC Detailed GI
Asset Group
Calvert Cutting Group

Chainage (SG Grid)
Offset
-110 m

Start Date
24/09/2020
End Date
25/09/2020

Scale
1:50

Sheet 2 of 2

SAMPLES		TESTS			PROGRESS		STRATA							Depth (Thickness)	Level	Install/ Backfill
Type + Depth	Type + Depth	Results	PI	Water Depth	Date & Time	Casing & Water Depth	Description	Legend	Geol Code1							
(D33) 10.50 (UT34) 10.70-11.15		UT34 58 blows 89% rec.					Stiff dark grey and dark bluish grey slightly sandy CLAY with rare fossilized shell fragments (4x4mm). Sand is fine. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]									
(D35) 11.15-11.20							from 11.15m to 12.23m locally indistinctly fissured.							(2.43)		
(D36) 11.50																
(B38) 11.70-12.20 (D37) 11.70-12.15	SPT(S) 11.70	N=36 (6,7,8,9,9,10)					from 11.70m to 12.20m stiff to very stiff.									
(D39) 12.20-12.23	SPT(S) 12.20	100/20mm (25/10,100/2 0mm)			25/09/2020 15:30	9.50 Dry	from 12.20m to 12.23m very stiff.							12.23	75.18	



Unless otherwise stated:
Depth (m), Diameter (mm), Time (hhmm),
Thickness (m), Level (mOD).

Equipment Used
Dando 3000

Contractor

Logged By

Checked By

MC



Rotary Borehole Log

FINAL

ML081-CR008

Project ASC C2 & C3 Controlled Data Client HS2	Project No. C2-C3-CONT-ASC Easting (SnakeGrid) 467427.28	Ground Level (mAOD) 85.29 Northing (SankeGrid) 226313.78	GI Phase HS2 Main GI Asset Group Calvert Cutting Group	Chainage (SG Grid) 81164.000 Offset (m) -11	Start Date 23/06/2017 End Date 26/06/2017	Scale 1:50 Sheet 1 of 3
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Samples	TCR SCR RQD	FI	PI	Results	Water	Progress		Strata				Depth (Thick- ness)	Level	Install/ Backfill						
						Date & Time	Casing & Water	Description	Legend	Geol Code1										
(D1) 0.20								TOPSOIL: Brown sandy clay with occasional rootlets. Factual Geolcode [TOP] Factual Geolcode 2 [C] Geology Code 3 [TOP-C Z]			(0.20)	85.09								
(LB2) 0.50-0.80								Firm to stiff orange and brown mottled slightly sandy CLAY with rare rootlets. Sand is fine to medium. Factual Geolcode [ALV] Factual Geolcode 2 [C] Geology Code 3 [ALV-C Z]			(0.60)									
(D3) 0.80			PL 21	U6 13				Soft to firm thinly laminated grey mottled orange brown speckled black slightly sandy CLAY with rare rootlets. Sand is fine to coarse. Factual Geolcode [ALV] Factual Geolcode 2 [C] Geology Code 3 [ALV-C Z]			0.80	84.49								
(LB4) 1.00-1.20			LL 63	blows																
(D5) 1.20			PI 42	100%rec.							(1.40)									
(U6) 1.20-1.65			NMC 26																	
(B9) 1.70-2.20			PL 28	SPT(S)							2.20	83.09								
(D7) 1.70			LL 68	N=5																
(D8) 1.70-2.15			PI 40	(1,0,1,1,1,2)																
			NMC 46																	
(D10) 2.20				U11 15																
(U11) 2.20-2.65				blows																
				100%rec.																
(B14) 2.70-3.20				SPT(S)																
(D12) 2.70				N=13																
(D13) 2.70-3.15				(2,2,3,3,3,4)							(1.50)									
(D15) 3.20			PL 21	U16 37																
(U16) 3.20-3.65			LL 55	blows																
			PI 34	100%rec.																
			NMC 26																	
(B19) 3.70-4.20			PL 24	SPT(S)																
(D17) 3.70			LL 59	N=20																
(D18) 3.70-4.15			PI 35	(3,3,3,5,5,7)							3.70	81.59								
			NMC 26																	
(D20) 4.20				U21 40																
(U21) 4.20-4.65				blows							(1.00)									
				100%rec.																
(D22) 4.70				SPT(S)																
(D23) 4.70-5.10			NMC 1	50/50mm							4.70	80.59								
				(25/25,50/50mm)							(0.40)									
(B24) 5.20-5.70				U-NR 70																
(U-NR) 5.20-5.65				blows 0% rec.							5.10	80.19								
(B26) 5.70-6.20				SPT(S)																
(D25) 5.70-6.15				N=31																
				(3,4,6,7,8,10)																
(D27) 6.20																				
(U28) 6.70-7.15				U28 53							(2.90)									
				blows																
				100%rec.																
(B31) 7.20-7.70			PL 17	SPT(S)																
(D29) 7.20			LL 40	N=37																
(D30) 7.20-7.65			PI 23	(3,4,4,7,10,16)																
			NMC 17																	
(D32) 8.20				U33 65																
(U33) 8.20-8.65				blows																
				100%rec.																
(B36) 8.70-9.20				SPT(S)																
(D34) 8.70				50/225mm																
(D35) 8.70-9.08				(8,15,15,16,19,0/0)							(2.70)									
(D37) 10.00			PL 18			21/06/2017	4.20													
			LL 26			18.00	4.20													
SAMPLES		TCR SCR RQD	Fracture Index	RESULTS	Water	Date Time	Casing Water	Description				Legend	Depth (Thickness)	Level	Install/Backfill					
DRILLING TECHNIQUE				FLUSH DETAILS				WATER OBSERVATIONS				HOLE/CASING DIAMETER				WATER ADDED				
From	To	Type		From	To	Rtn%	Flush Type	Date/Time	Strike At	Time (mins)	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)
0.00	1.20	Inspection Pit		10.70	25.00	100	Air/Mist							200	10.70	25.00	200	1.20	10.00	
1.20	10.70	Cable Percussion												146	25.00	150	10.70			
10.70	25.00	Rotary Core																		

Remarks
1. PAS 128 Type B survey conducted over position. 2. Where structure is not described, such features were not observed in the available samples. 3. No groundwater observed.

THIS LOG HAS BEEN REPRODUCED FROM AGS DATA. FOR THE ORIGINAL LOG PLEASE CHECK THE RELEVANT FACTUAL REPORT.

Termination Depth: 25.00m
Achieved Scheduled Depth



Unless otherwise stated:
Depth (m), Diameter (mm), Time (hhmm),
Thickness (m), Level (MOD).

Equipment Used
Insulated Hand Tools

Contractor

Logged By
JC
Checked By



Rotary Borehole Log

FINAL

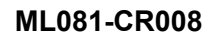
ML081-CR008

Project ASC C2 & C3 Controlled Data Client HS2	Project No. C2-C3-CONT-ASC Easting (SnakeGrid) 467427.28	Ground Level (mAOD) 85.29 Northing (SankeGrid) 226313.78	GI Phase HS2 Main GI Asset Group Calvert Cutting Group	Chainage (SG Grid) 81164.000 Offset (m) -11	Start Date 23/06/2017 End Date 26/06/2017	Scale 1:50 Sheet 2 of 3
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Samples	TCR SCR RQD	FI	PI	Results	Water	Progress		Strata				Depth (Thick- ness)	Level	Install/ Backfill							
						Date & Time	Casing & Water	Description		Legend	Geol Code1										
(B39) 10.20-10.70 (D38) 10.20-10.57			PI 8 NMC 25 NMC 27	SPT(S) 50/220mm (9,14,15,1 7,18/70)	4.60	22/06/2017 07:30	2.50 Dry	Very dense dark grey very clayey fine SAND. Factual Geolcode [KLB] Factual Geolcode 2 [S] Geology Code 3 [KLB-S V SV]													
(C40) 11.02-11.37						22/06/2017 11:30 23/06/2017 07:30	10.70 10.70 2.94 4.60	Very stiff fissured locally thinly laminated dark grey CLAY with rare shell fragments (up to 12mm). Fissures are randomly orientated extremely closely spaced planar smooth. Factual Geolcode [KLB] Factual Geolcode 2 [C] Geology Code 3 [KLB-C Z] from 10.70m to 11.02m recovered as soft (probable drilling disturbed) from 10.70m to 11.37m slightly sandy. Sand is fine. from 10.91m to 10.93m 1 No pocket of brown fine sand (up to 13mm)				10.70	74.59								
(C41) 12.27-12.61			PL 22 LL 68 PI 46 NMC 24					from 11.98m to 12.00m abundant shell fragments (up to 5mm) from 12.00m to 12.24m recovered as soft to firm (probable drilling disturbed)													
(C42) 12.84-13.17	TCR: 100 SCR: 55 RQD: 0	NI 20 70	PL 23 LL 67 PI 44					Extremely weak dark grey MUDSTONE with rare pyritised shell fragments (up to 15mm). Discontinuities: 1) randomly orientated extremely closely to closely spaced planar rough clean. Factual Geolcode [KLB] Factual Geolcode 2 [MDST] Geology Code 3 [KLB-MDST]													
(C43) 13.59-14.01								at 13.47m abundant shell fragments (up to 5mm)													
(C44) 14.50-15.00	TCR: 100 SCR: 97 RQD: 87	NI 170 500						Weak to medium strong light to dark grey fossiliferous LIMESTONE with widely spaced thick to medium beds of extremely weak thinly laminated dark grey mudstone and rare shell fragments (up to 5mm). Discontinuities: 1) 0 to 10 degrees closely to medium spaced undulating rough clean, locally infilled with clay and shell fragments (up to 5mm). Factual Geolcode [CB] Factual Geolcode 2 [LMST] Geology Code 3 [CB-LMST] from 14.20m to 14.28m cavities infilled with clay (up to 30mm)				13.59	71.70								
(C45) 15.65-16.01	TCR: 100 SCR: 95 RQD: 27	NI 20 30						from 15.30m to 16.15m set 1) discontinuities extremely closely to very closely spaced													
(C46) 16.54-16.94								from 16.11m to 16.27m strong light grey siltstone from 16.36m to 16.47m strong light grey siltstone													
(C47) 17.33-17.82	TCR: 100 SCR: 100 RQD: 70	NI 150 310																			
(C48) 18.49-18.91	TCR: 100 SCR: 65 RQD: 57					23/06/2017 17:30 26/06/2017 07:30	10.70 10.70 16.80 16.90	from 18.08m to 18.10m abundant shell fragments (up to 40mm)													
(C49) 19.50-19.85								Very stiff locally thinly laminated greenish grey mottled brownish black glauconitic CLAY. Factual Geolcode [FMB] Factual Geolcode 2 [C] Geology Code 3 [FMB-C Z]				19.22	66.07								
(C50) 20.00-20.33												(1.22)									
SAMPLES	TCR SCR RQD	Fracture Index		RESULTS	Water	Date Time	Casing Water	Description				Legend	Depth (Thickness)	Level	Install/Backfill						
DRILLING TECHNIQUE				FLUSH DETAILS				WATER OBSERVATIONS				HOLE/CASING DIAMETER				WATER ADDED					
From	To	Type		From	To	Rtn%	Flush Type	Date/Time	Strike At	Time (mins)	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)	
0.00	1.20	Inspection Pit Cable Percussion Rotary Core		10.70	25.00	100	Air/Mist							200	10.70	200	4.20	1.20	10.00		
1.20	10.70														146	25.00	150	10.70			
10.70	25.00																				

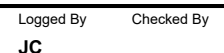
Remarks
1. PAS 128 Type B survey conducted over position. 2. Where structure is not described, such features were not observed in the available samples. 3. No groundwater observed.

THIS LOG HAS BEEN REPRODUCED FROM AGS DATA. FOR THE ORIGINAL LOG PLEASE CHECK THE RELEVANT FACTUAL REPORT.	Termination Depth: 25.00m Achieved Scheduled Depth
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Sheet 3 of 3

Remarks									
1. PAS 128 Type B survey conducted over position. 2. Where structure is not described, such features were not observed in the available samples. 3. No groundwater observed.									
THIS LOG HAS BEEN REPRODUCED FROM AGS DATA. FOR THE ORIGINAL LOG PLEASE CHECK THE RELEVANT FACTUAL REPORT.									Termination Depth: 25.00m Achieved Scheduled Depth





Rotary Borehole Log

FINAL

ML081-CR011

Project ASC C2 & C3 Controlled Data Client HS2	Project No. C2-C3-CONT-ASC Easting (SnakeGrid) 467425.72	Ground Level (mAOD) 85.07 Northing (SankeGrid) 226380.96	GI Phase HS2 Main GI Asset Group Calvert Cutting Group	Chainage (SG Grid) 81208.000 Offset (m) 40	Start Date 21/06/2017 End Date 22/06/2017	Scale 1:50 Sheet 1 of 3
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Samples	TCR SCR RQD	FI	PI	Results	Water	Progress		Strata				Depth (Thick ness)	Level	Install/ Backfill
						Date & Time	Casing & Water	Description			Legend			
(D1) 0.20 (AMAL1) 0.40-1.65 (LB2) 0.40-0.80 (D3) 0.50 (D5) 1.00 (LB4) 1.00-1.20 (U6) 1.20-1.65 (B9) 1.70-2.20 (D7) 1.70 (D8) 1.70-2.15 (D10) 2.20 (U11) 2.20-2.65 (B14) 2.70-3.20 (D12) 2.70 (D13) 2.70-3.15 (D15) 3.20 (UT16) 3.20-3.65 (B19) 3.70-4.20 (D17) 3.70 (D18) 3.70-4.15 (D20) 4.20 (UT21) 4.20-4.65 (B24) 4.70-5.20 (D22) 4.70 (D23) 4.70-5.15 (D25) 5.20 (UT26) 5.20-5.65 (B29) 5.70-6.20 (D27) 5.70 (D28) 5.70-6.15 (D30) 6.20 (UT31) 6.70-7.15 (B34) 7.20-7.70 (D32) 7.20 (D33) 7.20-7.64 (D35) 7.70 (UT36) 8.20-8.65 (B39) 8.70-9.20 (D37) 8.70 (D38) 8.70-9.00 (D40) 9.20 (B42) 9.70-10.20 (D41) 9.70-10.01			PL 24 LL 61 PI 37 NMC 33 <											

Remarks

1. PAS 128 Type B survey conducted over position. 2. Where structure is not described, such features were not observed in the available samples. 3. No groundwater observed.

THIS LOG HAS BEEN REPRODUCED FROM AGS DATA. FOR THE ORIGINAL LOG PLEASE CHECK THE RELEVANT FACTUAL REPORT.

Termination Depth: 25.00m
Achieved Scheduled Depth



Unless otherwise stated:
Depth (m), Diameter (mm), Time (hhmm),
Thickness (m), Level (mOD).

Equipment Used
Dando 3000

Contractor

Logged By

Checked By

JC



Rotary Borehole Log

FINAL

ML081-CR011

Project ASC C2 & C3 Controlled Data Client HS2	Project No. C2-C3-CONT-ASC Easting (SnakeGrid) 467425.72	Ground Level (mAOD) 85.07 Northing (SankeGrid) 226380.96	GI Phase HS2 Main GI Asset Group Calvert Cutting Group	Chainage (SG Grid) 81208.000 Offset (m) 40	Start Date 21/06/2017 End Date 22/06/2017	Scale 1:50 Sheet 2 of 3
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Samples	TCR SCR RQD	FI	PI	Results	Water	Progress		Strata				Depth (Thick ness)	Level	Install/ Backfill
						Date & Time	Casing & Water	Description	Legend	Geol Code1				
(D43) 10.70				SPT(S) 50/290mm (6,9,9,11,1 4,16/65)	5.00	13/06/2017 18:00 15/06/2017 07:30	10.50 10.50 3.70 7.00	Very dense dark grey clayey fine SAND. Factual Geolcode [KLB] Factual Geolcode 2 [C] Geology Code 3 [KLB-C Z]						
(B46) 11.20-11.70 (D44) 11.20-11.64 (D45) 11.30 (D47) 11.70									Stiff to very stiff fissured dark grey sandy CLAY. Fissures are randomly orientated extremely closely to closely spaced planar and undulating smooth locally with a dusting of fine sand and silt. Factual Geolcode [KLB] Factual Geolcode 2 [C] Geology Code 3 [KLB-C Z]			11.30 (0.70)	73.77	
(C48) 12.35-12.70						15/06/2017 00:00 21/06/2017 07:30	12.00 12.00 11.98 5.00	Very stiff fissured dark grey CLAY with rare fragments of pyritised shell (up to 10mm). Fissures are randomly orientated extremely closely spaced planar smooth. Factual Geolcode [KLB] Factual Geolcode 2 [C] Geology Code 3 [KLB-C Z]			12.00 (1.50)	73.07		
(C49) 14.40-14.84	TCR: 100 SCR: 83 RQD: 76	NI 240 890						from 12.94m to 12.95m 1 No fragment of pyritic shell from 13.31m to 13.32m 1 No fragment of pyritic shell from 13.44m to 13.50m slightly sandy with abundant shell fragments (up to 10mm)			13.50 (2.18)	71.57		
								Strong light grey mottled dark grey fossiliferous LIMESTONE with closely to medium locally widely spaced thin beds of very stiff sandy clay and with abundant shell fragments (up to 10mm). Sand is fine to coarse. Factual Geolcode [KLB] Factual Geolcode 2 [LMST] Geology Code 3 [CB-LMST]						
								from 14.00m to 14.07m with frequent vugs (up to 10mm) with dark grey staining from 14.39m to 14.40m 1 No discontinuity 50 to 60 degrees undulating rough infilled with slightly gravelly clay. Gravel is subangular fine to medium of limestone. from 14.86m to 14.87m 1 No discontinuity 20 to 30 degrees undulating rough clean from 15.12m to 15.13m 1 No discontinuity 0 to 20 degrees undulating rough clean from 15.32m to 15.40m 2 No discontinuities 10 to 20 degrees undulating rough infilled with clay (3mm) from 15.54m to 15.55m 1 No discontinuity 0 to 10 degrees undulating rough clean						
								Stiff fissured dark grey CLAY with rare shell fragments (up to 16mm). Fissures are randomly orientated extremely closely spaced planar smooth. Factual Geolcode [KLB] Factual Geolcode 2 [C] Geology Code 3 [CB-C Z]						
(C50) 16.82-17.14	TCR: 100 SCR: 53 RQD: 41	NI 100 180						Medium strong to strong grey SILTSTONE with closely spaced thick laminations of extremely weak mudstone. Discontinuities: 1) 0 to 10 degrees closely spaced undulating rough clean. Factual Geolcode [KLB] Factual Geolcode 2 [SLST] Geology Code 3 [CB-SLST]			15.68 (0.53)	69.39		
								from 16.37m to 16.48m clay with abundant shell fragments (up to 10mm)		16.21 (0.51)	68.86			
								Very stiff locally thinly laminated dark grey CLAY with some shell fragments (up to 16mm). Factual Geolcode [KLB] Factual Geolcode 2 [C] Geology Code 3 [FMB-C Z]		16.72 (0.64)	68.35			
								Medium strong to strong light grey fossiliferous LIMESTONE. Factual Geolcode [CB] Factual Geolcode 2 [LMST] Geology Code 3 [FMB-LMST]		17.36 (1.20)	67.71			
(C51) 18.84-19.21	TCR: 100 SCR: 33 RQD: 19	NI 190 510				21/06/2017 17:30 22/06/2017 07:30	12.00 12.00 15.71 Dry	at 17.56m 1 No discontinuity 0 to 10 degrees undulating rough infilled with sandy clay (100mm). from 17.73m to 17.79m sandy clay with shell fragments (up to 10mm). Sand is fine to medium from 17.81m to 18.05m rare medium to coarse gravel sized pockets of silt at 18.07m 1 No discontinuity 20 to 30 degrees planar undulating rough infilled with slightly sandy clay with some shell fragments (up to 10mm) from 18.23m to 18.27m grey clay			18.56 (0.91)	66.51		
								Very stiff locally thinly laminated dark grey slightly sandy CLAY with some shell fragments (up to 10mm). Sand is fine to medium. Factual Geolcode [FMB] Factual Geolcode 2 [C] Geology Code 3 [FMB-C Z]		19.47 (0.70)	65.60			
								Medium strong to strong grey fossiliferous LIMESTONE. Factual Geolcode [FMB] Factual Geolcode 2 [LMST] Geology Code 3 [FMB-LMST]						
								from 19.47m to 19.69m dark grey from 19.50m to 20.04m 1 No discontinuity 80 to 90 degrees undulating curved rough clean from 20.04m to 20.17m dark grey thinly laminated slightly gravelly slightly sandy clay with some shell fragments (up to 10mm). Sand is fine to medium. Gravel is subangular to subrounded fine to medium of carbonaceous material Weak to medium strong cream to grey LIMESTONE. Discontinuities: 1) 0 to 10 degrees closely to medium spaced, locally widely spaced undulating rough clean. Factual Geolcode [WHL] Factual Geolcode 2 [LMST] Geology Code 3 [WHL-LMST]						
SAMPLES	TCR SCR RQD	Endcore Index		RESULTS	Water	Date/Time	Casing Water	Description	Legend			20.17	64.90	

DRILLING TECHNIQUE			FLUSH DETAILS				WATER OBSERVATIONS						HOLE/CASING DIAMETER				WATER ADDED		
From	To	Type	From	To	Rtn%	Flush Type	Date/Time	Strike At	Time (mins)	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)
0.00	1.20	Inspection Pit Cable Percussion Rotary Core	12.00	25.00	100	Air/Mist							200	10.50	200	3.20	1.20	5.20	
1.20	12.00												146	25.00			5.20	8.20	
12.00	25.00																		

Remarks
1. PAS 128 Type B survey conducted over position. 2. Where structure is not described, such features were not observed in the available samples. 3. No groundwater observed.

THIS LOG HAS BEEN REPRODUCED FROM AGS DATA. FOR THE ORIGINAL LOG PLEASE CHECK THE RELEVANT FACTUAL REPORT.

Termination Depth: 25.00m
Achieved Scheduled Depth

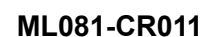


Unless otherwise stated:
Depth (m), Diameter (mm), Time (hhmm),
Thickness (m), Level (mOD).

Equipment Used
Dando 3000

Contractor

Logged By
JC
Checked By



	Unless otherwise stated:	Equipment Used	Contractor	Logged By	Checked By
	Depth (m), Diameter (mm), Time (hhmm), Thickness (m), Level (mOD).	Dando 3000		JC	

	Unless otherwise stated:	Equipment Used	Contractor	Logged By	Checked By
	Depth (m), Diameter (mm), Time (hhmm), Thickness (m), Level (mOD).	Insulated Hand Tools		AL	



Rotary Borehole Log

FINAL-MON

ML081-CR402

Project ASC C2 & C3 Controlled Data Client HS2	Project No. C2-C3-CONT-ASC Easting (SnakeGrid) 467457.84	Ground Level (mAOD) 85.40 Northing (SankeGrid) 226322.27	GI Phase ASC Scheme GI Asset Group Calvert Cutting Group	Chainage (SG Grid) 81146.000 Offset (m) 15	Start Date 23/04/2019 End Date 25/06/2019	Scale 1:50 Sheet 2 of 3
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Samples	TCR SCR RQD	FI	PI	Results	Water	Progress		Strata				Legend	Geol Code1	Depth (Thick- ness)	Level	Install/ Backfill				
						Date & Time	Casing & Water	Description												
(C1) 10.59-10.85			PL 17 LL 30 PI 13 NMC 16			24/06/2019 16:00	8.70	Grey and light greenish grey silty fine SAND. Locally with occasional medium to coarse gravel sized fragments of extremely weak to very weak grey sandstone lithorelicts.												
				25/06/2019 07:30	8.70 5.40 9.70	Factual Geolcode [KLB] Factual Geolcode 2 [S] Geology Code 3 [KLB-S V SV] from 10.40m to 10.50m clayey						10.50	74.90							
(C2) 12.36-12.66	TCR: 92 SCR: 76 RQD: 76							Very stiff thinly laminated dark grey CLAY. Locally with occasional thin lenses (<20mm x 35mm) of light brown fine sand. Factual Geolcode [KLB] Factual Geolcode 2 [C] Geology Code 3 [KLB-C Z] at 10.60m 1 No. pyrite nodule (10mm x 10mm) at 10.70m 1 No. pyritised fossilised shell fragment (2mm x 10mm x 15mm)						(1.00)						
						Extremely weak thinly laminated dark grey MUDSTONE. Locally with occasional lenses (20mm x 20mm x 50mm) of pyritised sand and pyrite nodules. Laminations are extremely closely spaced locally randomly orientated and polished. Factual Geolcode [KLB] Factual Geolcode 2 [MDST] Geology Code 3 [KLB-MDST] from 12.68m to 12.74m with abundant fossilised shell fragments (<10mm x 20mm)						11.50	73.90							
(C3) 14.00-14.31	320 580 820							Weak to medium strong medium bedded light grey fossiliferous argillaceous locally peloidal LIMESTONE with medium spaced very thin and thin beds of dark grey mudstone and clay. Occasional fossilised shells fragments (<10mm x 25mm) and frequent burrows (<15mm x 30mm x 50mm) infilled with dark grey mudstone. Discontinuities: 1) 15 - 25 degrees medium to widely spaced undulating rough and tight. Factual Geolcode [CB] Factual Geolcode 2 [LMST] Geology Code 3 [CB-LMST] from 13.24m to 13.44m 1 No. discontinuity 80 degrees undulating rough partly open infilled with calcite and occasional vugs (1mm x 3mm) from 13.33m to 13.34m 1 No. thin lens of stiff dark grey clay with abundant fossilised shell fragments (1mm x 2mm) and occasional fossilised shells (15mm x 15mm) from 13.68m to 13.77m extremely weak dark grey fossiliferous arenaceous mudstone from 13.77m to 14.00m assumed zone of core loss						(1.22)						
						Medium strong to strong thinly and medium bedded grey fine grained LIMESTONE with closely to medium spaced very thinly to thinly bedded arenaceous mudstone. Discontinuities: 1) 5 - 10 degrees medium to widely spaced undulating and rough. Factual Geolcode [FMB] Factual Geolcode 2 [LMST] Geology Code 3 [FMB-LMST] at 14.48m 1 No. discontinuity 5 degrees undulating rough and tight from 14.48m to 14.50m very weak thin laminae of dark grey mudstone with frequent fossilised shell fragments (<1mm x 2mm) from 14.80m to 15.00m 1 No. discontinuity 90 degrees planar and rough from 14.50m to 14.61m weak brownish grey fine grained calcareous argillaceous sandstone with fragments (<5mm x 10mm x 20mm) of black lignite and patches of calcareous worm tubes (10mm x 20mm) from 14.59m to 14.61m 1 No. discontinuity 20 degrees undulating rough and tight						14.48	70.92							
(C4) 15.50-15.70	TCR: 97 SCR: 97 RQD: 97	140 230 600						Extremely weak dark grey MUDSTONE. Factual Geolcode [FMB] Factual Geolcode 2 [MDST] Geology Code 3 [FMB-MDST] from 15.80m to 15.81m arenaceous with frequent fossilised shell fragments (<2mm x 8mm) and shell impressions. Occasional fragments (<5mm x 10mm) of black lignite at 15.81m 1 No. discontinuity 0 degrees planar smooth with clay film on surface from 15.88m to 15.93m 1 No. very thin bed of medium strong grey fine grained sandstone						(1.76)						
						Weak to medium strong thinly to medium bedded locally cross bedded light grey fine grained locally fossiliferous argillaceous LIMESTONE with very weak closely spaced thinly bedded dark grey fossiliferous mudstone and siltstone. Discontinuities: 1) 0 - 5 degrees medium to widely spaced undulating locally planar rough tight locally with black clay film on surfaces. Factual Geolcode [FMB] Factual Geolcode 2 [LMST] Geology Code 3 [FMB-LMST] from 16.12m to 16.17m extremely weak grey siltstone from 16.30m to 16.44m extremely weak grey siltstone from 16.70m to 16.75m extremely weak grey siltstone with occasional fossilised shells (<20mm x 20mm) from 16.75m to 16.90m weak grey fine grained limestone with dark brown lignite fragments (<2mm x 3mm) from 16.90m to 17.00m assumed zone of core loss from 17.19m to 17.30m weak dark grey fossiliferous siltstone from 17.39m to 17.48m very weak dark grey arenaceous mudstone with frequent fossilised shells and shell fragments (<20mm x 35mm)						15.40	70.00							
(C5) 17.55-17.90	260 493 780							Strong brownish grey and light greenish grey fine grained fossiliferous LIMESTONE. Factual Geolcode [FMB] Factual Geolcode 2 [LMST] Geology Code 3 [FMB-LMST] Medium strong to strong medium bedded dark grey and light grey fine grained argillaceous LIMESTONE with weak thinly laminated light greenish grey siltstone. Discontinuities: 1) 0 - 20 degrees closely to medium spaced undulating and planar smooth open infilled with clay. Factual Geolcode [FMB] Factual Geolcode 2 [LMST] Geology Code 3 [FMB-LMST] from 17.93m to 18.20m with occasional fossilised shell fragments						(0.60)						
												16.00	69.40							
(C6) 19.12-19.32	TCR: 95 SCR: 85 RQD: 85	160 230 260												(1.48)						
												17.48	67.92							
														(0.45)						
														17.93	67.47					
														(0.69)						
														18.62	66.78					
														(0.38)						
														19.00	66.40					
														(0.45)						
														19.45	65.95					
														(0.28)						
														19.73	65.67					
														(0.27)						
						25/06/2019 17:30	8.70 15.87	Geology Code 3 [FMB-LMST] from 17.93m to 18.20m with occasional fossilised shell fragments						20.00	65.40					
SAMPLES	TCR SCR RQD	Fracture Index		RESULTS	Water	Date Time	Casing Water	Description				Legend		Depth (Thickness)	Level	Install/Backfill				
DRILLING TECHNIQUE				FLUSH DETAILS				WATER OBSERVATIONS				HOLE/CASING DIAMETER				WATER ADDED				
From	To	Type		From	To	Rtn%	Flush Type	Date/Time	Strike At	Time (mins)	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (litr)
0.00	1.20	Inspection Pit		9.14	20.00	100	Air/Mist	24/04/2019 08:50:00	8.20	5	8.10	2.00		200	2.00	200	2.00			
1.20	9.14	Cable Percussion								10	8.10			150	9.14	150	8.70			
9.14	20.00	Rotary Core								15	8.10			146	20.00					
										20	8.10									

Remarks

1. PAS 128 Type B survey conducted over position.

THIS LOG HAS BEEN REPRODUCED FROM AGS DATA. FOR THE ORIGINAL LOG PLEASE CHECK THE RELEVANT FACTUAL REPORT.

Termination Depth: 20.00m
Achieved Scheduled Depth.Unless otherwise stated:
Depth (m), Diameter (mm), Time (hhmm),
Thickness (m), Level (mOD).Equipment Used
Insulated Hand Tools

Contractor

Logged By
Checked By
AL



Rotary Borehole Log

FINAL-MON

ML081-CR402

Project ASC C2 & C3 Controlled Data Client HS2	Project No. C2-C3-CONT-ASC Easting (SnakeGrid) 467457.84	Ground Level (mAOD) 85.40 Northing (SankeGrid) 226322.27	GI Phase ASC Scheme GI Asset Group Calvert Cutting Group	Chainage (SG Grid) 81146.000 Offset (m) 15	Start Date 23/04/2019 End Date 25/06/2019	Scale 1:50 Sheet 3 of 3
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Samples	TCR SCR RQD	FI	PI	Results	Water	Progress		Strata				Legend	Geol Code1	Depth (Thick ness)	Level	Install/ Backfill					
						Date & Time	Casing & Water	Description													
								Medium strong to strong medium bedded dark grey and light grey fine grained argillaceous LIMESTONE with weak thinly laminated light greenish grey siltstone. Discontinuities: 1) 0 - 20 degrees closely to medium spaced undulating and planar smooth open infilled with clay. Factual Geolcode [FMB] Factual Geolcode 2 [LMST] Geology Code 3 [FMB-LMST] from 17.93m to 18.20m with occasional fossilised shell fragments (<20mm x 30mm) from 18.20m to 18.23m firm grey clay from 18.23m to 18.45m with occasional black lignite fragments (<10mm x 15mm) from 18.45m to 18.62m weak light greenish grey thinly laminated siltstone Extremely weak dark grey MUDSTONE with frequent randomly orientated indistinct polished surfaces. Factual Geolcode [WHL] Factual Geolcode 2 [MDST] Geology Code 3 [WHL-MDST] Extremely weak dark green locally mottled orangish brown MUDSTONE. Factual Geolcode [WHL] Factual Geolcode 2 [MDST] Geology Code 3 [WHL-MDST] from 19.12m to 19.40m orangish brown mottling Stiff green CLAY. Factual Geolcode [WHL] Factual Geolcode 2 [C] Geology Code 3 [WHL-C Z] Very weak to weak creamish white SILTSTONE. Bioturbated with frequent burrows (10mm x 15mm x 30mm) infilled with dark green clay and dark brown lignite (10mm x 30mm). Factual Geolcode [WHL] Factual Geolcode 2 [SLST] Geology Code 3 [WHL-SLST] from 19.73m to 19.86m 1 No. discontinuity 60 degrees undulating rough polished striated and tight from 19.86m to 20.00m assumed zone of core loss													
SAMPLES	TCR SCR RQD	Fracture Index		RESULTS	Water	Date Time	Casing Water	Description				Legend		Depth (Thickness)	Level	Install/Backfill					
DRILLING TECHNIQUE				FLUSH DETAILS				WATER OBSERVATIONS				HOLE/CASING DIAMETER				WATER ADDED					
From	To	Type		From	To	Rtn%	Flush Type	Date/Time	Strike At	Time (mins)	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)	
0.00	1.20	Inspection Pit Cable Percussion Rotary Core		9.14	20.00	100	Air/Mist	24/04/2019 08:50:00	8.20	5	8.10	2.00		200	2.00	200	2.00				
1.20	9.14										10	8.10			150	9.14	150	8.70			
9.14	20.00										15	8.10			146	20.00					
										20	8.10										

Remarks 1. PAS 128 Type B survey conducted over position.															Termination Depth: 20.00m Achieved Scheduled Depth.	
THIS LOG HAS BEEN REPRODUCED FROM AGS DATA. FOR THE ORIGINAL LOG PLEASE CHECK THE RELEVANT FACTUAL REPORT.																



Cable Percussive Borehole

Log

Final data

ML081-CR440

Project
ASC C2 & C3 Controlled
Data
HS2

Project No.
C2-C3-CONT-ASC
Easting (OSGB)
467453.95

Ground Level (mAOD)
85.97
Northing (SnakeGrid)
226359.76

GI Phase
ASC Detailed GI
Asset Group
Calvert Cutting Group

Chainage (SG Grid)
42 m

Start Date
28/10/2020
End Date
30/10/2020

Scale
1:50

Sheet 1 of 2

SAMPLES		TESTS			PROGRESS		STRATA					Depth (Thickness)	Level	Install/ Backfill				
Type + Depth	Type + Depth	Results	PI	Water Depth	Date & Time	Casing & Water Depth	Description	Legend	Geol Code1									
(B3) 0.10-0.40 (D1) 0.10 (ES2) 0.10	PID (1) 0.10	<1ppm					TOPSOIL: Grass over dark brown slightly sandy slightly gravelly clay with occasional roots (<5mm). Sand is fine to medium. Gravel is subangular to rounded fine to medium of chert and mudstone. Factual Geolcode [TOP] Factual Geolcode 2 [C] Geology Code 3 [TOP-C Z]			(0.45)								
(B6) 0.50-0.80 (D4) 0.50 (ES5) 0.50	PID (1) 0.50 PID (2) 0.50	<1ppm 60(15)kPa 68(25)kPa	PL 18 LL 38 PI 20				Firm brown locally mottled light brown slightly sandy slightly gravelly CLAY with rare roots (<5mm). Sand is fine to medium. Gravel is subangular fine to coarse of mudstone. Factual Geolcode [OXC] Factual Geolcode 2 [Z] Geology Code 3 [OXC-C Z]			(0.40)	85.52							
(B8) 0.90-1.20 (D7) 0.90	HV(1) 0.60 HV(2) 0.60 HV(3) 0.60	77(28)kPa	NMC 15 NMC 23 NMC 27				Firm to stiff light grey mottled orangish brown slightly sandy CLAY. Sand is fine to coarse. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			(0.40)	85.12							
(B10) 1.30-1.70 (D9) 1.30			PL 24 LL 60 PI 36 NMC 35				Soft to firm orangish brown CLAY with rare lenses of light brown fine sand. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			1.25	84.72							
(U11) 1.70-2.15		U11 50 blows 100% rec.					Firm brownish grey and brown slightly sandy CLAY with occasional partially decomposed rootlets and rare yellowish brown limestone nodules. Sand is fine. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			(0.75)	83.97							
(B14) 2.20-2.70 (D12) 2.20 (D13) 2.20-2.65	SPT(S) 2.20	N=13 (2,3,3,3,3,4)	PL 25 PL 29 LL 57 LL 59 PI 30 PI 32 NMC 1				Stiff thinly laminated dark grey slightly sandy CLAY. Sand is fine. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			2.80	83.17							
(B16) 2.90-3.20 (D15) 2.90			NMC 38															
(U17) 3.20-3.65		U17 75 blows 100% rec.					from 3.20m to 3.70m rare fossilised shell fragments (<5mm).											
(D18) 3.70			PL 23 LL 53 PI 30															
(D19) 4.00			NMC 25															
(B21) 4.20-4.70 (D20) 4.20-4.65	SPT(S) 4.20	N=29 (3,5,5,7,7,10)	PL 20 LL 53 PI 33 NMC 24 NMC 25															
(D22) 5.00			PL 26 LL 62 PI 36				from 5.00m to 5.20m brownish grey.											
(U23) 5.20-5.65		U23 100 blows 100% rec.	NMC 22 NMC 25				from 5.20m to 8.20m rare bands of weak grey claystone recovered as angular to subangular fine gravel.			(5.40)								
(D24) 5.70			PL 22 LL 65 PI 43				from 5.70m to 8.20m occasional fossilised shell fragments (<5mm).											
(EWMW1) 6.00			NMC 25															
(D25) 6.20			NMC 28															
(B27) 6.70-7.20 (D26) 6.70-7.15	SPT(S) 6.70	N=54 (4,8,12,12,14,16)	PL 22 LL 58 PI 36 NMC 23 NMC 27				from 6.70m to 8.20m stiff to very stiff.											
(D28) 7.70							from 7.70m to 8.20m rare to occasional lenses of grey fine sand.											
(EWMW2) 8.00 (EWMW3) 8.00 (U29) 8.20-8.65 (EWMW2) 8.30 (EWMW2(P1)) 8.50 (D30) 8.70		U29 110 blows 100% rec.					Stiff dark greenish grey sandy CLAY. Sand is fine to medium. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			8.20 (0.55)	77.77							
(D31) 9.00 (EWMW2(P1)) 9.00 (B33) 9.20-9.70 (D32) 9.20-9.65	SPT(S) 9.20	N=56 (3,6,9,15,15,17)	PL 12 LL 29 PI 17 NMC 24 NMC 17 NMC 36		29/10/2020 17:30 30/10/2020 07:30	9.00 6.10 9.00 [Text Style]	Stiff to very stiff dark grey slightly sandy CLAY with occasional fossilised shell fragments (<5mm). Sand is fine to coarse. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z] Very dense grey and light greenish grey clayey fine SAND. Factual Geolcode [KLB] Factual Geolcode 2 [S] Geology Code 3 [KLB-S V SV] Stiff grey and light greenish grey sandy CLAY. Factual Geolcode [KLB] Factual Geolcode 2 [C] Geology Code 3 [KLB-C Z] Very dense grey and light greenish grey slightly gravelly clayey fine SAND. Gravel is medium to coarse of sandstone. Factual Geolcode [KLB] Factual Geolcode 2 [S] Geology Code 3 [KLB-S V SV]	 		8.75 (0.45) 9.20 (0.55) 9.75 (0.30) 10.05	77.22 76.77 76.22 75.92							
(D35) 10.00-10.32	Type	Results	NMC 17	Water	Date Time	Casing Water	Description	Legend		Depth (Thickness)	Level	Install/Backfill						
DRILLING TECHNIQUE			CHISELLING			WATER OBSERVATIONS				HOLE/CASING DIAMETER				WATER ADDED				
From	To	Type	From	To	Duration	Date/Time	Strike At	Time Elapsed (mins)	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)
0.00	1.20	Inspection Pit	4.80	5.00	00:30							200	10.70	200	10.50			
		Cable Percussion	7.75	8.05	00:45													
	10.70		10.10	10.50	01:00													
Remarks											SPT Hammer: S64							
1. PAS 128 Type B survey conducted over position. 2. EKFB instructed to cancel the rotary part and terminate the hole on CP refusal depth.											Energy Ratio (%): 67							
THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.											Termination Depth: 10.70m							
											Hard Strata - CP only, rotary section despoiled by EKFB							



Unless otherwise stated:
Depth (m), Diameter (mm), Time (hhmm),
Thickness (m), Level (MOD).

Equipment Used
Insulated Hand Tools

Contractor

Logged By
JP
Checked By



Cable Percussive Borehole Log

Final data

ML081-CR440

Project
ASC C2 & C3 Controlled Data
HS2

Project No.
C2-C3-CONT-ASC
Easting (OSGB)
467453.95

Ground Level (mAOD)
85.97
Northing (SnakeGrid)
226359.76

GI Phase
ASC Detailed GI
Asset Group
Calvert Cutting Group

Chainage (SG Grid)
42 m
Offset

Start Date
28/10/2020
End Date
30/10/2020

Scale
1:50

Sheet 2 of 2

SAMPLES		TESTS			PROGRESS		STRATA				Depth (Thickness)	Level	Install/ Backfill					
Type + Depth	Type + Depth	Results	PI	Water Depth	Date & Time	Casing & Water Depth	Description	Legend	Geol Code1									
(D36) 10.50-10.70	SPT(S) 10.10	100/170mm (25/52,37,48, 15/20)		5.70	30/10/2020 17:30	10.50 <i>[TextStyle]</i>	Very dense grey and light greenish grey slightly gravelly clayey fine SAND. Gravel is medium to coarse of sandstone. Factual Geolcode [KLB] Factual Geolcode 2 [S] Geology Code 3 [KLB-S V SV]			(0.65)	75.27							
	SPT(S) 10.50	100/160mm (25/40,41,49, 10/10)																
Type	Type	Results		Water	Date Time	Casing Water	Description	Legend		Depth (Thickness)	Level	Install/Backfill						
DRILLING TECHNIQUE			CHISELLING			WATER OBSERVATIONS				HOLE/CASING DIAMETER			WATER ADDED					
From	To	Type	From	To	Duration	Date/Time	Strike At	Time Elapsed (mins)	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)
0.00	1.20	Inspection Pit Cable Percussion	4.80	5.00	00:30							200	10.70	200	3.20			
	10.70		7.75	8.05	00:45									150	10.50			
			10.10	10.50	01:00													
Remarks 1. PAS 128 Type B survey conducted over position. 2. EKFB instructed to cancel the rotary part and terminate the hole on CP refusal depth.										SPT Hammer: S64								
										Energy Ratio (%): 67								
										Termination Depth: 10.70m								
										Hard Strata - CP only, rotary section descoped by EKFB								
THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.																		



Unless otherwise stated:
Depth (m), Diameter (mm), Time (hhmm),
Thickness (m), Level (mOD).

Equipment Used
Insulated Hand Tools

Contractor

Logged By
JP
Checked By



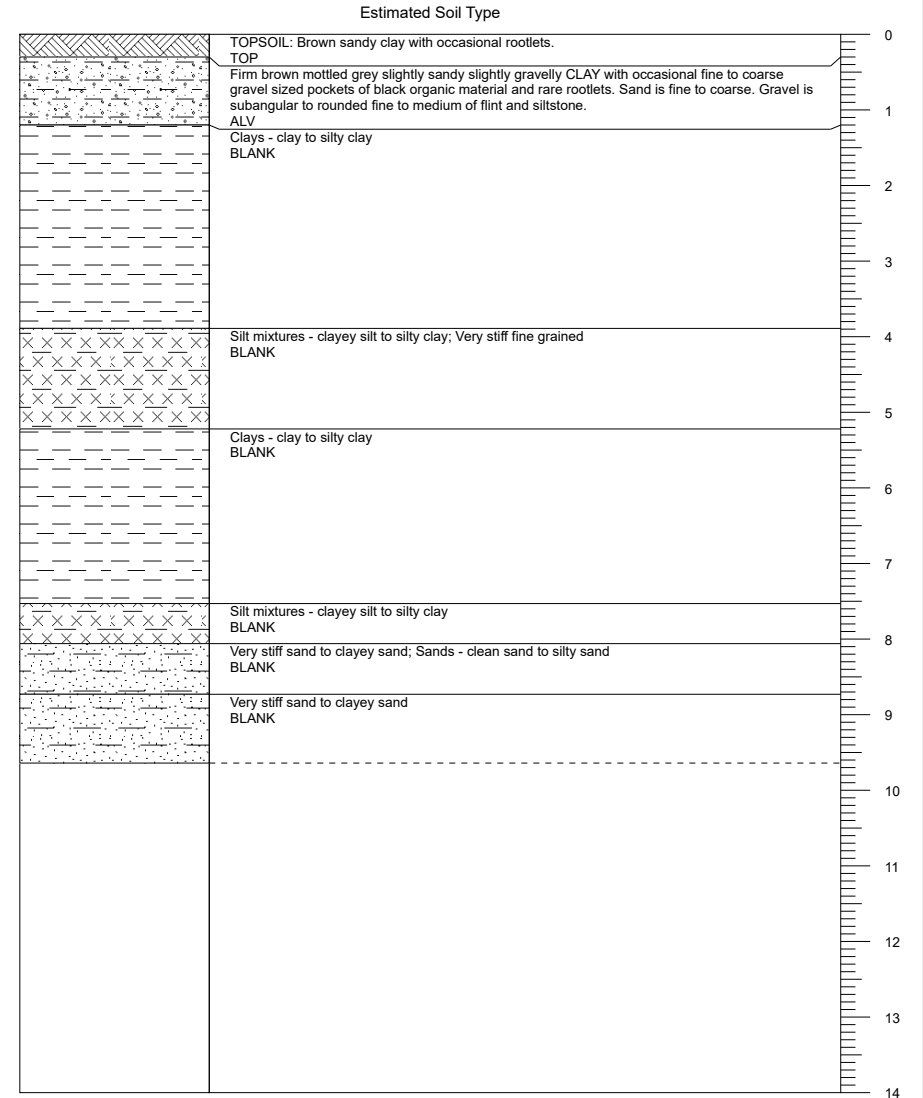
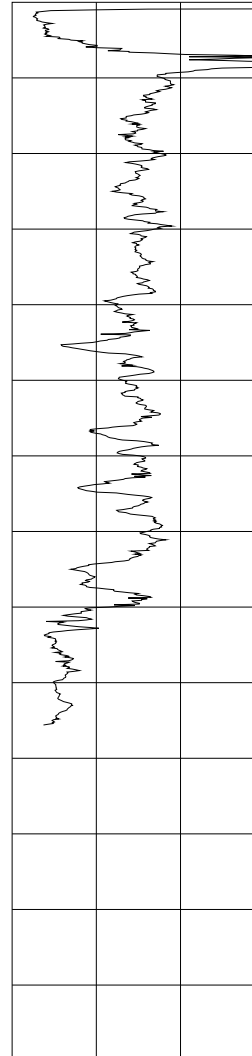
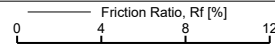
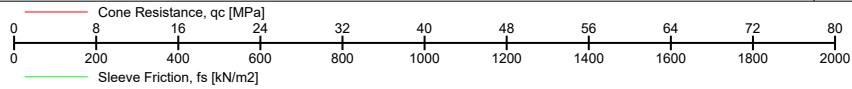
Twyford Embankment Landscape Earthworks Conceptual Site Model
1MC06-CEK-EV-NOT-CS06_CL10-000005
Rev.C01

CPT Geology Log

Borehole No
ML081-CT001

Sheet 1 of 1

Project Name ASC C2 & C3 Controlled Data	Project No C2-C3-CONT-ASC	Co-ords: 467444.66 - 226350.00	Cone Used: S15-CFIP.0915	Hole Type IP+CPT
Location: 1MC06 North Portal of Chiltern Tunnels to Brackley & 1MC07 Brackley to Long Itchington Wood Green Tunnel South Portal	Level: 85.48 m AOD	CPT Rig: 20.5 Tonne Track-Truck Mounted CPT Unit +Insulated Hand Tools	Scale 1:100	Logged By JC
Client: HS2	Dates: 15/06/2017 - 23/06/2017	Operator: UK15+Craig Blackett		





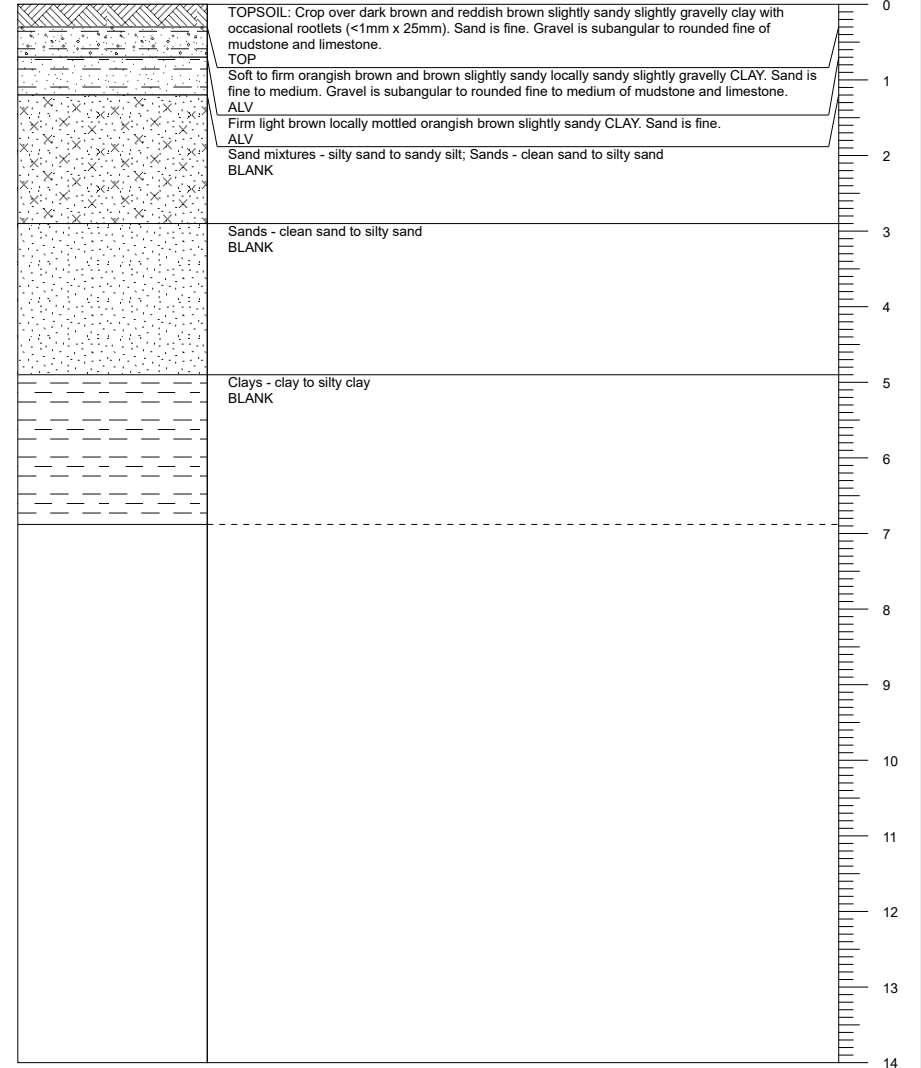
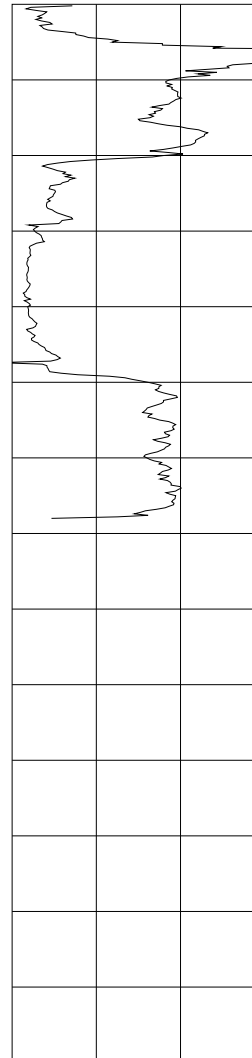
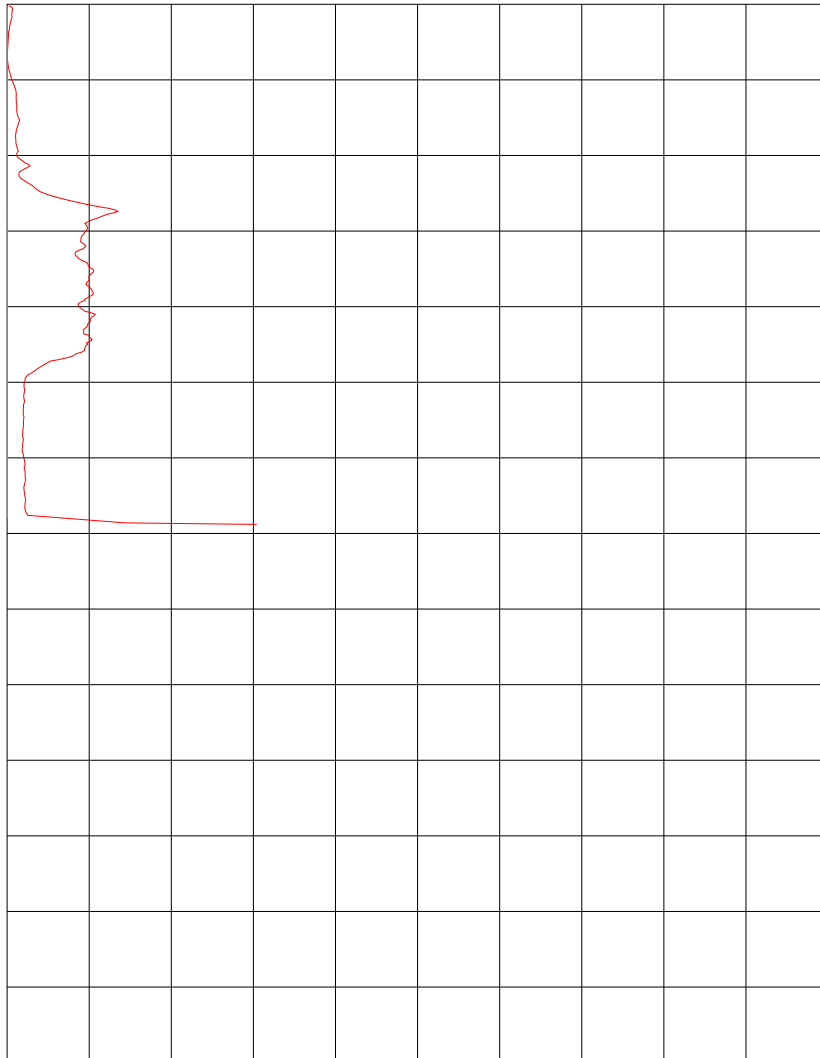
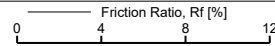
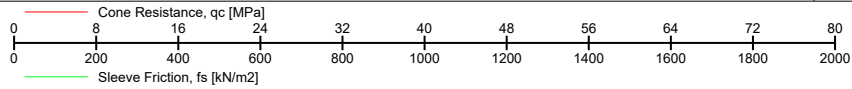
Twyford Embankment Landscape Earthworks Conceptual Site Model
1MC06-CEK-EV-NOT-CS06_CL10-000005
Rev.C01

CPT Geology Log

Borehole No
ML081-CT400

Sheet 1 of 1

Project Name ASC C2 & C3 Controlled Data	Project No C2-C3-CONT-ASC	Co-ords: 467179.91 - 226525.72	Cone Used: S15-CFIP.1528	Hole Type IP+CPT
Location: 1MC06 North Portal of Chiltern Tunnels to Brackley & 1MC07 Brackley to Long Itchington Wood Green Tunnel South Portal	Level: 84.05 m AOD	CPT Rig: Insulated Hand Tools	Scale 1:100	Logged By JP
Client: HS2	Dates: 26/06/2019 - 26/06/2019	Operator:		





Inspection Pit Log

Final data

ML081-HP003

Project
ASC C2 & C3 Controlled
Data
HS2

Project No.
C2-C3-CONT-ASC
Easting (OSGB)
467148.40

Ground Level (mAOD)
86.50
Northing (SnakeGrid)
226387.78

GI Phase
HS2 Main GI
Asset Group

Calvert Cutting Group

Chainage (SG Grid)

Offset
-127 m

Start Date
20/09/2017
End Date
20/09/2017

Scale
1:10
Sheet 1 of 1

SAMPLES		TESTS				Water Strikes	STRATA			Depth (Thickness)	Level	Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results	PI		Description	Legend	Geol Code1			
0.10	D1						TOPSOIL: Brown slightly gravelly sandy clay. Factual Geolcode [TOP] Factual Geolcode 2 [C] Geology Code 3 [TOP-C Z]			(0.20)		
0.20	D2						Stiff grey mottled brown sandy CLAY with occasional rootlets. Factual Geolcode [ALV] Factual Geolcode 2 [C] Geology Code 3 [ALV-C Z]			0.20	86.30	
0.25 - 0.50	B3											
0.50	ES4	0.50	PID	<1ppm						(0.60)		
0.50 - 0.80	LB5											
0.55	D6											
0.80	D7						Firm grey mottled brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of flint and limestone. Factual Geolcode [ALV] Factual Geolcode 2 [C] Geology Code 3 [ALV-C Z]			0.80	85.70	
1.00	ES8	1.00	PID	<1ppm						(0.70)		
1.00 - 1.30	LB9											
1.50	D10									1.50	85.00	

PLAN DETAILS						Remarks
0.7 0.6 Long Axis Orientation: Shoring / Support: None Stability: Stable Groundwater (description):						1. PAS 128 Type B survey conducted over position
						THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.
						Termination Depth: 1.50m Achieved Scheduled Depth



Unless otherwise stated:
Depth (m), Diameter (mm), Time (hhmm),
Thickness (m), Level (mOD).

Equipment Used
Insulated Hand Tools

Contractor

Logged By
PS
Checked By

HS2 Trial Pit Log

FINAL-MON

ML081-TP401

Project
ASC C2 & C3 Controlled Data
Client
HS2

Project No.
C2-C3-CONT-ASC
Easting (OSGB)
467150.74

Ground Level (mAOD)
83.88
Northing (OSGB)
226524.97

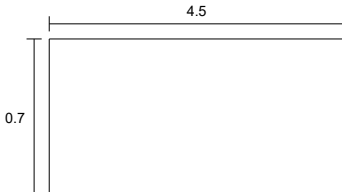
GI Phase
ASC Scheme GI
Asset Group
Twyford Embankment Group

Chainage (SG Grid)
Offset
-17

Start Date
17/04/2019
End Date
17/04/2019

Scale
1:25
Sheet 1 of 1

SAMPLES		TESTS				Water Strikes	STRATA			Depth (Thickness)	Level	Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results	PI		Description	Legend	Geol Code1			
0.00 - 0.35	LB1						TOPSOIL: Dark brown slightly sandy slightly gravelly clay with frequent rootlets (<1mm x 30mm). Sand is fine to medium. Gravel is subangular to rounded fine to medium of mudstone and limestone. Factual Geolcode [TOP] Factual Geolcode 2 [C] Geology Code 3 [TOP-C Z]			(0.35)		
0.20 - 0.30	D2						Firm orangish brown and greyish brown locally gravelly fine to medium SAND. Gravel is subrounded to rounded fine to medium of mudstone and limestone. Factual Geolcode [TILMP] Factual Geolcode 2 [C] Geology Code 3 [TILMP-C Z] from 0.60m to 1.60m sandy slightly gravelly clay. Sand is fine to medium. Gravel is subrounded to rounded fine to medium of mudstone			0.35	83.53	
0.50 - 0.60	D3	0.50	HV(1)	84(27)kPa	PL 18							
0.60 - 0.90	LB4	0.50	HV(2)	87(33)kPa	LL 32							
		0.50	HV(3)	93(30)kPa	PI 14							
					NMC 18							
0.90 - 1.00	D5						from 0.90m to 1.60m with occasional weathered ironstone nodules (<2mm x 2mm)			(1.25)		
		1.00	HV(1)	78(36)kPa								
		1.00	HV(2)	81(33)kPa								
		1.00	HV(3)	90(36)kPa								
1.40 - 1.50	D6											
		1.50	HV(1)	75(27)kPa								
1.60 - 1.90	LB7	1.50	HV(2)	81(27)kPa								
		1.50	HV(3)	84(33)kPa								
1.90 - 2.00	D8						Stiff greenish grey and orangish brown slightly sandy CLAY with rare to occasional partially decomposed rootlets (<1mm x 30mm). Sand is fine to medium. Factual Geolcode [TILMP] Factual Geolcode 2 [C] Geology Code 3 [TILMP-C Z]			1.60	82.28	
		2.00	HV(1)	93(39)kPa								
		2.00	HV(2)	96(39)kPa								
		2.00	HV(3)	99(36)kPa								
2.40 - 2.50	D9											
		2.50	HV(1)	84(30)kPa								
2.60 - 2.90	LB10	2.50	HV(2)	84(36)kPa								
		2.50	HV(3)	99(30)kPa								
2.90 - 3.00	D11						Orangish brown and brownish grey clayey fine to medium SAND with a few to frequent lenses (<30mm x 50mm) of fine to medium sandy clay. Factual Geolcode [GFDMP] Factual Geolcode 2 [S] Geology Code 3 [GFDMP-S V SV]			2.60	81.28	
		3.00	HV(1)	()kPa								
3.40 - 3.50	D12											
3.50 - 3.80	LB13	3.50	HV(1)	()kPa	PL 10		from 3.50m to 4.00m slightly gravelly very clayey fine to medium sand. Gravel is subrounded to rounded fine to medium of mudstone					
					LL 26							
					PI 16							
					NMC 22							
3.90 - 4.00	D14									4.00	79.88	

PLAN DETAILS						Remarks	
 Long Axis Orientation: 0 Shoring / Support: None Stability: All faces stable Groundwater (description):						1. PAS 128 Type B survey conducted over position. 2. Water seepage observed at 3.00m. THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG. Termination Depth: 4.00m Achieved Scheduled Depth.	



Unless otherwise stated:
Depth (m), Diameter (mm), Time (hhmm),
Thickness (m), Level (mOD).

Equipment Used
JCB Excavator

Contractor

Logged By Checked By

JP

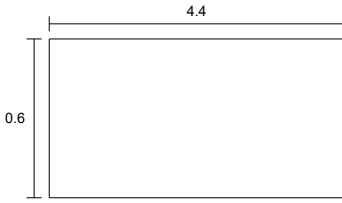
HS2 Trial Pit Log

FINAL

ML081-TP407

Project ASC C2 & C3 Controlled Data	Project No. C2-C3-CONT-ASC	Ground Level (mAOD) 85.53	GI Phase ASC Detailed GI	Chainage (SG Grid) Offset 8	Start Date 06/10/2020 End Date 06/10/2020	Scale 1:25
Client HS2	Easting (OSGB) 467332.51	Northing (OSGB) 226414.91	Asset Group Calvert Cutting Group			Sheet 1 of 1

SAMPLES		TESTS				Water Strikes	STRATA			Depth (Thickness)	Level	Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results	PI		Description	Legend	Geol Code1			
0.05 - 0.20 0.05 - 0.20	D2 ES1	0.05	PID	<1ppm			TOPSOIL: Grass over dark brown slightly sandy slightly gravelly clay. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone. Occasional rootlets. Factual Geolcode [TOP] Factual Geolcode 2 [C] Geology Code 3 [TOP-C Z]			(0.30)		
0.30 - 0.50 0.30 - 0.50 0.30 - 0.70	B5 D4 ES3	0.20 0.30	PID PID	<1ppm <1ppm	PL 21 LL 60 PI 39 NMC 27		Firm light orangish brown mottled bluish grey slightly sandy CLAY. Sand is fine to coarse. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			0.30	85.23	
		0.50 0.50 0.50 0.50	PID HV(1) HV(2) HV(3)	<1ppm 42(0)kPa 45(3)kPa 51(3)kPa								
0.80 - 1.00	D6				NMC 16							
		1.00 1.00 1.00	HV(1) HV(2) HV(3)	51(3)kPa 57(0)kPa 63(6)kPa								
1.30 - 1.50 1.30 - 1.50 1.30 - 1.50	B9 D8 ES7	1.30	PID	<1ppm						(2.00)		
		1.50 1.50 1.50 1.50	PID HV(1) HV(2) HV(3)	<1ppm 51(3)kPa 52(6)kPa 57(6)kPa								
1.80 - 2.00	D10											
		2.00 2.00 2.00	HV(1) HV(2) HV(3)	51(0)kPa 51(3)kPa 57(6)kPa								
2.30 - 2.50 2.30 - 2.50	B12 D11				PL 24 LL 61 PI 37 NMC 26		Firm bluish grey slightly sandy CLAY with occasional gypsum crystals. Sand is fine to medium. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			2.30	83.23	
		2.50 2.50 2.50	HV(1) HV(2) HV(3)	57(6)kPa 60(6)kPa 68(3)kPa								
2.80 - 3.00	D13				NMC 15							
		3.00 3.00 3.00	HV(1) HV(2) HV(3)	57(3)kPa 63(3)kPa 65(3)kPa						(1.70)		
3.30 - 3.50 3.30 - 3.50	B15 D14											
		3.50 3.50 3.50	HV(1) HV(2) HV(3)	65(0)kPa 68(6)kPa 68(6)kPa								
3.80 - 4.00	D16											
		4.00 4.00 4.00	HV(1) HV(2) HV(3)	63(0)kPa 63(6)kPa 68(3)kPa						4.00	81.53	

PLAN DETAILS				Remarks
				1. PAS 128 Type B survey conducted over position. 2. No groundwater encountered. 3. Trial pit backfilled upon completion.
				THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.
				Termination Depth: 4.00m Achieved Scheduled Depth

HS2 Trial Pit Log

FINAL

ML081-TP408

Project ASC C2 & C3 Controlled Data	Project No. C2-C3-CONT-ASC	Ground Level (mAOD) 84.39	GI Phase ASC Detailed GI	Chainage (SG Grid)	Start Date 20/10/2021	Scale 1:25
Client HS2	Easting (OSGB) 467326.67	Northing (OSGB) 226268.46	Asset Group Calvert Cutting Group	Offset -110	End Date 20/10/2021	Sheet 1 of 1

SAMPLES		TESTS				Water Strikes	STRATA			Depth (Thickness)	Level	Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results	PI		Description	Legend	Geol Code1			
0.10 0.10 - 0.40 0.15	D1 B3 ES2	0.15	PID	<1ppm			TOPSOIL: Grass over brown sandy clay with occasional rootlets. Sand is fine to coarse. Factual Geolcode [TOP] Factual Geolcode 2 [C] Geology Code 3 [TOP-C Z]			(0.40)		
0.50 0.55	D4 ES5	0.50 0.50 0.50 0.55	HV(1) HV(2) HV(3) PID	58(32)kPa 60(31)kPa 63(34)kPa <1ppm	PL 23 LL 50 PI 27 NMC 34		Firm mottled grey and orangish brown slightly sandy CLAY with occasional rootlets. Sand is fine to coarse. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			0.40	83.99	
1.00 - 2.00	B6	1.00 1.00 1.00	HV(1) HV(2) HV(3)	77(21)kPa 81(21)kPa 84(23)kPa						(1.60)		
1.50	D7	1.50 1.50 1.50	HV(1) HV(2) HV(3)	73(23)kPa 74(21)kPa 81(28)kPa								
2.00 - 3.00	B8	2.00 2.00 2.00	HV(1) HV(2) HV(3)	80(20)kPa 81(18)kPa 86(25)kPa	PL 23 LL 55 PI 32 NMC 32		Stiff grey slightly sandy CLAY with occasional shell fragments to fine gravel size. Sand is fine to coarse. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			2.00	82.39	
2.50	D9	2.50 2.50 2.50	HV(1) HV(2) HV(3)	81(20)kPa 83(23)kPa 86(26)kPa						(1.50)		
3.00		3.00 3.00 3.00	HV(1) HV(2) HV(3)	77(23)kPa 81(18)kPa 88(21)kPa								
3.50 - 4.00	B10	3.40 3.40 3.40	HV(1) HV(2) HV(3)	88(25)kPa 91(23)kPa 91(26)kPa			Very stiff grey slightly sandy CLAY with frequent to abundant shell fragments, ammonites and bivalves to medium gravel size (<30mm). Sand is fine to coarse. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			3.50 (0.50)	80.89	
4.00	D11	4.00 4.00 4.00	HV(1) HV(2) HV(3)	93(25)kPa 96(28)kPa 99(23)kPa						4.00	80.39	

PLAN DETAILS						Remarks	
						1. PAS 128 Type B survey conducted over position.	
						THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.	Termination Depth: 4.00m Achieved Scheduled Depth

HS2 Trial Pit Log

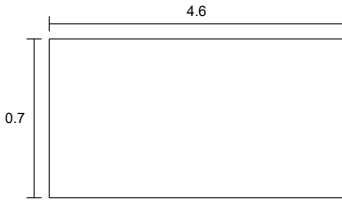
FINAL-MON

ML081-TP410

Project ASC C2 & C3 Controlled Data	Project No. C2-C3-CONT-ASC	Ground Level (mAOD) 85.32	GI Phase ASC Scheme GI	Chainage (SG Grid)	Start Date 17/04/2019	Scale 1:25
Client HS2	Easting (OSGB) 467439.42	Northing (OSGB) 226281.79	Asset Group Calvert Cutting Group	Offset -28	End Date 17/04/2019	Sheet 1 of 1

SAMPLES		TESTS				Water Strikes	STRATA			Depth (Thickness)	Level	Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results	PI		Description	Legend	Geol Code1			
0.00 - 0.30	LB1						TOPSOIL: Grass over dark brown and brown slightly sandy slightly gravelly clay with frequent rootlets (<1mm x 30mm). Sand is fine. Gravel is subrounded to rounded fine to medium of mudstone and limestone. Factual Geolcode [TOP] Factual Geolcode 2 [C] Geology Code 3 [TOP-C Z]			(0.30)		
0.10 - 0.20	D2						Firm greenish grey and orangish brown slightly sandy CLAY. Sand is fine to medium. Factual Geolcode [TILMP] Factual Geolcode 2 [C] Geology Code 3 [ALV-C Z]			0.30	85.02	
0.50 - 0.60	D3	0.50	HV(1)	81(30)kPa	PL 23							
0.60 - 0.90	LB4	0.50	HV(2)	87(24)kPa	LL 66							
		0.50	HV(3)	99(24)kPa	PI 43	NMC 35						
0.90 - 1.00	D5						from 0.90m to 1.40m orangish brown			(1.30)		
1.40 - 1.50	D6				PL 32		from 1.40m to 1.60m soft to firm greyish brown and orangish brown					
1.60 - 1.90	LB7	1.50	HV(1)	72(21)kPa	LL 61	PI 29				1.60	83.72	
		1.50	HV(2)	75(27)kPa		NMC 39						
		1.50	HV(3)	81(33)kPa			Firm greyish brown and greenish grey locally mottled yellowish brown slightly sandy slightly gravelly CLAY with occasional partially decomposed rootlets (<1mm x 15mm). Sand is fine to medium. Gravel is subangular to rounded fine of limestone and mudstone. Factual Geolcode [TILMP] Factual Geolcode 2 [C] Geology Code 3 [ALV-C Z]					
1.90 - 2.00	D8						from 1.90m to 2.70m rare to occasional weathered ironstone nodules (<2mm x 2mm)			(1.10)		
		2.00	HV(1)	81(27)kPa								
		2.00	HV(2)	87(30)kPa								
		2.00	HV(3)	90(24)kPa								
2.40 - 2.50	D9											
		2.50	HV(1)	78(27)kPa								
		2.50	HV(2)	90(24)kPa								
		2.50	HV(3)	99(27)kPa								
2.70 - 3.00	LB10						Stiff to very stiff locally thinly laminated bluish grey slightly sandy CLAY. Sand is fine. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			2.70	82.62	
3.00 - 3.10	D11	3.00	HV(1)	117(27)kPa								
		3.00	HV(2)	129(33)kPa								
		3.00	HV(3)	135(30)kPa								
3.40 - 3.50	D12						from 3.30m to 4.00m stiff to very stiff			(1.30)		
3.50 - 3.80	LB13	3.50	HV(1)	135(45)kPa			from 3.40m to 4.00m brown and greyish brown. Rare to occasional fossilised shell fragments (<2mm x 2mm)					
		3.50	HV(2)	144(42)kPa								
		3.50	HV(3)	150(45)kPa								
3.90 - 4.00	D14									4.00	81.32	

PLAN DETAILS

 Long Axis Orientation: Shoring / Support: None Stability: All faces stable Groundwater (description):		Remarks
		1. PAS 128 Type B survey conducted over position. 2. No groundwater encountered.
		THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.
		Termination Depth: 4.00m Achieved Scheduled Depth.



Unless otherwise stated:
Depth (m), Diameter (mm), Time (hhmm),
Thickness (m), Level (mOD).

Equipment Used
JCB Excavator

Contractor

Logged By
JP

Checked By

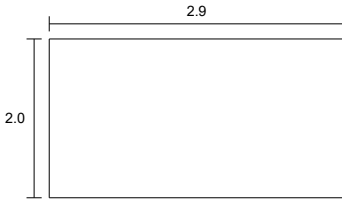
HS2 Trial Pit Log

FINAL

ML081-TP426

Project ASC C2 & C3 Controlled Data	Project No. C2-C3-CONT-ASC	Ground Level (mAOD) 83.30	GI Phase ASC Detailed GI	Chainage (SG Grid)	Start Date 07/10/2020	Scale 1:25
Client HS2	Easting (OSGB) 467104.23	Northing (OSGB) 226541.76	Asset Group Twyford Embankment Group	Offset -31	End Date 07/10/2020	Sheet 1 of 1

SAMPLES		TESTS				Water Strikes	STRATA			Depth (Thickness)	Level	Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results	PI		Description	Legend	Geol Code1			
0.05 - 0.20 0.05 - 0.20	D2 ES1	0.05	PID	<1ppm			TOPSOIL: Grass over dark brown slightly sandy slightly gravelly clay. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of sandstone and quartz. Occasional rootlets. Factual Geolcode [TOP] Factual Geolcode 2 [C] Geology Code 3 [TOP-C Z]			(0.30)		
0.30 - 0.50 0.30 - 0.50 0.30 - 0.50	B5 D4 ES3	0.20 0.30	PID PID	<1ppm	PL 13 LL 29 PI 16 NMC 15 NMC 21		Firm light orangish brown mottled bluish grey slightly gravelly sandy clayey SILT. Sand is fine to coarse. Gravel subangular to rounded fine to coarse of sandstone, quartz and limestone. Factual Geolcode [RTD1] Factual Geolcode 2 [Z] Geology Code 3 [RTD1-Z]			0.30	83.00	
		0.50 0.50 0.50 0.50	PID HV(1) HV(2) HV(3)	<1ppm 42(0)kPa 42(3)kPa 51(0)kPa								
0.80 - 1.00	D6				NMC 15							
		1.00 1.00 1.00	HV(1) HV(2) HV(3)	42(3)kPa 45(0)kPa 48(3)kPa								
1.30 - 1.50 1.30 - 1.50 1.30 - 1.50	B9 D8 ES7	1.30	PID	<1ppm								
		1.50 1.50 1.50 1.50	PID HV(1) HV(2) HV(3)	<1ppm 39(3)kPa 42(6)kPa 51(3)kPa						(2.50)		
1.80 - 2.00	D10				NMC 15							
		2.00 2.00 2.00	HV(1) HV(2) HV(3)	51(3)kPa 54(3)kPa 54(6)kPa								
2.30 - 2.50 2.30 - 2.50	B12 D11				PL 16 LL 40 PI 24 NMC 23							
		2.50 2.50 2.50	HV(1) HV(2) HV(3)	51(3)kPa 54(9)kPa 57(9)kPa								
2.80 - 2.90 2.80 - 2.90	B14 D13				LL 26 NMC 12		Light orangish brown slightly clayey fine to coarse SAND and subangular to rounded fine to coarse GRAVEL of sandstone, quartz and limestone. Factual Geolcode [RTD1] Factual Geolcode 2 [SV] Geology Code 3 [RTD1-S V SV]			2.80 (0.10) 2.90	80.50 80.40	

PLAN DETAILS						Remarks	
						1. PAS 128 Type B survey conducted over position.	
						THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.	Termination Depth: 2.90m Pit collapsing

HS2 Trial Pit Log

FINAL**ML081-TP448**

Project
ASC C2 & C3 Controlled Data
Client
HS2

Project No.
C2-C3-CONT-ASC
Easting (OSGB)
467124.15

Ground Level (mAOD)
87.30
Northing (OSGB)
226413.57

GI Phase
ASC Detailed GI
Asset Group
Calvert Cutting Group

Chainage (SG Grid)
Offset
-122

Start Date
05/08/2021
End Date
05/08/2021

Scale
1:25

Sheet 1 of 1

SAMPLES		TESTS				Water Strikes	STRATA			Depth (Thickness)	Level	Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results	PI		Description	Legend	Geol Code1			
0.00 - 0.50	B2						TOPSOIL: Grass over dark brown slightly gravelly clayey fine to coarse sand with frequent rootlets. Gravel is subangular to subrounded fine to coarse of flint. Factual Geolcode [TOP] Factual Geolcode 2 [S] Geology Code 3 [TOP-S V SV]			(0.36)		
0.10	D1											
0.36	D3						Firm closely fissured grey mottled orangish brown slightly gravelly CLAY with rare rootlets. Gravel is subangular to subrounded fine to medium of flint. Fissures are randomly orientated. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			0.36	86.94	
		0.50	HV(1)	106(34)kPa								
		0.50	HV(2)	117(36)kPa								
		0.50	HV(3)	126(36)kPa								
0.80 - 1.20	B4				PL 24 LL 68 PI 44 NMC 33					(0.84)		
		1.00	HV(1)	120(31)kPa								
		1.00	HV(2)	126(36)kPa								
		1.00	HV(3)	134(39)kPa								
1.20	D5				PL 25 LL 56 PI 31 NMC 27		Stiff closely fissured orangish brown mottled grey slightly sandy CLAY with occasional pockets of orangish brown and grey fine to medium sand (up to 40mm x 20mm). Sand is fine to medium. Fissures are randomly orientated. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			1.20	86.10	
1.50 - 2.00	B6									(0.80)		
2.00	D7						Firm thinly laminated dark brown to orangish brown CLAY with abundant iron staining and rare pockets of orangish brown silt dusting (up to 30mm x 10mm). Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			2.00	85.30	
		2.00	HV(1)	120(34)kPa								
		2.00	HV(2)	120(39)kPa								
		2.00	HV(3)	129(39)kPa								
2.50 - 2.90	B8									(0.90)		
2.90	D9						Soft thinly laminated dark grey CLAY with frequent orangish brown to dark brown organic matter with odour. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			2.90	84.40	
2.90 - 3.10	B10									(0.20)		
		3.00	HV(1)	100(18)kPa								
		3.00	HV(2)	94(28)kPa								
3.10	D11						Extremely weak to very weak thinly laminated dark grey MUDSTONE with frequent white bivalve fossil shells and 3 No. septarian nodules (up to 700mm x 400mm x 100mm). Recovered as angular to subangular fine to coarse gravel. Factual Geolcode [OXC] Factual Geolcode 2 [MDST] Geology Code 3 [OXC-MDST]			3.10	84.20	
		3.00	HV(1)	100(18)kPa								
		3.00	HV(2)	94(28)kPa								
		3.00	HV(3)	97(28)kPa								
3.50 - 4.00	B12									(0.90)		
		3.50	HV(1)	132(36)kPa								
		3.50	HV(2)	140(34)kPa								
		3.50	HV(3)	140(42)kPa								
										4.00	83.30	

PLAN DETAILS

0.9

Long Axis Orientation:

0

Shoring / Support: None used

Stability: All faces stable

Groundwater (description):

4.0

Remarks

1. PAS 128 Type B survey conducted over position.

THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.

Termination Depth: 4.00m

Achieved Scheduled Depth



Unless otherwise stated:
Depth (m), Diameter (mm), Time (hhmm),
Thickness (m), Level (mOD).

Equipment Used
360 Excavator

Contractor

Logged By

Checked By

RN



Dynamic Sample Borehole Log

FINAL

ML081-WS010

Project ASC C2 & C3 Controlled Data Client HS2	Project No. C2-C3-CONT-ASC Easting (OSGB) 467407.34	Ground Level (mAOD) 84.82 Northing (SnakeGrid) 226205.65	GI Phase HS2 Main GI Asset Group Calvert Cutting Group	Chainage (Snake grid) -107	Start Date 17/07/2017 End Date 17/07/2017	Scale 1:50
Sheet 1 of 1						

SAMPLES	TESTS				PROGRESS		STRATA			Depth (Thickness)	Level	Install/ Backfill	
Type + Depth	Type + Depth	Results	PI	Water Depth	Date & Time	Casing & Water Depth	Description	Legend	Geol Code1				
(B2) 0.05-0.20 (D1) 0.05							TOPSOIL: Dark brown clay with some rootlets. Factual Geolcode [TOP] Factual Geolcode 2 [C] Geology Code 3 [TOP-C Z]			(0.40)			
(D3) 0.40 (LB4) 0.50-0.80							Firm to stiff brown mottled grey CLAY. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			0.40	84.42		
(LB5) 1.00-1.20													
(D6) 1.30-1.35 (B7) 1.35-2.80										(2.40)			

Type		Type	Results			Water	Date Time	Casing Water	Description							Legend			Depth (Thickness)	Level	Install/Backfill
DRILLING TECHNIQUE				CHISELLING				WATER OBSERVATIONS						HOLE/CASING DIAMETER				WATER ADDED			
From	To	Type	Hard Strata		Duration	Date/Time	Depth Strike	Duration (min)	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)			
0.00	1.20	Inspection Pit										95	3.20								
1.20	5.00	Dynamic Sample										90	4.20								
												70	5.00								

Remarks
1. PAS 128 Type B survey conducted over position. 2. Where structure is not described, such features were not observed in the available samples. 3. No groundwater observed.

THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.															Termination Depth:	5.00m
															Achieved Scheduled Depth	

HS2**Dynamic Sample Borehole
Log****FINAL****ML081-
WS447**

Rev.C01

Project ASC C2 & C3 Controlled Data Client HS2	Project No. C2-C3-CONT-ASC Easting (OSGB) 467321.38	Ground Level (mAOD) 84.28 Northing (SnakeGrid) 226211.97	GI Phase ASC Detailed GI Asset Group Calvert Cutting Group	Chainage (Snake grid) Offset -157	Start Date 17/09/2021 End Date 17/09/2021	Scale 1:50
Sheet 1 of 1						

SAMPLES		TESTS			PROGRESS		STRATA				Depth (Thickness)	Level	Install/ Backfill						
Type + Depth	Type + Depth	Results	PI	Water Depth	Date & Time	Casing & Water Depth	Description	Legend	Geol Code1										
(B2) 0.00-0.30 (D1) 0.00-0.20	SPT(S) 1.20	N=10 (1,1,2,2,3,3)		0.00			TOPSOIL: Grass over brown slightly gravelly sandy clay with plant material. Sand is fine to medium. Gravel is angular to subrounded fine to coarse of flint. Factual Geolcode [TOP] Factual Geolcode 2 [C] Geology Code 3 [TOP-C Z]			(0.20)	84.08								
(B4) 0.40-0.80 (D3) 0.40-0.60							Firm brown slightly sandy CLAY. Sand is fine to coarse. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			0.20									
							Firm light brown mottled orangish brown and creamish grey slightly gravelly CLAY with frequent pockets of fine sand and occasional partly decomposed roots (2mm). Gravel is angular to rounded fine to coarse of flint. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			0.40									
(D5) 1.20 (D6) 1.20-1.65																			
(B13) 1.50-2.00 (D12) 1.70-2.00																			
(D8) 2.00-2.45							SPT(S) 2.00	N=11 (2,2,2,3,3,3)					Firm creamish grey mottled orangish brown CLAY with frequent fine to medium sand pockets and some frequent brown fibrous peat. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			1.80	82.48		
(B15) 2.50-3.00 (D14) 2.80-3.00																		(1.20)	
(D10) 3.00-3.45							SPT(S) 3.00	N=15 (2,2,3,4,4,4)						Stiff fissured grey CLAY, locally with frequent selenite crystals to fine gravel size and shell fragments. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]			3.00	81.28	
(B17) 3.50-4.00 (D16) 3.70-4.00																		(1.00)	
													17/09/2021 16:00	0.00 Dry				4.00	80.28
Type	Type	Results		Water	Date Time	Casing Water	Description	Legend		Depth (Thickness)	Level	Install/Backfill							
DRILLING TECHNIQUE			CHISELLING			WATER OBSERVATIONS				HOLE/CASING DIAMETER				WATER ADDED					
From	To	Type	Hard Strata From	To	Duration	Date/Time	Depth Strike	Duration (min)	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)	
0.00 1.20	1.20 4.00	Inspection Pit Dynamic Sample										87 78	3.00 4.00						

Remarks

1. PAS 128 Type B survey conducted over position.

THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.

Termination Depth: 4.00m

Achieved Scheduled Depth

Unless otherwise stated:
Depth (m), Diameter (mm), Time (hhmm),
Thickness (m), Level (mOD).Equipment Used
Insulated Hand Tools

Contractor

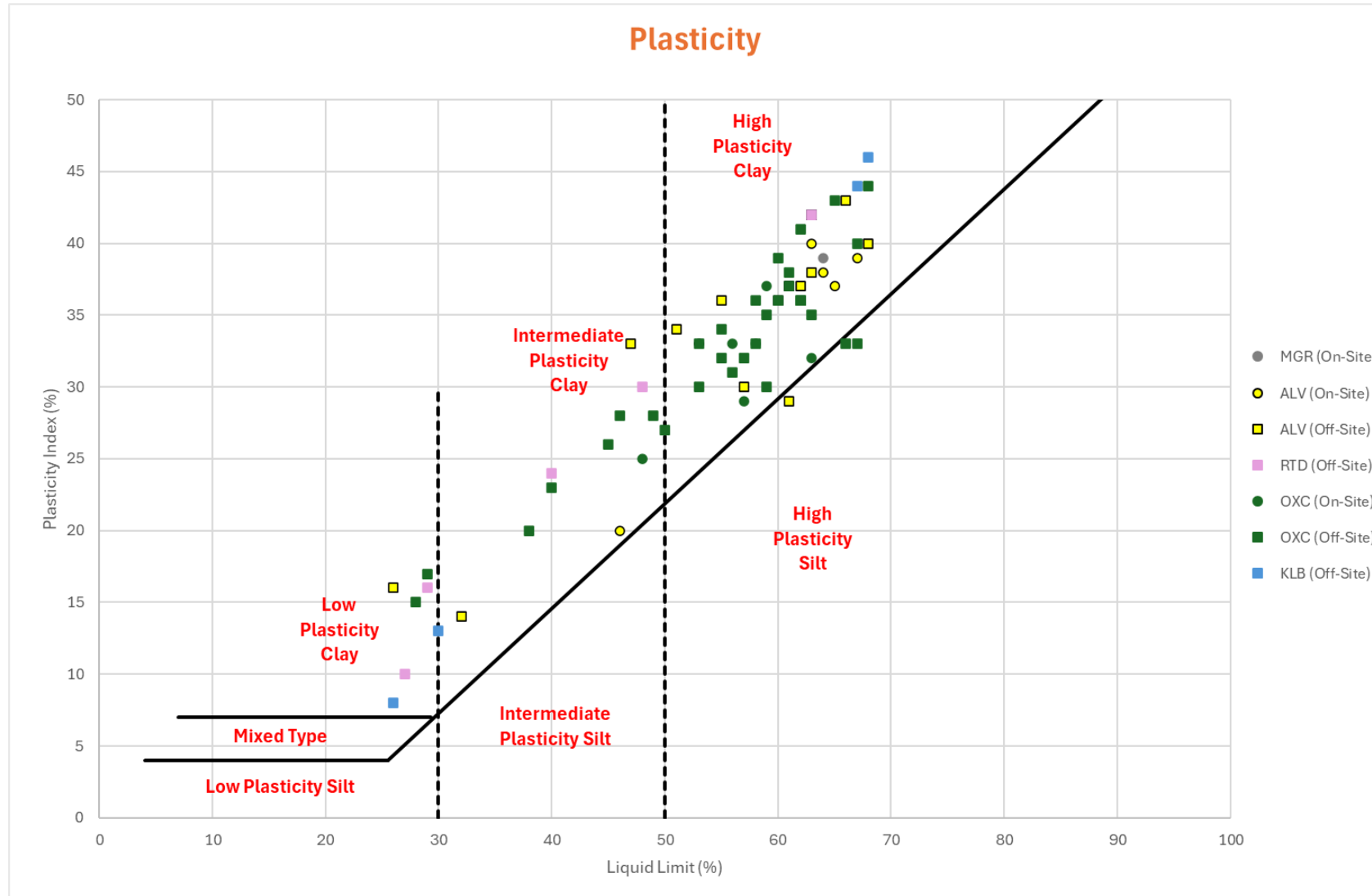
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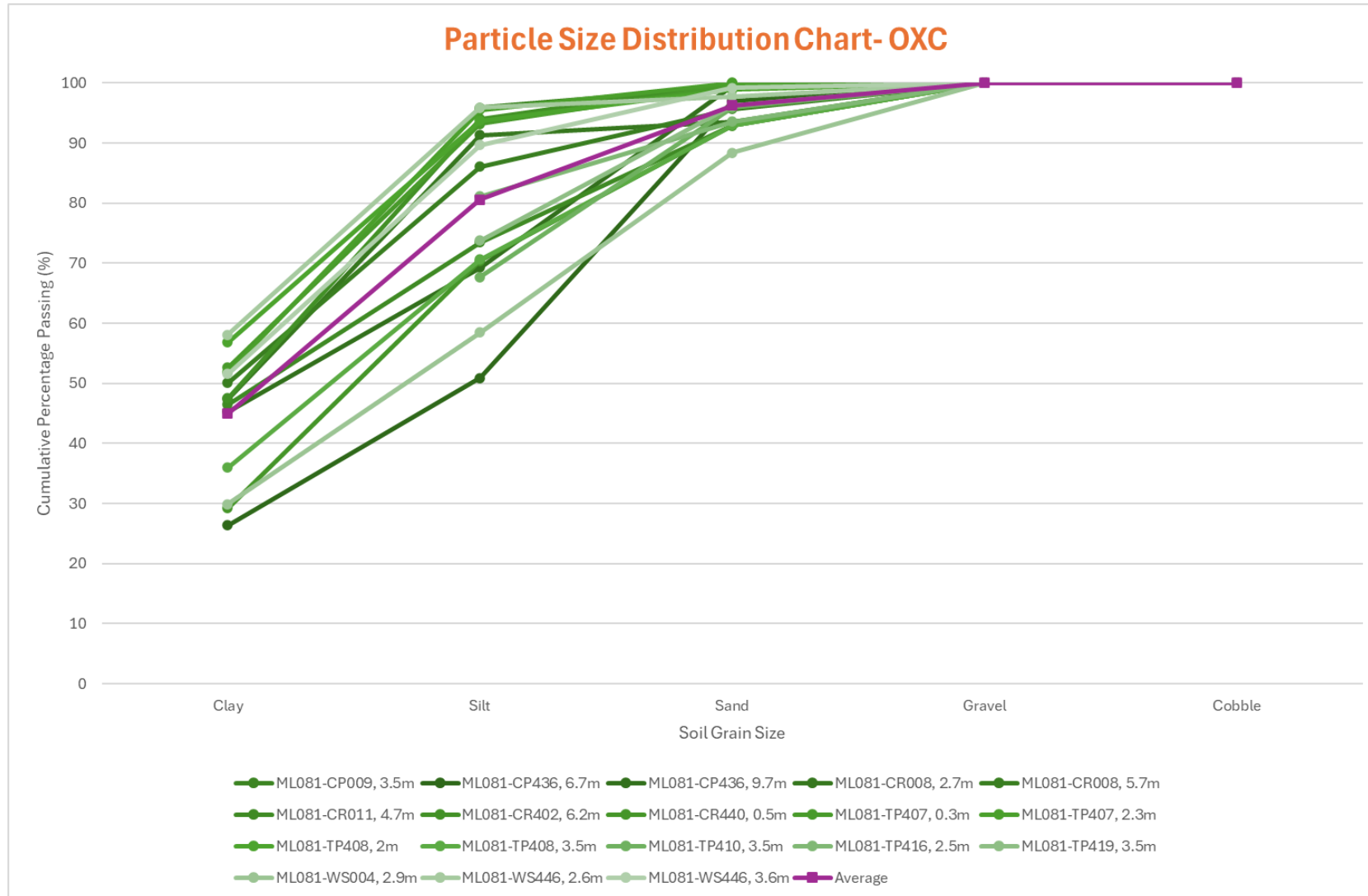
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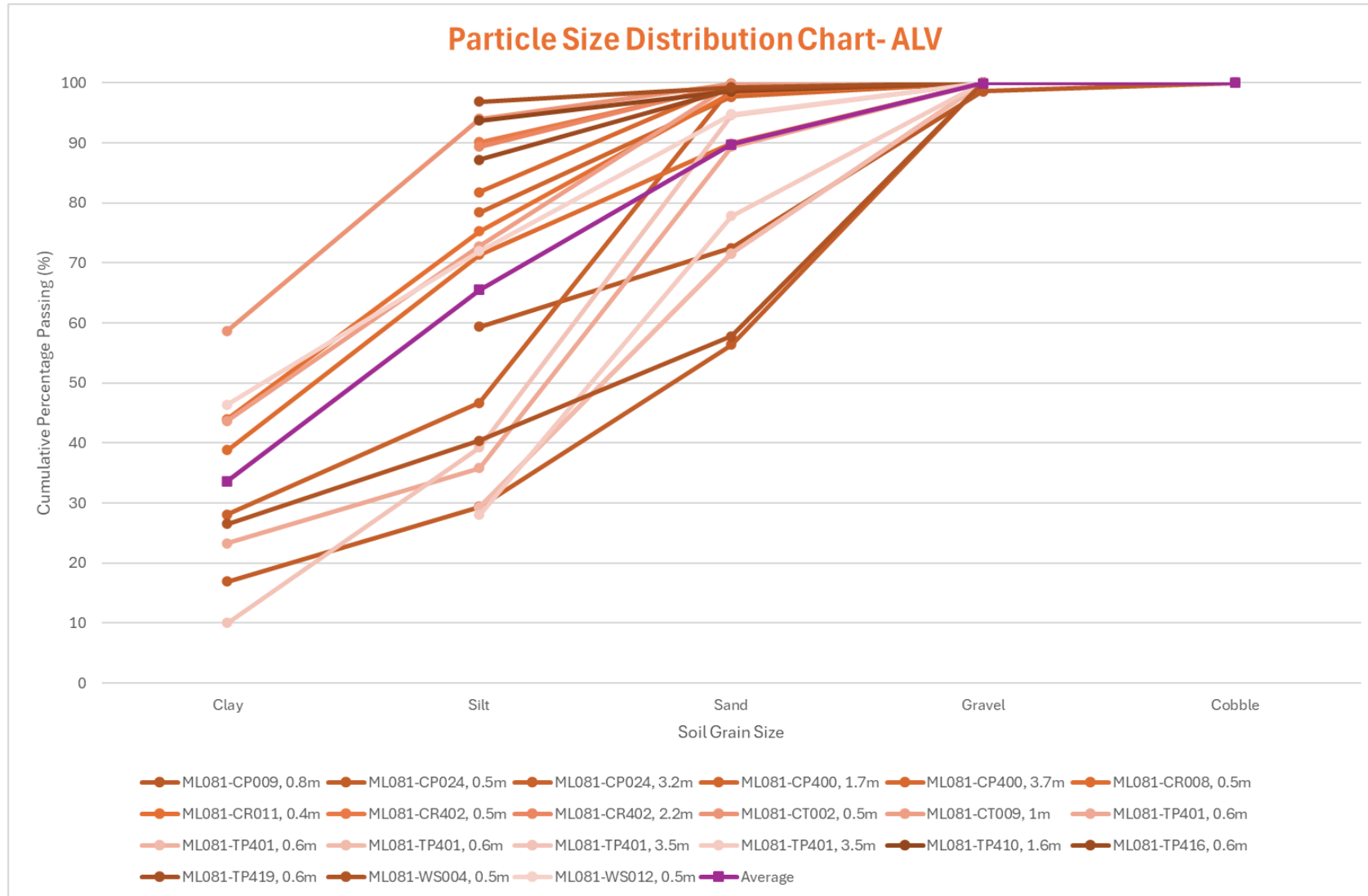
Appendix II-2

ALV, RTD and OXC Soil Classification Figures

03 pages



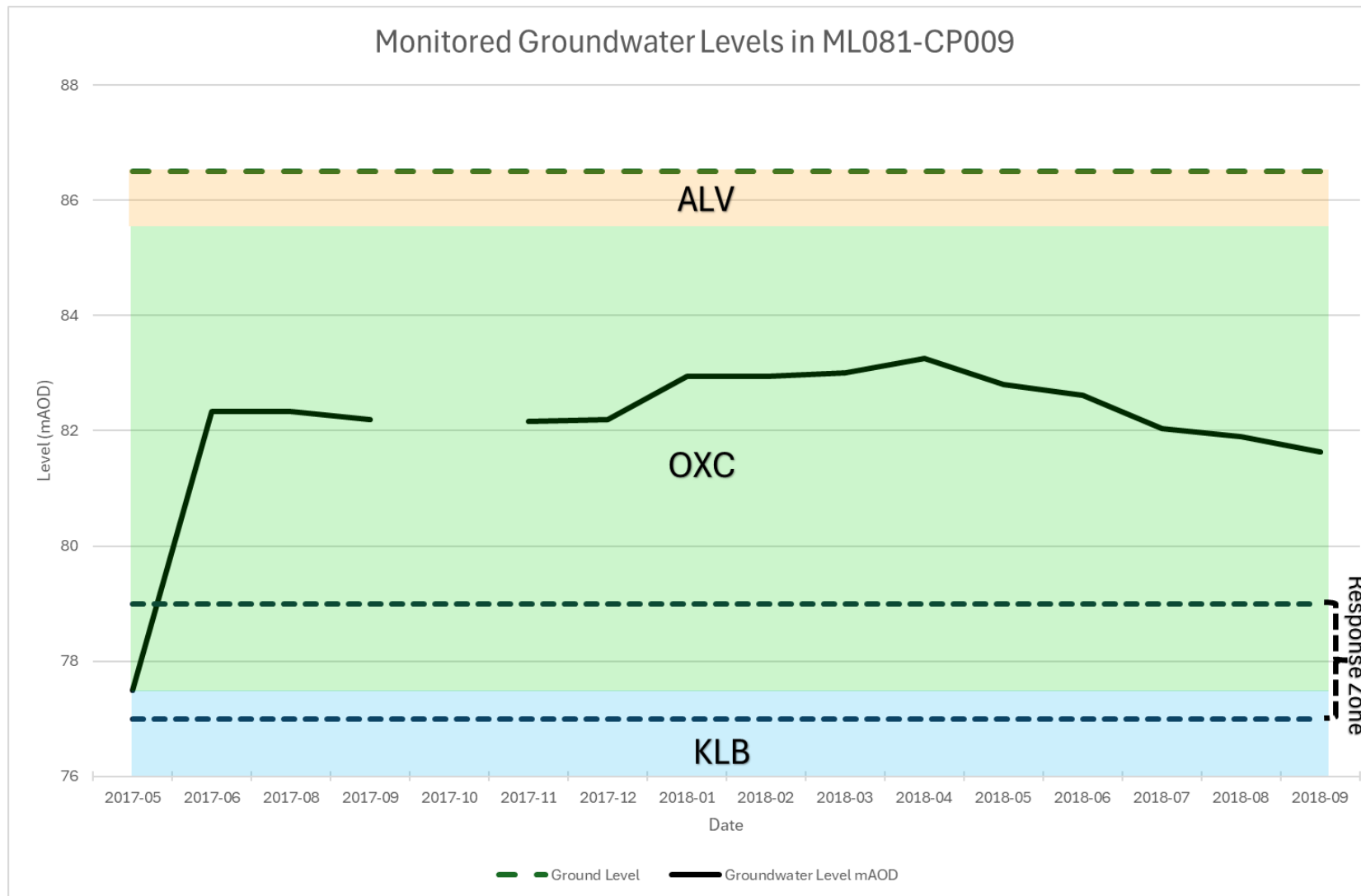


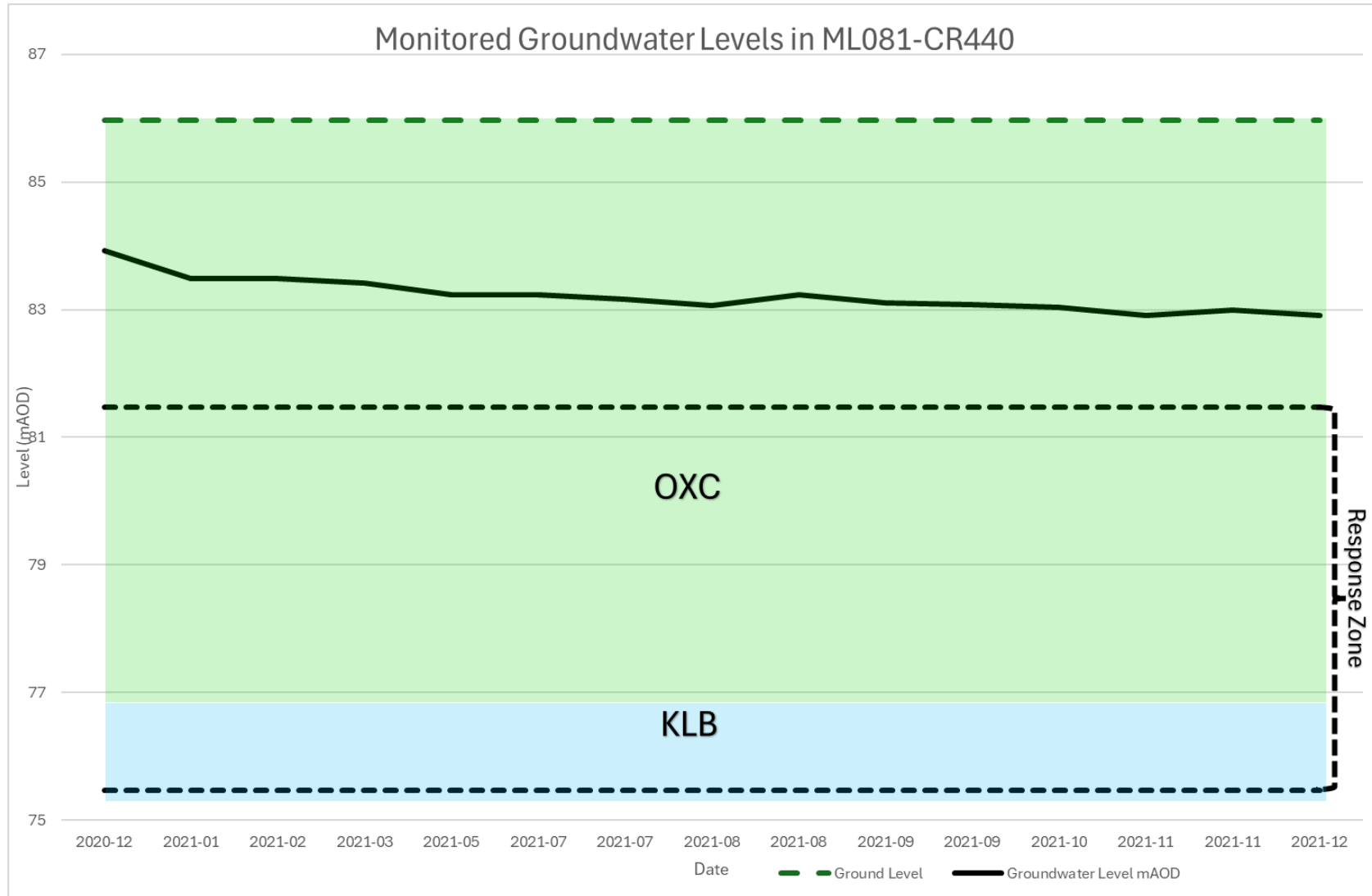


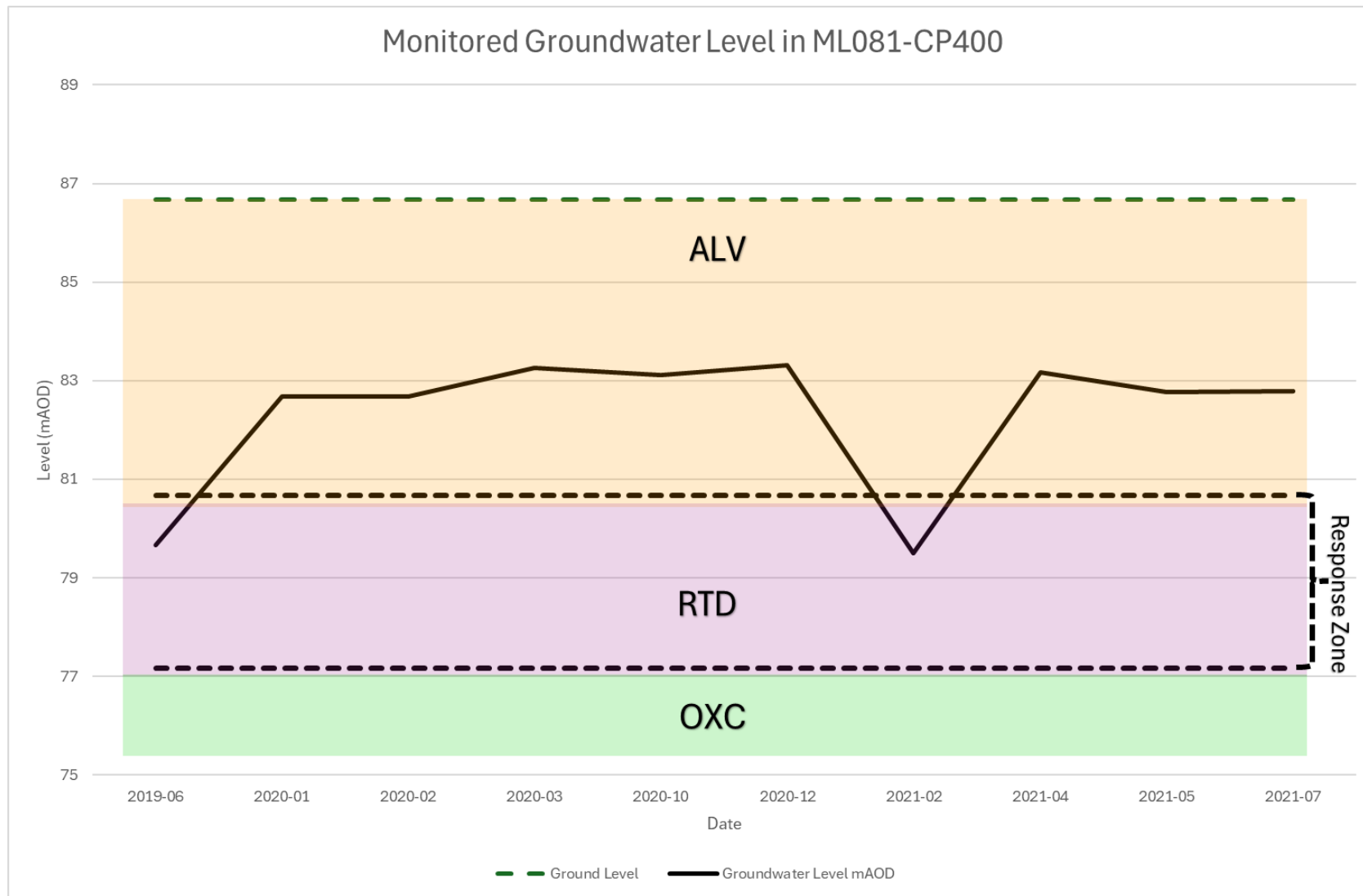
Appendix II-3

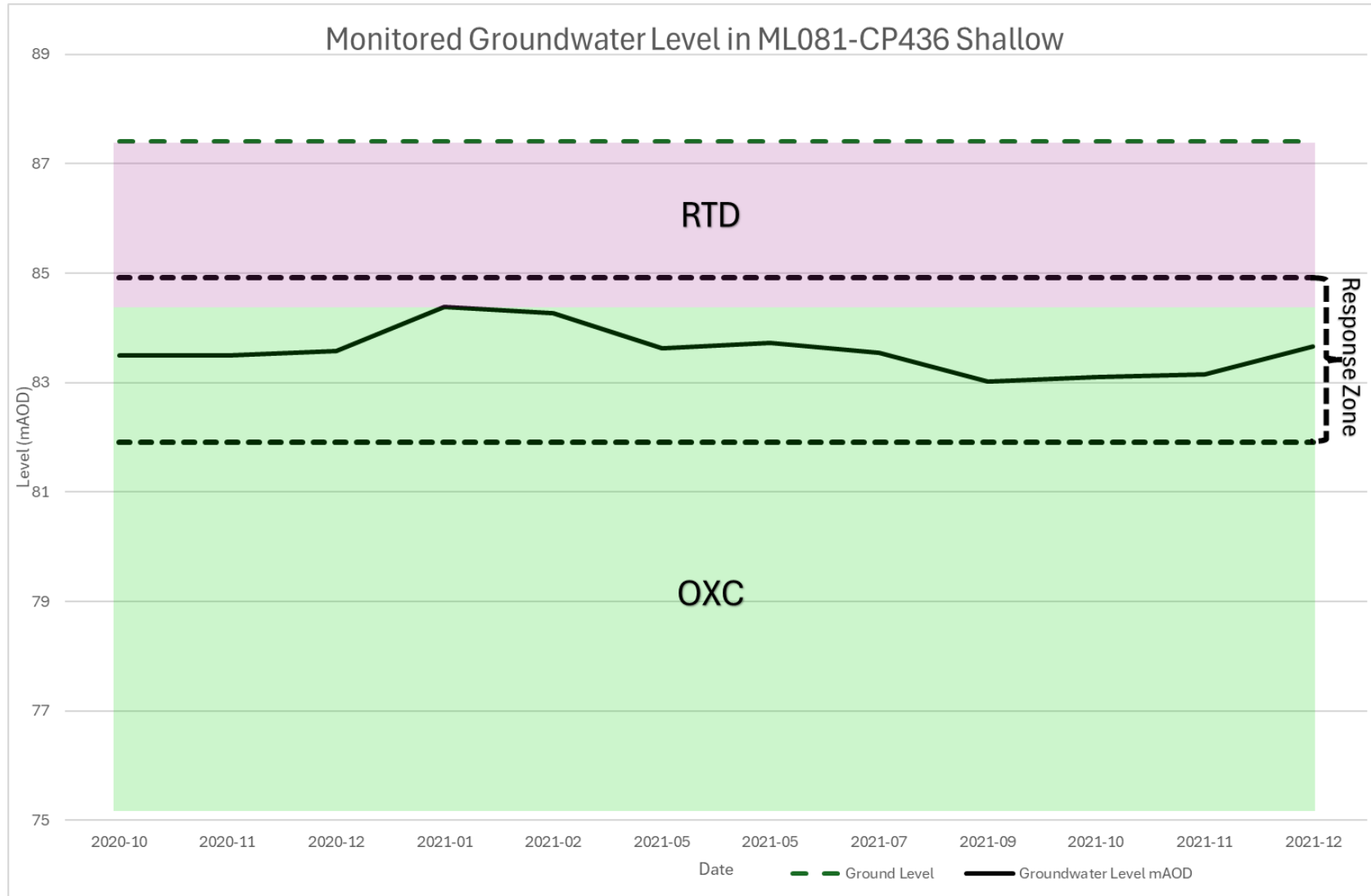
Annotated Groundwater Elevation Graphs

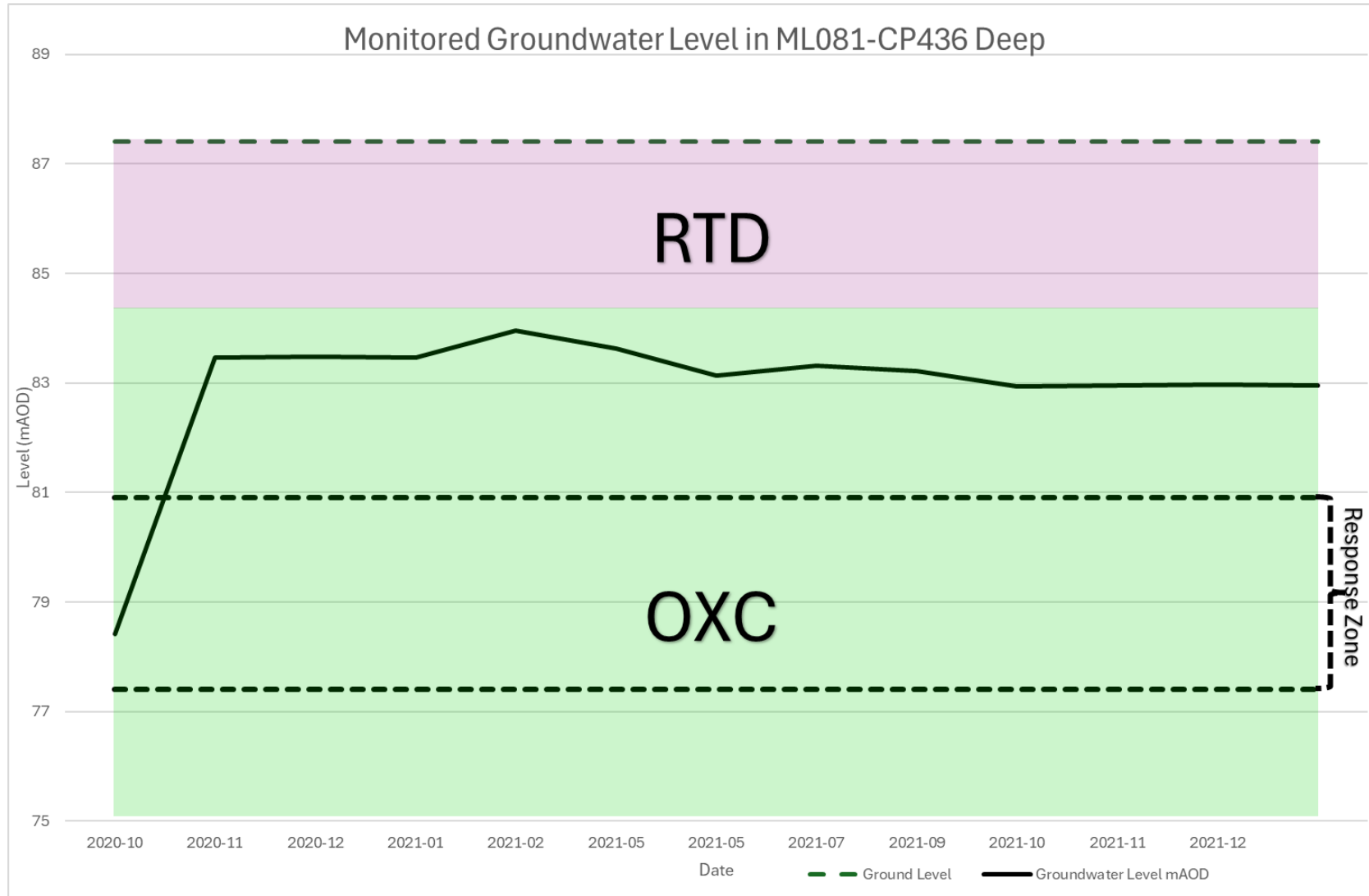
05 pages













A High-Speed Design Partnership



High Speed 2 - 1MC06 - Stage One C2 - MWCC –
North Portal of Chiltern Tunnels to Brackley

Twyford Embankment Landscape Earthworks Conceptual Site Model
1MC06-CEK-EV-NOT-CS06_CL10-000005
Rev.C01

APPENDIX III

III-1 Pre-Remediation Landfill Waste Screened Chemical Data

III-2 Post-Remediation Landfill Waste Screened Chemical Data

III-3 Pre-Remediation / Post-Remediation Comparison

Number of Pages: 04

Appendix III-1

Pre-Remediation Landfill Waste Screened Chemical Data

01 page

Soils Summary Assessment

[illegible]

Notes	
#	Sample deviated holding time for PWRs. Results are not considered to be accurate and removed from the assessment
Red	List of Detection exceeds 1 or more in-use screening criteria
-	No screening value as a containment of concern is not predicted to reach base of the unsaturated zone within 1,000 years
	No result recorded

Appendix III-2

Post-Remediation Landfill Waste Screened Chemical Data

01 page

Notes

#	Sample deviated holding time for PAHs. Results are not considered to be accurate and removed from the assessment.
Red	Limit of Detection exceeds 1 or more re-use screening criteria
-	No screening value as contaminant of concern is not predicted to reach base of the unsaturated zone within 1,000 years
	No result recorded

Appendix III-3

Pre-Remediation / Post-Remediation Comparison

02 pages

Table III Comparison of Pre- and Post- Remediation Chemical Testing against Made Ground Re-use Criteria.

PRE- Remediation (82 samples) - LQ14-02 HS2 GI Data								
Criteria	Aquifer (GW >4mbgl)				Human Health			
	Zone 2b		Allotment		POS park		Commercial/ Industrial	
Chemical Name	# of Exceedances	% of total samples	# of Exceedances	% of total samples	# of Exceedances	% of total samples	# of Exceedances	% of total samples
Arsenic	-	-	9	11%	0	0%	0	0%
Cadmium	-	-	6	7%	0	0%	0	0%
Zinc	-	-	1	1%	0	0%	0	0%
Naphthalene	21	25%	2	2%	0	0%	0	0%
Fluoranthene	-	-	1	1%	0	0%	0	0%
Phenanthrene	-	-	3	4%	0	0%	0	0%
Chrysene	-	-	8	10%	0	0%	0	0%
Benzo(a)anthracene	-	-	10	12%	0	0%	0	0%
Benzo(b)fluoranthene	-	-	25	30%	2	2%	0	0%
Benzo(k)fluoranthene	-	-	0	0%	0	0%	0	0%
Benzo(a)pyrene	-	-	25	30%	2	2%	0	0%
Dibenz(a,h)anthracene	-	-	19	23%	3	4%	0	0%
Indeno(1,2,3-c,d)pyrene	-	-	1	1%	0	0%	0	0%
>EC ₈ -EC ₁₀ Aromatics	4	7%	4	7%	0	0%	0	0%
>EC10-EC12 Aromatics	4	7%	3	5%	0	0%	0	0%
>EC12-EC16 Aromatics	2	3%	4	7%	0	0%	0	0%
>EC16-EC21 Aromatics	1	2%	1	2%	0	0%	0	0%
>EC21-EC35 Aromatics	0	0%	1	2%	0	0%	0	0%
Benzene	2	3%	0	0%	0	0%	0	0%
Asbestos	# Detect	% Detect	Min (% v/v)	Max (% v/v)	Types	Form		
	8	10%	<0.001	Fragment sample	Chrysotile Amosite	Cement Floor Tile Board Fibres		
Total 20								

Key	
-	No SSAC derived as CoC not predicted to reach base of the unsaturated zone within 1,000 years
	Exceedance of Criteria recorded
	Contaminant of Concern
	Exceedance not recorded

POST- Remediation (25 samples) - DUO/Jackson Remediation Data								
Criteria	Aquifer (GW >4mbgl)		Human Health					
	Zone 2b		Allotment		POS park		Commercial/ Industrial	
Chemical Name	# of Exceedances	% of total samples	# of Exceedances	% of total samples	# of Exceedances	% of total samples	# of Exceedances	% of total samples
Arsenic								
Cadmium								
Zinc								
Naphthalene	3	18%	0	0%	0	0%	0	0%
Fluoranthene								
Phenanthrene								
Chrysene								
Benzo(a)anthracene								
Benzo(b)fluoranthene			1	6%	0	0%	0	0%
Benzo(k)fluoranthene								
Benzo(a)pyrene			1	6%	0	0%	0	0%
Dibenz(a,h)anthracene								
Indeno(1,2,3-c,d)pyrene			0	0%	0	0%	0	0%
>EC ₈ -EC ₁₀ Aromatics								
>EC10-EC12 Aromatics								
>EC12-EC16 Aromatics								
>EC16-EC21 Aromatics								
>EC21-EC35 Aromatics								
Benzene								
Asbestos	# Detect	% Detect	Min (% v/v)	Max (% v/v)	Types	Form		
	3	12%	<0.001	<0.001	Chrysotile	Fibres		
Total 5								

Table III shows that for the post-remediation of the landfill waste, exceedances for metals, TPH, or BTEX for the screening criteria are not recorded, a significant reduction compared to pre-remediation.

Pre-remediation exceedances of 10 PAH compounds were reported variously for re-use Zones 2B, 2C, and 3 (Allotment and POS_(park)). Post remediation exceedances of only 1 PAH compound were reported for Zones 2B, 4 PAH compounds for Zone 2C, and 2 PAH compounds for Zone 3 (Allotment). The percentages of samples with exceedances for the relevant zones are typically lower and at lower concentrations. In some cases, by an order of magnitude (e.g. benzo(a)pyrene allotment criteria - 30% samples pre vs 6% post).

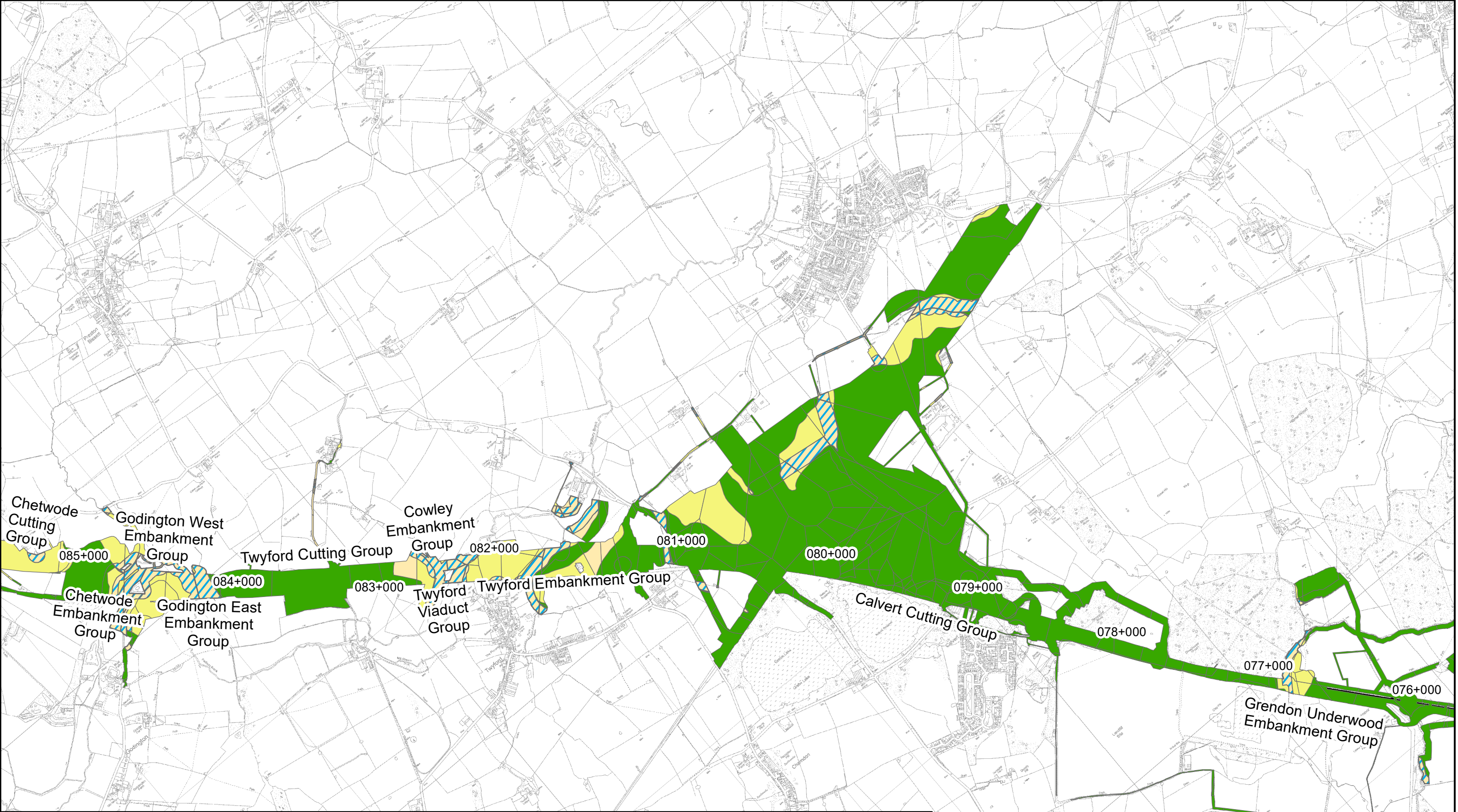
A similar percentage of samples report detections for asbestos both pre (10%) and post remediation (12%) however, post-remediation, following hand picking of visible ACMs, only free fibres are detected at concentrations below the LOD (<0.001% v/v).

The comparison of the pre-remediation and post-remediation results demonstrates that the remediation undertaken has reduced the number of and magnitude of exceedances against the relevant re-use criteria compared to testing undertaken pre-remediation.

APPENDIX IV

Made Ground Re-Use Zoning Plan

Number of Pages: 01



Note.

1. Mapped locations of assets and extents of Landscape Earthworks are based on scheme design information received on 21/07/2020
2. Landscape Earthworks annotated to receive Made Ground is based mass haul information received from EKFB on 17/09/2020.
3. Zoning of Landscape Earthworks are based on the agreed zoning system with the Environment Agency (EA).
4. The zones are indicative and relies on available ground investigation data and published geological maps to delineate geological extents, aquifer designation and groundwater levels.
5. See the respective Appendix 6/14 and 6/15 of the Earthworks Specification for assets and the Remediation Strategy Report/Verification Plans for details on how to apply the zones and MGR re-use criteria.
6. This map is for indication purposes only.

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Legend

Made Ground Re-use Zone

- Zone 1A
- Zone 1B
- Zone 2A
- Zone 2B
- Zone 2C

HS2 Route Asset Type :

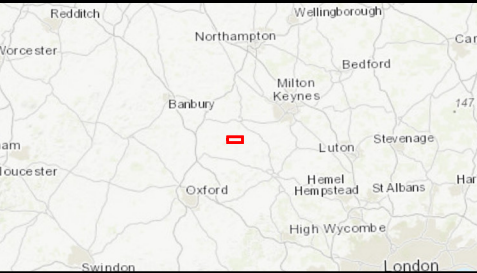
- Cutting
- Embankment
- Green Tunnel
- Viaduct

Chainage Markers

-

Twyford Embankment Landscape Earthworks Conceptual Site Model
1MC06-CEK-EV-NOT-CS06_CL10-000005
Rev.C01

Service Layer Credits:
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community



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**High Speed Two
Made Ground (MGR)
Reuse Zoning Map**

Published

Scale at A3:
1:23,610

0 0.75
Kilometres

APPENDIX V

Controlled Water Made Ground Chemical Acceptance Criteria

Number of Pages: 06

Table E-1 Made Ground Acceptance Criteria

Contaminants	Limit of Detection (mg/kg, unless stated)	Controlled Waters SCAC (mg/kg). All values are Consim derived, unless stated otherwise					Human Health Screening Criteria (S4UL) 1% SOM (mg/kg) unless stated otherwise Zone 3			Comment
		Zone 1a	Zone 1b	Zone 2a	Zone 2b	Zone 2c	>1.2m in parts of the LLAU to be returned to agriculture (Allotment)	≤ 300mm in Ecological Planting Area: Public Open Space (park)	≤ 600mm in the LOD: Commercial/Industrial	
Asbestos		N/A	N/A	N/A	N/A	N/A	No detectable asbestos	<0.001% subject to further assessment ♦		
Metals										
Arsenic	<1	-	-	45.3*	-	45.3*	43	170	640	
Beryllium	<1	-	-	-	-	-	35	63	12	
Boron	<1	-	-	-	-	-	45	46,000	240,000	
Cadmium	<0.2	-	-	2.5	-	2.5	1.9	532	190	
Chromium III	<1	93.9*	93.9*	93.9*	-	93.9*	18,000	33,000	8,600	
Chromium VI	<1	16.7	50	16.7	-	16.7	1.8	220	33	
Copper	<1	-	-	6,667	-	6,667	520	44,000	68,000	
Lead	<2	-	-	-	-	-	80 #	1,300 #	2,300 #	C4SL Value used for Human Health (no S4UL value available)
Mercury	<0.3	-	-	-	-	-	21	30	58	

Contaminants	Limit of Detection (mg/kg, unless stated)	Controlled Waters SCAC (mg/kg). All values are Consim derived, unless stated otherwise					Human Health Screening Criteria (S4UL) 1% SOM (mg/kg) unless stated otherwise Zone 3			Comment
		Zone 1a	Zone 1b	Zone 2a	Zone 2b	Zone 2c	>1.2m in parts of the LLAU to be returned to agriculture (Allotment)	≤ 300mm in Ecological Planting Area: Public Open Space (park)	≤ 600mm in the LOD: Commercial/Industrial	
Nickel	<2	-	-	67	-	67	53	800	980	
Selenium	<1	-	-	-	-	-	88	1,800	12,000	
Vanadium		-	-	-	-	-	91	5,000	9,000	
Zinc	<2	-	-	35,300	-	35,300	620	170,000	730,000	
Inorganics										
Total Cyanide	<1	-	-	50	-	50	-	-	-	No published human health value
TPH Aliphatics										
C ₅ -C ₆	<0.01	882	5,000† (16,667)	405	469	3	730	5,000† (95,000)	3,200	Screening driven by visual and olfactory observation (see Table E-2, E-3) rather than Human Health risk screening values
>C ₆ -C ₈	<0.01	3,750	5,000† (75,000)	1,765	2,500	13	2,300	5,000† (150,000)	5,000† (7,800)	
>C ₈ -C ₁₀	<0.1	333	3,000	231	-	231	320	5,000† (14,000)	2,000	
>C ₁₀ -C ₁₂	<0.1	-	-	-	-	-	2,200	5,000† (21,000)	5,000† (9,700)	
>C ₁₂ -C ₁₆	<0.1	-	-	-	-	-	5,000† (11,000)	5,000† (25,000)	5,000† (59,000)	

Contaminants	Limit of Detection (mg/kg, unless stated)	Controlled Waters SCAC (mg/kg). All values are Consim derived, unless stated otherwise					Human Health Screening Criteria (S4UL) 1% SOM (mg/kg) unless stated otherwise Zone 3			Comment
		Zone 1a	Zone 1b	Zone 2a	Zone 2b	Zone 2c	>1.2m in parts of the LLAU to be returned to agriculture (Allotment)	≤ 300mm in Ecological Planting Area: Public Open Space (park)	≤ 600mm in the LOD: Commercial/ Industrial	
>C ₁₆ -C ₃₅	<0.1	-	-	-	-	-	5,000† (260,000)	5,000† (450,000)	5,000† (1,600,000)	
TPH Aromatics										
>EC ₅ -EC ₇	<0.01	-	-	-	-	-	13	5,000† (76,000)	5,000† (26,000)	Screening driven by visual and olfactory observation (see Table E-2, E-3) rather than Human Health risk screening values
>EC ₇ -EC ₈	<0.01	-	-	-	-	-	22	5,000† (87,000)	5,000† (56,000)	
>EC ₈ -EC ₁₀	<0.1	75	5,000† (5,882)	17.6	33	5	8.6	5,000† (7,200)	3,500	
>EC ₁₀ -EC ₁₂	<0.1	18	500	6.9	10	4	13	5,000† (9,200)	5,000† (16,000)	
>EC ₁₂ -EC ₁₆	<0.1	90	5,000	15	45	15	23	5,000† (10,000)	5,000† (36,000)	Screening driven by visual and olfactory observation (see Table E-2, E-3) rather than Human Health risk screening values
>EC ₁₆ -EC ₂₁	<0.1	45	129	30	90	30	46	5,000† (7,600)	5,000† (28,000)	
>EC ₂₁ -EC ₃₅	<0.1	1,011	-	1,111	-	1,111	370	5,000† (7,800)	5,000† (28,000)	
<EC ₃₅ -EC ₄₄	<0.1	-	-	-	-	-	370	5,000† (7,800)	5,000† (28,000)	
BTEX										

Contaminants	Limit of Detection (mg/kg, unless stated)	Controlled Waters SCAC (mg/kg). All values are Consim derived, unless stated otherwise					Human Health Screening Criteria (S4UL) 1% SOM (mg/kg) unless stated otherwise Zone 3			Comment
		Zone 1a	Zone 1b	Zone 2a	Zone 2b	Zone 2c	>1.2m in parts of the LLAU to be returned to agriculture (Allotment)	≤ 300mm in Ecological Planting Area: Public Open Space (park)	≤ 600mm in the LOD: Commercial/Industrial	
Benzene	<0.001	0.005	0.1	0.002	0.003	0.002	0.017	90	27	Screening driven by visual and olfactory observation (see Table E-2, E-3) rather than Human Health risk screening values
Toluene	<0.01	23.3	1750	5.38	10.8	1.9	22	5,000† (87,000)	5,000† (56,000)	
Ethylbenzene	<0.01	21.4	1500	4.92	9.7	1.1	16	5,000† (17,000)	5,000† (5,700)	
o xylene	<1	-	-	-	-	-	28	5,000† (17,000)	660	
m xylene	<1	-	-	-	-	-	31	5,000† (17,000)	5,000† (6,200)	
p xylene	<1	-	-	-	-	-	29	5,000† (17,000)	5,000† (5,900)	
Total Xylenes		35.7	2500	8.33	16.7	1.7	No published value	-	-	
PAH#										
Naphthalene	<0.01	0.033	0.1	0.028	0.02	0.028	4.1	1,200	190	Screening driven by visual and olfactory observation (see Table E-2, E-3) rather than Human Health risk screening values
Benzo(k)fluoranthene	<0.1	0.417	-	0.676	-	0.676	37	370	1,200	
Benzo(b)fluoranthene	<0.1	0.125	-	0.167	-	0.167	0.99	13	44	
Benzo(a)pyrene	<0.1	0.135	-	0.116	-	0.116	0.97	11	35	
Indeno(123cd)pyrene	<0.1	0.25	-	0.281	-	0.281	9.5	150	500	Screening driven by

Contaminants	Limit of Detection (mg/kg, unless stated)	Controlled Waters SCAC (mg/kg). All values are Consim derived, unless stated otherwise					Human Health Screening Criteria (S4UL) 1% SOM (mg/kg) unless stated otherwise Zone 3			Comment
		Zone 1a	Zone 1b	Zone 2a	Zone 2b	Zone 2c	>1.2m in parts of the LLAU to be returned to agriculture (Allotment)	≤ 300mm in Ecological Planting Area: Public Open Space (park)	≤ 600mm in the LOD: Commercial/Industrial	
Benzo(ghi)perylene	<0.1	-	-	-	-	-	290	1,400	3,900	visual and olfactory observation (see Table E-2, E-3) rather than Human Health risk screening values
Acenaphthene	<0.1	-	-	-	-	-	34	29,000	84,000	
Acenaphthylene	<0.1	-	-	-	-	-	28	29,000	83,000	
Anthracene	<0.1	-	-	-	-	-	380	150,000	520,000	
Benzo(a)anthracene	<0.1	-	-	-	-	-	2.9	49	170	
Chrysene	<0.1	-	-	-	-	-	4.1	93	350	
Dibenz(a,h)anthracene	<0.1	-	-	-	-	-	0.14	1.1	3.5	
Fluoranthene	<0.1	-	-	-	-	-	52	6,300	23,000	
Fluorene	<0.1	-	-	-	-	-	27	20,000	63,000	
Phenanthrene	<0.1	-	-	-	-	-	15	6,200	22,000	
Pyrene	<0.1	-	-	-	-	-	110	15,000	54,000	
Phenolics										
Phenol	<0.05	0.59	428	0.05	0.23	0.05	66	760	760	Screening driven by visual and olfactory

Contaminants	Limit of Detection (mg/kg, unless stated)	Controlled Waters SCAC (mg/kg). All values are Consim derived, unless stated otherwise					Human Health Screening Criteria (S4UL) 1% SOM (mg/kg) unless stated otherwise Zone 3			Comment
		Zone 1a	Zone 1b	Zone 2a	Zone 2b	Zone 2c	>1.2m in parts of the LLAU to be returned to agriculture (Allotment)	≤ 300mm in Ecological Planting Area: Public Open Space (park)	≤ 600mm in the LOD: Commercial/Industrial	
										observation (see Table E-2, E-3) rather than Human Health risk screening values

- No Derived Criteria as CoC not predicted to reach base of the unsaturated zone within 1,000 years, hence an appropriate human health risk screening criterion (S4UL or C4SL) based on proposed land use will be adopted.

* Background concentration adopted as discussed in Derivation of Made Ground Assessment Criteria for the Protection of Controlled Waters [12].

≠ Note: The Soil Chemical Acceptance Criteria (SCAC) are not to be applied to tarmac and road surfacing materials. Tarmacadam is to be segregated from Made Ground and stockpiles of Tarmac bound materials (such as existing road surfaces) to be tested for speciated PAH to inform the potential re-use or disposal options.

(C4SL, Allotment, 6 % SOM).

♦ Detectable asbestos <0.001% or low levels of cement bound fibres can be used at depths < 600/300 mm, subject to further assessment which may include Detailed Quantitative Risk Assessment (DQRA).

† Screening for hydrocarbons will be driven by visual/olfactory observations of the materials to be used in accordance with Table V-2 below rather than Human Health risk screening values. Material which appears to be visibly impacted by hydrocarbon contamination (presence of odours or oily sheens), will not be considered suitable for re-use. For TPH fractions a target value of 5,000 mg/kg has been applied for the re-use criteria where the S4UL and derived values are >5000mg/kg. Concentrations in soil above this value will require treatment.

Records of visual/olfactory observations during the watching brief are primarily to support pre-screening and subsequent segregation of Made Ground. These details should be recorded on the EKFB Land Quality Sampling Record for Made Ground Materials during the watching brief for inclusion in the final Verification Report. The criteria are discussed in Table V-2 and V-3.

Table E-2 - Visual / Olfactory Assessment Criteria for Hydrocarbon Impacted Material

Contaminant / Indicator	Criteria for Unacceptable Contamination
Polycyclic Aromatic Hydrocarbons (PAH)	Visual: Black liquid or semi-solid tar in veins or zones. Heavily stained or coated surfaces. Solid tar/bitumen. Headspace ⁽¹⁾ : Over 100 ppm, Olfactory ⁽²⁾
Mineral Oils (Total Petroleum Hydrocarbons – TPH)	Visual: Liquid oil, oil saturated solids in veins or zones. Heavily stained or coated surfaces. Headspace ⁽¹⁾ : Over 100 ppm, Olfactory ⁽²⁾

Notes

1. Headspace analysis to be conducted where required/applicable. Headspace analysis criteria shall be subject to calibration of instruments.
2. Olfactory assessment shall always be confirmed by headspace analysis.

Additionally, the following provides a scale of aesthetic criteria.

Table E-3 - Aesthetic criteria for appropriate stockpile

Category	Visual	Olfactory
1	Occasional-frequent staining	Faint to distinct but no strong odour in soil
2	Heavy staining of soil	Strong odour in soil
3	Visible hydrocarbon product	Strong to overwhelming odour