

Hinckley Academy

Ground Investigation Report

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EXECUTIVE SUMMARY

Site Location and Description	The site is centred on National Grid Reference: 443929, 294487 and covers an area of approximately 11 Hectares on the eastern outskirts of Hinckley, south Leicestershire. At the time of the investigation the site comprised school buildings and landscaped areas constructed on levelled platforms.
Geology	Ground investigation confirmed the following geological sequence: Made Ground (predominantly fine soils which are likely derived from Oadby Member): 0.26-4.60 thick . Oadby Member (fine soils): up to 3.30m thick where present depth fully established. Woolston Sand and Gravel (coarse soils): to the full depth of the investigation (15.00m bgl).
Hydrogeology	The superficial deposits have been classified as an Undifferentiated Secondary A Aquifer .
Hydrology	A lined pond is located on site. Thurston Brook and Soar rivers are within 250m of the site.
UXO	Risk maps show the site to be at Low risk of UXO .
Ground Investigation	The ground investigation completed by Tetra Tech during November 2021 comprised the following: • 1No. cable percussive boreholes to a depth of 15m including recovery of undisturbed (UT100) samples and Standard Penetration Tests (SPTs) • 3No. window sample boreholes to a maximum depth of 5m bgl • 5No. hand excavated inspection pits • 4No. Dynamic cone penetrometer tests • 4No. Groundwater and gas monitoring wells • Soil geo-chemical and geotechnical testing, of samples recovered from site • 3No. return groundwater and ground gas monitoring visits
Geo-Environmental Risk Assessment	Based on the review of desk study information, subsequent ground investigation and a conceptual model of source, pathway and receptor linkages, the following risk levels established have been identified: • Groundworkers – Low/Moderate • Future School Site Users – Low/Moderate • Surface Water Features – Very Low • Secondary A Superficial Aquifer – Very Low No significant contamination has been recorded within the soils and groundwater on site (albeit limited testing completed). However, fragments of anthropogenic materials (concrete, brick, ceramic etc) in Made Ground may present a hazard if present in soft cover playing fields.
Ground Gas	The site has been assessed to be CS1 (Very Low Risk).
Geotechnical	Conventional shallow foundations (pad or strip) can be considered for relatively light structural loads associated with the temporary modular units. Piled foundations will be required to support permanent development in the vicinity of Block D.

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1.0 INTRODUCTION

1.1 INSTRUCTION

Tetra Tech (Tt) were commissioned by Gleeds, on behalf of the Department for Education (D for E), to undertake a ground investigation at Hinckley Academy and John Cleveland Sixth Form Centre in Hinckley, Leicestershire.

1.2 OBJECTIVE

Following the Phase 1 Desktop Assessment^{ref 1}, the investigation was scoped by Tt to provide a more detailed understanding of risks associated with ground contamination and provide geotechnical recommendations for future development. This information will be provided to contractors to inform design and construction.

This report details the investigations undertaken and provides a factual record of the conditions encountered.

1.3 PROPOSED DEVELOPMENT

The development proposal being considered at the time of compilation of this report was confirmed in an email from Gleeds (12.11.21) and included the removal and landscaping of Blocks B and C in the north area of the site. Block D (the Technology Block) in the northeast will also be demolished and a new development is proposed in this area, the details of which were not confirmed / available at the time of writing. Temporary modular classrooms will be required during the construction phase and an area to the southwest of the main carpark has been identified to site these units.

Blocks F, G, I, L and M are scheduled for refurbishment. Blocks A, Q, R and W will remain untouched throughout the scheme. Block X is leased to another provider and will not form part of this scope of work.

The proposed development plans are provided in **Appendix 2**.

1.4 REPORT CONDITIONS

This report has been prepared for the client, Department for Education, in accordance with the terms and conditions of the contract. The report is prepared in line with the Invitation to Tender and the Tetra Tech tender submission and the agreed scope for the ground investigation for this specific site (dated 25th October 2021) and is subject to the report conditions included as **Appendix 1**.

The recommendations and opinions expressed within this report are based on the information provided and other sources of readily available information. Where reference has been made to

¹ B030162_Hinckley_DTS_V1_1, TetraTech (August 2021)

other reports or information provided by the client, or from other Third-party sources, such data has been reviewed in good faith and it has been assumed that their contents are correct. Tetra Tech is unable to guarantee any Third-Party Information. The ground conditions presented herein are representative of the conditions recorded at the time and in the positions of the investigation. Ground conditions may vary over time and in between investigation locations.

2.0 SITE INFORMATION

2.1 SITE LOCATION AND DESCRIPTION

The site is centered on National Grid Reference: 443929, 294487 and covers an area of approximately 11 Hectares on the eastern outskirts of Hinckley, south Leicestershire.

The school buildings occupy the northeast portion of the site and are arranged around hardstand access roads, walkways and landscaped areas which include broad-leaved mature trees, grass and hedgerows.

The buildings comprise the original single and two-story brick structures with pitched tiled roofs dating from c.1900 to 1960 (blocks A, B, I and K) and later (c.1990 to 2000) flat roof buildings, including the technology block D, which is of block construction.

The site lies across a southeast facing hillside, with levels stepped into the slope to accommodate the buildings. At its highest level, in the northwest extremity of the site, the playing fields reside at c. 135mAOD. Blocks B and C (scheduled for demolition / landscaping) are constructed into the slope falling from c.132 in the west to 127mAOD in the east, and this area is bounded by a steep bank down to the Block D level (Technology Block) at c.123.4mADO. A covered walkway connects an upper level on Block D with the ground floor of Block B. The lowest point in the southwest extremity of the site as at c.110mAOD.

Asphalt and AstroTurf sports pitches are situated to the southwest of the school buildings, beyond which, to the southwest and northwest are playing fields. The area identified to accommodate temporary units during the construction phase is in the northwest playing field immediately southwest of the main school carpark.

Structural defects, including water ingress and damp, noted in the project brief are attributed to flash flooding of the site.

2.2 GEOLOGY AND HYDROGEOLOGY

Information regarding the underlying geology anticipated from published British Geological Survey (BGS) maps and provided in the Phase 1 Assessment ^{ref 1} is summarised in Table 1.

Table 1 Summary of Anticipated Ground Conditions

Stratum	Thickness (m)	Aquifer Classification
Made Ground	0 to 3.00	Undifferentiated / Non-aquifer
Oadby Member	Up to 20m	Secondary Undifferentiated Aquifer
Wolston Sand and Gravel	Up to 20m	Secondary A Aquifer
Mercia Mudstone Group	more than 100m	Secondary B Aquifer

2.2.1 Made Ground

Various phases of development reside on generally level ground, and although not indicated on BGS mapping, it is anticipated that fill (likely comprising site won soils) would have been used to construct these platforms into the general southeast sloping topography. Therefore, based on the recorded site levels, the thickness of imported fill could potentially increase from <1m to c.5m from northwest to southeast across each platform.

2.2.2 Oadby Member

The BGS Lexicon of Named Rock Units ^{ref2} describes the Oadby Member, which is indicated across to the north and west of the site, as a grey, weathered brown, Diamicton comprising Cretaceous and Jurassic rock fragments with subordinate lenses of sand and gravel, clay and silt, and typically occurring as a brown to grey, and silty clay, with chalk and flint fragments.

2.2.3 Wolston Sand and Gravels

The south and eastern edges of the site is indicated to be underlain by the Wolston Sand and Gravels, which are also of glacial origin and are described as sand and gravel, locally with lenses of silt, clay or peat.

2.2.4 Mercia Mudstone Group

The bedrock geology is indicated to be of the Mercia Mudstone Group, described as red, commonly green-grey, mudstones and siltstones with thick halite-bearing units.

It is noted that based on BS5930 definitions, in terms of composition, the Mercia Mudstone Group can be highly variable and can be present as both soil or rock units of variable thickness depending on its detailed lithology and state of weathering. In some cases, localised weaker material (e. clay) can occur below stronger material (e.g sandstone), with associated geotechnical risks for substructures. Furthermore, the Mercia Mudstone Group contains evaporite minerals, mainly halite (sodium chloride) and gypsum (hydrous calcium sulfate). These lithologies can cause significant problems for construction due to dissolution (both naturally occurring and anthropogenically induced through brining). The Mercia Mudstone may contain aqueous solutions of sulfate and sulfuric acid in sufficient quantity for potential chemical attack on concrete.

2.2.5 Historic Boreholes

The BGS database holds records of borehole dating from 1957 which describe soils as ‘Topsoil over firm to stiff reddish brown slightly sandy clay with little gravel, becoming stiff with depth’ to depths of approximately 2m bgl (6ft). This description is comparable to the BGS lexicon description of the Oadby Member.

² <https://www.bgs.ac.uk/technologies/the-bgs-lexicon-of-named-rock-units/>

The nearest BH records extending beyond these shallow depths are SP49SW364^{ref 3} and SP49SW46^{ref 4} located approximately 320m west southwest of the site on ground currently residing at c.121m AOD. These records describe 18.5m of 'soft' and 'sandy marl' from ground level, above 4.3m of 'Very fine running sand' with alternating 'sandy clay' and 'marl' until 'rock marl' indicated at a depth of c.50m, which is possibly suggestive a locally deep Mercia Mudstone weathering profile

2.3 SERVICES

Services integral to the site including water, drainage, gas, electricity, and telecoms run below surface and are connecting to the mains statutory routes along Butts Lane to the north. The service routes within the site boundary were traced during a non-intrusive survey undertaken by others as indicated on the site layout plan (Figure ref: B030162-TTE-00-XX-DR-U-0001 (Ground Investigation Layout Plan) included in Appendix 2.

During the intrusive investigations, prior to breaking ground, exploratory hole locations were scanned using CAT and genny operating in both passive and active mode. Inspection pits were then excavated to a depth of 1.20m bgl. No uncharted services were encountered in these excavations.

³ http://scans.bgs.ac.uk/sobi_scans/boreholes/334578/images/14820719.html

⁴ http://scans.bgs.ac.uk/sobi_scans/boreholes/334260/images/10633607.html

3.0 GROUND INVESTIGATION

3.1 SUMMARY OF SCOPE

The scope of work originally proposed (Tt document ref: Hinckley - Proposed GI Scope 25.10.21 and Hinckley - Fee adjustment notice 11.11.21) was reduced due to the requirement for weekend working to limit disruption to school activities. The weekend work was further subject to statutory constraints on working hours relating to construction noise generation on sites at weekends. Furthermore, late notice revisions to the proposed developments resulted in revisions to the proposed layout of the proposed exploratory boreholes which could not be achieved due to practical constraints, including operational access tracks that could not be obstructed, and steep slopes impacting the safe mobilisation of cable percussive drilling.

The Tt intrusive investigations undertaken on 20th and 21st of November and 2nd December 2021 were therefore reduced from the originally planned scope of work, and in summary comprised the following.

- 5No. Hand excavated inspection pits (IP01 to IP05 inclusive) to 1m bgl
- 1No. Cable percussive boreholes with standard penetration testing (SPTs) (BH01) to a depth of 15m bgl
- 3No. Dynamic sample boreholes to depths ranging between 3 and 5m bgl
- 4No. TRRL Dynamic Cone Penetrometer tests to depths of c.1.40m bgl
- 4No. Dual purpose groundwater and gas monitoring installations
- Laboratory geo-environmental and geotechnical testing soil samples
- 3No. return monitoring visits to recover water samples and measure ground gas concentrations

Site investigation activities were undertaken in general accordance with BS5930:2015 'Code of Practice for Site Investigations' which incorporates BS-EN 1997-2:2007 and BS10175:2011 A1:2013.

Exploratory hole locations are indicated on the plan included in **Appendix 2**.

3.2 SUMMARY OF GROUND CONDITIONS ENCOUNTERED

The ground conditions encountered during the investigation compared well to the conditions anticipated from published information (Section 2.2) and in summary comprised the following deepening succession.

- Made Ground
- Oadby Member (locally present)
- Woolston Sand and Gravels

A summary of strata depths and thicknesses is provided in Tables 2 and 3. Detailed soil descriptions are provided on the Engineering Logs included in **Appendices 3 & 4**.

Table 2 Proposed Demolition / Development Area (around Block B and D) Summary of Strata Depths and Thicknesses

Location	Made Ground		Oadby Member		Woolston Sand and Gravel	
	From (mbgl)	Thickness (m)	From (mbgl)	Thickness (m)	From (mbgl)	Thickness (m)
BH01	GL	1.30	1.30	3.30	4.60	>11.40
WS01	GL	4.60	NP	NP	4.60	>0.40
WS02	GL	>3.80	NE	NE	NE	NE
WS03	GL	>3.90	NE	NE	NE	NE
IP01	GL	>1.00	NE	NE	NE	NE
IP02	GL	>1.00	NE	NE	NE	NE

'>' Denotes the maximum thickness confirmed (base depth of the material not proved), NE – Not Encountered, NP – Not Present

Table 3 Proposed Temporary Classrooms Summary of Strata Depths and Thicknesses

Location	Made Ground		Oadby Member		Woolston Sand and Gravel	
	From (mbgl)	Thickness (m)	From (mbgl)	Thickness (m)	From (mbgl)	Thickness (m)
IP03	GL	>1.00	NE	NE	NE	NE
IP04	GL	>1.00	NE	NE	NE	NE
IP05	GL	0.26	0.26	>0.74	NE	NE

'>' Denotes the maximum thickness confirmed (base depth of the material not proved), NE – Not Encountered

3.3 MADE GROUND

3.3.1 Proposed Demolition / Development area

IP01, IP02, WS01 and WS03 were located in soft landscaped areas and encountered a c.200mm thick layer of Topsoil at surface comprising grass / turf (where present) over dark brown slightly gravelly sandy silt. Gravel generally comprised flint with rare brick and concrete fragments and rootlets were also noted.

WS02 was commenced on hard standing and confirmed a 100mm thick layer of bitumen bound macadam (asphalt), whilst BH01 was drilled within a parking bay surfaced with mortared herringbone brick.

The full thickness of the Made Ground was not established in WS02, WS03, IP01, IP02 and IP03 where it persisted to the base of the exploratory holes at depths ranging between 1.00 and 3.90m bgl and confirmed the anticipated thicker layer of disturbed soils associated with historic earthworks (see Sections 2.1 and 2.2.1).

Where the full thickness was confirmed in BH01 and WS01, it extended to depths of between 0.20 to 4.60m bgl.

WS03 refused at a depth of 3.90m bgl.

Although slightly variable in composition, the Made Ground generally comprised fine soil (silt and clay) with lesser subordinate sand and gravel, and inclusions of ceramic tile, concrete, asphalt fragments near the surface, and rare fragments of brick noted throughout.

3.3.2 Area of Proposed Temporary Classrooms

Below the surface Topsoil within the area of the proposed temporary classrooms, soils showed obvious signs of disturbance between a depth of 0.18 and 0.26m bgl in IP05. Below this depth, natural soils are tentatively assumed, however this assumption is based only on the absence of anthropogenic materials.

The Made Ground was variable in composition and comprised dark grey to black slightly ashy slightly sandy gravel of quartzite, sandstone and coal with rare metal.

3.4 OADBY MEMBER

3.4.1 Proposed Demolition / Development area

The Oadby Member was encountered below the Made Ground in BH01 at a depth of 1.30m bgl where the full thickness of the unit was established (3.30m). This unit was locally absent at WS01 where the underlying Wolston Sand and Gravels were encountered below the Made Ground at 4.60. The Made Ground unit above the Woolston Sands and Gravels (between 2.20 and 4.60m bgl) at WS01 is noted to be of similar composition to the Oadby Member (reddish brown slightly gravelly silty CLAY), albeit with rare fragments of asphalt indicating disturbance.

The unit was relatively uniform in composition and described as soft to firm orangish to reddish brown slightly gravelly sandy clay.

3.4.2 Area of Proposed Temporary Classrooms

The Oadby Member was encountered in HP05 at 0.26m bgl and although similar soils were encountered in HP04 and HP05 at similar depths, rare brick fragments have also been identified indicating possible disturbance within the depths investigated at these positions.

The unit was relatively uniform in composition and soils encountered were similar to those encountered in the proposed development areas (and consisted of soft to firm orangish to reddish brown slightly gravelly sandy clay). The gravel component comprised subangular to subrounded fine to medium flint and quartzite (with rare brick fragments noted in IP04 and IP03).

3.5 WOLSTON SAND AND GRAVEL

The Wolston Sand and Gravel was encountered directly below the Made Ground (possibly disturbed Oadby Member) in WS01 and below the Oadby Member in BH01 at a depth of 4.60m bgl.

The full thickness of the unit was not established, and the unit persisted to the full depth of the investigation (15.00m bgl) in BH01.

The deposit was variable in composition and comprised a c.12.5m thick horizon of medium dense reddish brown silty fine to coarse sand, becoming gravelly between 8.70 and 10.40m bgl, and loose at 10.40m (possibly associated with the groundwater) overlying dense greyish brown sand with 40 to 120mm bands of stiff grey-brown clay which persisted to the base of BH01 (at 15.00m bgl).

3.6 GROUNDWATER STRIKES

During drilling, a groundwater strike occurred at 13.20 which then rose to a depth of 10.71m bgl after 20minutes in BH01.

3.7 MONITORING INSTALLATIONS

50mm internal diameter dual purpose land gas and groundwater monitoring standpipes were installed within BH01, WS01, WS02 and WS03. Installation details are provided on the engineering logs in Appendix 3 & 4 and response zone depths are summarised in Table 4.

Table 4 Summary of Borehole Installations

Location	Response Zone (m bgl)		Unit
	Top	Base	
BH01	1.00	14.50	Made Ground / Woolston Sand and Gravel
WS01	1.00	4.60	Made Ground
WS02	1.00	3.80	Made Ground
WS03	1.00	3.90	Oadby Member / Woolston Sand and Gravel

3.8 INSITU TESTING

3.8.1 Standard Penetration Tests (SPTs)

Standard Penetration Tests (SPTs) were undertaken at 1.00 to 1.50m intervals in BH01, WS01, WS02 and WS03. SPT N values are indicated on the engineering logs (Appendix 3 & 4).

3.8.2 Dynamic Cone Penetrator (DCP) Testing

Dynamic cone penetrator (DCP) testing was undertaken from ground level at 3No. locations adjacent to hand pits within the area of the proposed temporary classrooms as indicated on Figure B030162-TTE-00-XX-DR-U-0001 (Ground Investigation Layout Plan) ('DCP' ref locations). The tests were undertaken using a standard Transport and Roads Research Laboratory (TRRL) specification DCP probe to drive a 20mm diameter 60° cone using an 8kg weight dropped from a height of 575mm. The California Bearing Ratio (CBR) derived from these tests is presented in the tables

included in Appendix 5. CBR has been calculated for layers displaying discernible uniform rates of penetration (blows /10mm) using the TRRL standard relationship:

- $\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \cdot \text{Log}_{10}(\text{mm/blow})$ ^{ref 5}

3.9 MONITORING AND SAMPLING

3No return gas and groundwater monitoring visits have been carried out to date on 2.12.21 (Round 1), 8.12.21 (Round 2) and 8.2.22 (Round 3) to monitor and record the following parameters using a Photo Ionisation Detector (PID) and GA5000 Gas Analyser.

- Volatile Organic Hydrocarbons (VOCs)
- Methane CH₄ (% Volume)
- Carbon Dioxide CO₂ (% volume)
- Carbon Monoxide CO (% volume)
- Oxygen O₂ (% volume), CO (ppm)
- Hydrogen Sulfide H₂S (ppm)
- Atmospheric pressure (mB)
- Gas flow rates (liters/hr)

Groundwater levels recorded during monitoring are summarised in Table 5 and ground gas monitoring results are included as Appendix 6 and summarised in Table 6.

Table 5 Summary of Groundwater Monitoring

Location	R1: 2.12.21 (m bgl)		R2: 8.12.21 (m bgl)		R3: 8.2.22 (m bgl)	
	Water	Base	Water	Base	Water	Base
BH01	10.44	13.39	10.39	13.38	10.22	13.36
WS01	Dry	4.35	Dry	4.34	Dry	4.34
WS02	Dry	3.20	Dry	3.20	Dry	3.21
WS03	Dry	3.71	Dry	3.69	Dry	3.68

⁵ ORN8 A users manual for a program to analyse dynamic cone penetrometer data (TRL, 1990)

Table 6 Summary of Land Gas Monitoring

Round	Peak Readings (*denotes minimum)							
	VOC (ppm)	CH ₄ (%)	CO ₂ (%)	CO (%)	O ₂ (%)*	H ₂ S (ppm)	ATM Trend	Flow (ltrs/hr)
1	1.10	ND	3.50	ND	15.50	ND	Static	-0.026
2	0.40	0.10	3.10	1	16.40	ND	Rising	0.000
3	0.20	0.10	2.90	ND	15.6	ND	Static	-0.020

3.10 GEOTECHNICAL LABORATORY ANALYSIS

A programme of geotechnical testing was carried out on samples recovered from the exploratory holes. The testing was scheduled by Tetra Tech and undertaken by GEO Site & Testing Services Ltd who are UKAS accredited for a wide range of geotechnical tests. All testing was carried out in accordance with BS 1377:1990 ‘Methods of Tests for Soils for Civil Engineering Purposes’. Table 7 presents a summary of geotechnical testing undertaken. Laboratory certificates are detailed in **Appendix 7**.

Table 7 Summary of Laboratory Geotechnical Testing

Test	Standard	No. Tests
Moisture Content	BS 1377: Part 2 : Clause 3.2 : 1990	8
Atterberg Limits	BS EN ISO 17892-12:2018	7
Particle Size Distribution	BS EN ISO 17892-4:2016, cl. 5.2	10
PSD (Pipette Method)	BS EN ISO 17892-4:2016, cl. 5.4	8
Quick Undrained Single Stage 106mm dia	BS EN ISO 17892-7:2018	1
Geotechnical Chemistry - BRE SD1 Suite A	BRE SD1 2005, BS1377: Part 3: 1990	2
pH and SO ₄ of soil	BRE SD1 2005, BS1377: Part 3: 1990	2

3.11 ENVIRONMENTAL LABORATORY ANALYSIS

The assessment of the environmental chemistry of selected soil and water samples was scheduled by Tetra Tech and carried out by Element Laboratories (Element) as summarised in Table 8. Element are an approved supplier in accordance with the requirements of Tt quality system and are themselves UKAS and MCERTS accredited for a range of chemical analyses. Laboratory testing was carried out in accordance with BS 10175: 2011+A1:2013^{ref 6}.

⁶ BS 10175: 2011+A1:2013 Investigation of Potentially Contaminated Sites – Code of Practice

Laboratory test certificates with results are provided in **Appendix 8**.

Table 8 Summary of Laboratory Environmental Testing

Test	Determinants	No. Tests
Tt Soil Suite B	Asbestos Screen, FOC (Fraction of Organic Carbon), cyanide, heavy metals, PAH, TPH, BTEX	8
Tt Leachate Suite B	pH, SO ₄ , NH ₄ alkalinity as CaCO ₃ , heavy metals, total phenol, PAH, TPH.	2
Tt Water Suite B	pH, cyanide, heavy metals, PAH, TPH, BTEX	1

4.0 GROUND MODEL AND GEOTECHNICAL PARAMETERS

4.1 SUMMARY GROUND MODEL

4.1.1 Soil Units

The ground model presented in Table 9 has used information from the investigation to summarise the depth and thickness of the units encountered.

Table 9 Ground Model

Unit	Unit Ref	Characteristic Surface		Characteristic Thickness (m)
		mbgl	mAOD	
Made Ground	MG	GL	123	1 to 5*
Oadby Member	ODT	1 to 5	122	<3
Woolston Sand and Gravel	WOL	2 to 4.5	119	>12

*Made Ground thickness increasing from west to east across cut / fill platforms.

4.1.2 Groundwater

Groundwater levels within the limited investigation remained relatively stable at around 10.40m bgl (113m AOD) during the investigation and monitoring. Shallow wells (<5m deep) remained dry.

4.2 SOIL PROPERTIES

The ranges of the various soil properties measured via in situ and laboratory testing are summarised in the following sections. Where characteristic values are provided, these are reasonably conservative estimates of a measured or assessed property, usually based on the lower quartile or average value that may be used to represent the overall behaviour of the material.

Due to inherent variability of MG, which comprised of slightly gravelly silty clay with occasional fragments of brick and concrete, these soils are not considered readily characterisable and conservative parameters should be used. Allowances should also be made for the presence of hydraulically bound materials (e.g. asphalt and concrete) where present.

4.2.1 Classification

4.2.1.1 Made Ground (MG)

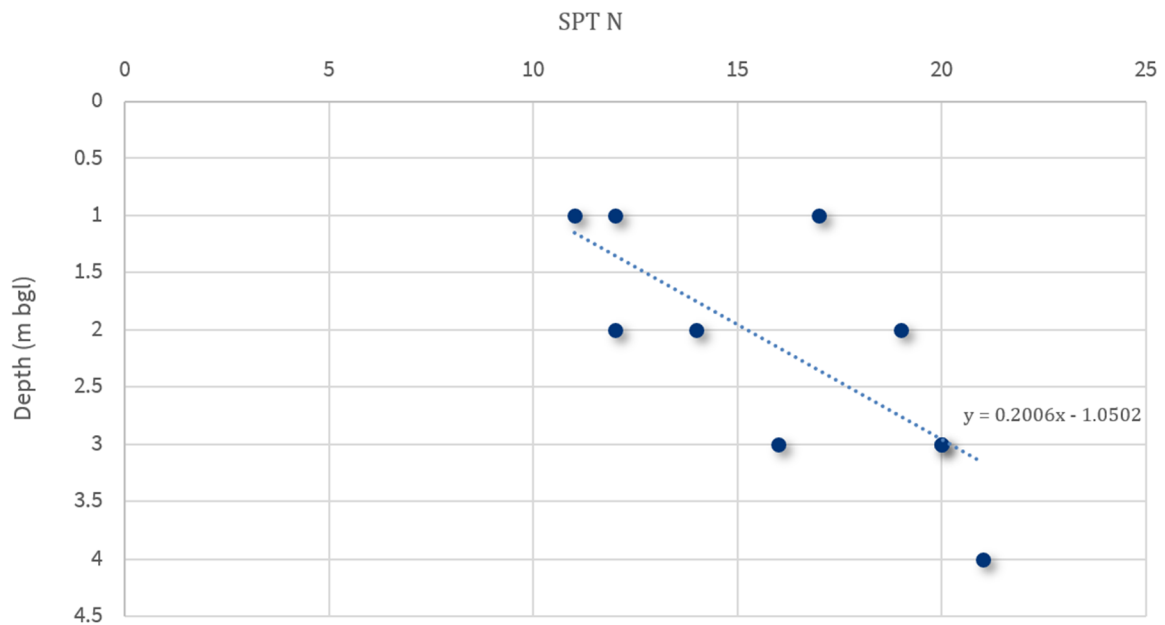
Particle Size Distribution (PSD) assessment undertaken on 3No. samples of MG confirmed predominantly fine soils with a similar size distribution to the likely parent materials (underlying Oadby Member) and compared well with the engineer's description of slightly sandy, slightly gravelly silty clay and clayey silt.

Atterberg limits derived from laboratory assessment of MG have confirmed moisture content in the range of 13 and 19%, a liquid limit in the range of 24 and 52%, a plastic limit in the range of 10 and 16%, and a plasticity index ranging between 14 and 42%.

Between 72 and 82% of the sample passed the 425µm sieve indicating a modified plasticity index (**I_p**) ranging between **11** and **34**, indicative of **low plasticity** fine soil of low to medium volume change potential ^{ref 7}.

SPT N within MG generally ranged between 11 and 21 (a single outlier N of >50 recorded in WS03 at 4.00m bgl is possibly indicative of refusal in the underlying soils) and showed a gradual increase with depth (see Figure 1).

Figure 1 SPT N vs Depth (m bgl): Made Ground



Using the relationship proposed by Stroud and Butler ^{ref 8}, where for SPT N <~25, the undrained shear strength (C_u) = SPT N x 4.5, the C_u ranges between **49 and 94 kPa** (where N = <50).

N shows an increase in depth equivalent to the gradient: Depth (m bgl) = 0.2N-1.05. Although SPT N demonstrates relative consistency, due to the evidence of disturbance and limited data available, unless further assessment is undertaken, it is recommended that these indicative strength parameters are used with caution, and a worse case (**N=11**) is considered characteristic throughout this unit.

TRRL DCP probes within the area of the proposed temporary classrooms confirmed variable CBR (%) ranging between 3 and 10% through the upper meter of MG. Owing to the inherent variability of the Made Ground a lower bound CBR of **3%** is considered conservative.

⁷ NHBC Standards 2011 Chapter 4, 4.2 Building near trees

⁸ Stroud and Butler, The Standard Penetration Test and the Engineering Properties of Glacial Materials, 1975 Conf. of the Midlands Geotechnical Society

Assessment of the geotechnical chemistry of 3No. samples of MG is summarised in Table 10.

Table 10 Summary of Chemical Analysis – Made Ground

Range (min – max)				
Acid Soluble Sulfate SO ₄ (% w/w)	Total Sulfur (% w/w)	pH	Water Soluble Sulfate SO ₄ as 2:1 extract (mg/l)	Corresponding DS & ACEC Class
0.04	0.02	8.5-8.6	41-72	DS1 AC-1

DS – Design Sulfate Class, ACEC – Aggressive Chemical Environment for Concrete

4.2.1.2 Oadby Member (ODT)

Due to limited presence (the ODT was only encountered in BH01 between depths of 1.30 and 3.30m bgl, and in IP05 from 0.27 to >1.00m bgl), limited assessment of the ODT has been undertaken. From the engineer's soil descriptions, it is tentatively concluded that the ODT is the parent material for much of the Made Ground on site, and therefore occurs as localised replacement fill which extends across the cut platform area covering the proposed development area (below blocks B and D), hence its subsequent classification as MG with which it is likely to share the general properties described in Section 4.2.1.1.

A PSD on a single sample of ODT confirmed the engineer's description of slightly gravelly very sandy, silty clay.

Atterberg limits derived from laboratory assessment of a single sample of ODT have confirmed moisture content of 14%, a liquid limit of 41%, a plastic limit of 12%, and a plasticity index of 29%. 95% of the sample passed the 425µm sieve indicating **I_p of 27.55**, indicative of low plasticity fine soil of **low volume change** potential which is within the range determined for the MG.

SPT N of 19 and 25 at depth of 1.50 and 3.5m bgl suggest an increase in consistency with depth which plots above the MG trend line (see Figure 1) and are possibly indicative of higher consistencies owing to the soils undisturbed state. Laboratory quick undrained triaxial assessment of a single UT100 samples obtained from the ODT determined a **Cu (kPa) of 123** which compares well with SPT N derived consistency of 112.5kPa^{ref 8} at 3.50m bgl.

A bulk and dry density of 198 and 1.71Mg/m³ was determined on a single sample of ODT from a depth of 2.50m bgl.

TRL DCP blow counts at deeper levels within TRL04 recorded an average stabilised CBR of c.5% through the ODT.

Assessment of the geotechnical chemistry of a single sample of ODT is summarised in Table 11 and again indicates similar properties to the MG.

Table 11 Summary of Chemical Analysis – Oadby Member

Acid Soluble Sulfate SO ₄ (% w/w)	Total Sulfur (% w/w)	pH	Water Soluble Sulfate SO ₄ as 2:1 extract (mg/l)	Corresponding DS & ACEC Class
-	-	8.6	41	DS1 AC-1

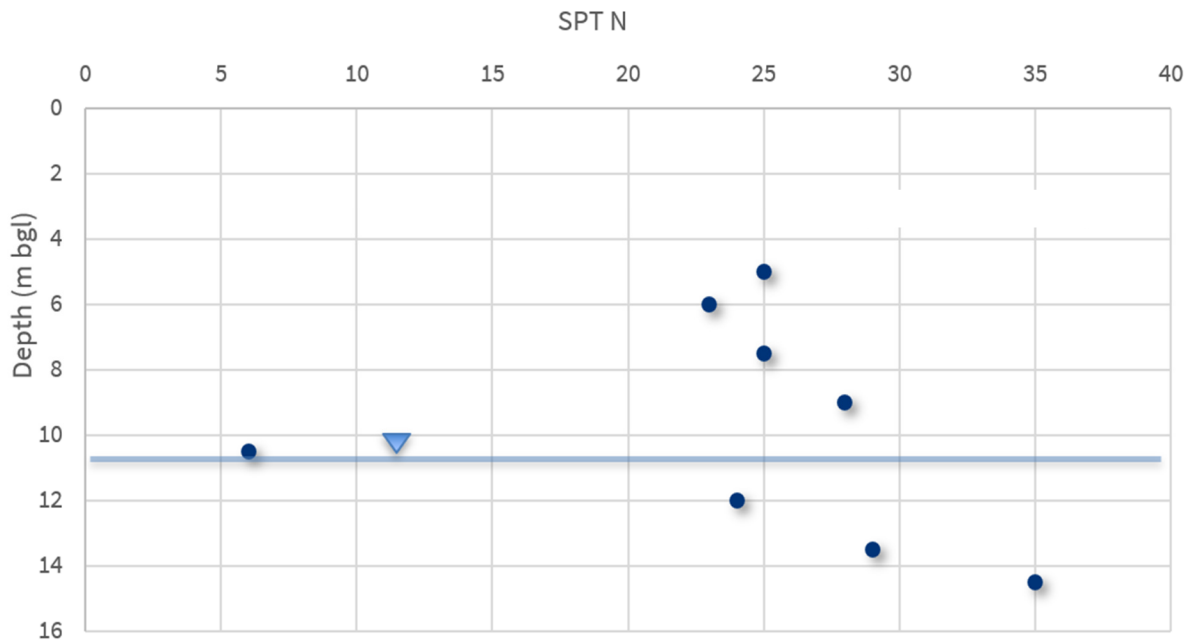
DS – Design Sulfate Class, ACEC – Aggressive Chemical Environment for Concrete

4.2.1.3 Wolston Sand and Gravel (WOL)

PSD assessments of samples obtained from the WOL at 4.60m bgl (WS01) and 6.00 and 9.00m bgl (BH01) indicate predominantly coarse soils and confirm the engineer's description of a silty fine to coarse sand horizon between 8.70 and 10.40m bgl. The engineers' observations of a horizon with greater fine soil component at deeper levels is also confirmed by PSD assessment on a sample at 14.50m bgl which determined 50% silt / clay and 50% sand components.

SPT N within WOL generally ranged between 23 and 35. Although a generalised increase in N with depth was discernible within the limited data available, a single outlier from this range of 6 was recorded at a depth of 10.50m bgl. This test coincided with a groundwater strike and is likely to be indicative of loosening of the soils associated with vadose conditions (see Figure 2).

Figure 2 SPT N vs Depth (m bgl): Wolston Sand and Gravel



5.0 GEOTECHNICAL CONSIDERATIONS

5.1 INTRODUCTION

The current development proposals (as of December 2021) are summarised in Section 1.3.

A new development is proposed in the current Block D (Technology Block) area, the details of which were not confirmed / available at the time of writing. This area is characterised by an area of Made Ground from surface which is likely to deepen from west to east overlying the predominantly fine soils of the Oadby Member, which in turn overlie the Woolston Sand and Gravel comprising predominantly coarse soils, with potentially loose coarse soils at the water table and clay / silt bands at deeper levels.

Geotechnical risks are presented by the assumed associated relatively high structural loads of the proposed block bearing upon the variable composition and thickness of the Made Ground, and Woolston Sand and Gravel at deeper levels.

Temporary modular classrooms will be required during the construction phase and an area to the southwest of the main carpark has been identified to site these units. Soils in this area were relatively uniform and the risks associated with the assumed temporary and relatively light loads of proposed structure are considered less significant, but residual risk remains.

The following sections present preliminary recommendations which are based on the limited data available from the constrained investigations. With consideration to the established geotechnical risks, once development proposals are finalised, it is recommended that further investigations are undertaken to inform efficient design, and further reduce these risks.

5.2 FOUNDATIONS

Due to the relatively variable near surface geotechnical conditions within the footprint of the proposed development, which potentially includes Made Ground to depths of up to 5m bgl, the use of conventional shallow foundations, e.g pads or strip, are unlikely to be a viable foundation solution for the new block due to the risk of unacceptable total or differential settlements, which could occur both in the short and long term, and therefore, it is therefore likely that piled foundations will need to be considered.

There is a lower risk of deeper Made Ground in the footprint of the proposed temporary classrooms. In this area and the soils show a relatively consistent composition. The proposed temporary modular units are also likely to be less sensitive to variable / differential settlements in the short term, much of which can be accommodated by design, e.g. via the use of large footprint or adjustable pad foundations, and therefore conventional shallow could be considered for relatively light structural loads of temporary modular units.

Shallow soils are noted to be of low to medium volume change potential and are susceptible to shrink and swell movements associated with seasonal moisture changes. Although these movements may not pose a significant risk to temporary buildings, in line with NHBC guidance ^{ref 7},

it is recommended that permanent structures would need to be constructed on foundations bearing at depths below the zones of influence of nearby trees.

Furthermore, both pile caps and the upper sections of piled foundations would need to be protected with compressible voids and sleeves to remove risks associated with volume change and the possible introduction of negative skin friction to pile shafts.

5.2.1 Conventional Shallow Foundations

The adoption of conventional spread foundations (e.g pad or strip foundations) is likely to be viable for light or broadly distributed loads such as the temporary classrooms.

Due to potential variability in composition and consistency of the near surface soils it is anticipated that these soils, if loaded, may give rise to unpredictable and unacceptable total and differential settlements. It is therefore recommended that foundations pass through the Made Ground and bear onto the underlying Oadby Member.

In consideration of allowable bearing pressures alone, calculations based on the Brinch Hansen method have estimated a net allowable bearing capacity (NBC) of the order of 70kPa. Loads of this order would limit settlement to less than 25mm and could be achieved for a 1x1m wide pads bearing at a depth of 1.0m bgl within the Oadby Member where it occurs at shallow levels, e.g within the area of the proposed temporary classrooms.

It is recommended that the local conditions are confirmed by a geotechnical engineer, and foundations extended to avoid low strength / variable soils where required.

5.2.2 Piled Foundations

Piled foundations will be required to support the permanent structures planned in the area of the existing technology block (Block D). A choice of pile type of various lengths and diameters can be designed to bear into the strata encountered beneath the site. However general site conditions, environs and proximity to adjacent extant structures and foundations are all influential in choice of piling system.

In consideration of the prevailing conditions and the anticipated scale of the scheme, where piles are required, Continuous Flight Auger (CFA) piles are likely to provide a practical and cost-effective solution due to limited generation of arisings and relatively quick installation. CFA piles also limit the risks to sensitive nearby substructures associated with vibration and percussion.

It is noted that certain practical constraints apply, for example when considering the incorporation of pile reinforcement or geothermal exchange systems, and pile emplacement in ground with potential obstructions. For these reasons it is recommended that a competent and experienced specialist piling contractor undertakes all piling works, adopting appropriate controls and that their advice should be sought at the earliest opportunity.

To provide an indicative assessment of pile capacities for the purposes of this illustrative exercise, variations in strata thickness have been averaged in a simplified model of ground conditions and characteristics as indicated in Table 9 whilst adopting worse case conditions (Made Ground of c. 5m thick). It is noted that the parameters applied are potentially conservative and have been

developed from the limited data available. The indicative capacities in Table 12 account for potentially weak soils at or near to the water table and include a widened buffer of 3m of potentially loose coarse soils around the vadose zone. Further efficiency / capacity may be achievable through a more detailed characterisation based on additional lateral coverage and deeper ground investigations to provide parameters for deeper piles.

Service capacities for a range of possible founding depths and pile dimensions have been calculated for CFA piles as outlined in Table 12.

Table 12 Summary CFA Preliminary Pile Capacity Assessment

Pile Embedment Length (m)	Pile Diameter (m)		
	0.30	0.60	1.20
	Approximate Service Capacity (kN)		
8	140	380	1170
10	190	510	1540
12	420	1300	4600

Parameters: α 0.30, β 0.30-0.56, N_c 8, N_q 2xSPT N, Groundwater 2.40m bgl. FOS: **1.5** shaft, **3.50** base.

5.2.3 Floor Slabs

Due to the presence of a variable thickness of Made Ground, which will be subject to variable longer-term settlement under relatively light loads, it is recommended that floor slabs are suspended.

5.2.4 Temporary Works

Shallow excavations remained stable during the investigation, however, owing to the variability of the shallow soils, there is potential for excavations to be unstable. It is therefore likely that temporary excavations will require battering back during excavation, and in line with good working practices, man entry into excavations greater than 1.2m deep, or working adjacent to unsupported soils, should only be carried out where temporary works and shoring are in place.

Shallow groundwater was not encountered during the investigation; however, there is some potential for minor perched water ingress, particularly after heavy precipitation and therefore allowances for the dewatering of excavations will need to be considered. It is recommended that dewatering is undertaken in accordance with the guidelines of CIRIA C515 Groundwater control – Design and Practice.

5.2.5 Concrete

It is recommended that concrete used for substructures complies with the design sulfate class of DS1 and ACEC class of AC-1 which assumes a mobile groundwater condition.

6.0 CONCEPTUAL SITE MODEL AND QUALITATIVE RISK ASSESSMENT

6.1 INTRODUCTION

Under the current UK environmental legislation (Environment Act 1995, Water Resources Act 1994, Environmental Protection Act 1990 (as amended), Health and Safety at Work Act 1994, Town and Country Planning Act 1990 and Building Regulations 1985), land is defined as contaminated if there is a significant ‘pollutant linkage’. This requires evidence of the presence of a contaminant “source”, a “pathway” through which contaminants could travel, and a “receptor” that could be harmed by the contaminant. In addition, the type of receptor and any harm must meet the descriptions of significant harm given in the statutory guidance. A site where a contaminant is causing, or is likely to cause, significant pollution of controlled waters also constitutes contaminated land.

This section of the report refines the Conceptual Site Model (CSM) developed during the Desk Based Assessment ^{ref 1}, which includes a qualitative assessment of environmental risks associated with each of the pollutant linkages identified.

The qualitative risk assessment is achieved by classifying the likely significance or severity of the risk and the probability of the risk actually occurring, to determine an overall risk for that particular pollutant linkage. The assessment has been undertaken with cognisance of:

- The nature, volume and extent of any identified contamination source;
- The potential pathways;
- Identified primary receptors; and
- Due regard to the current site status and potential future site redevelopment as a school.

6.2 GROUND CONTAMINATION TIER 1 SCREENING ASSESSMENT

The objective of the Tier 1 Screening Assessment presented herein is to identify the chemical constituents analysed which might potentially pose unacceptable levels of risk to sensitive on-site and off-site receptors. Measured concentrations in soil have been compared with various sets of Tier 1 Screening Values (TSVs). Where measured concentrations exceed these levels, this does not necessarily indicate a requirement for remediation; it can, however, be the trigger for the undertaking of a more detailed quantitative assessment in accordance with the current UK tiered risk assessment framework.

6.2.1 Human Health

6.2.1.1 Soils

In March 2014, DEFRA published the ‘C4SLs’ within the ‘Policy Companion Document: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination’

(SP1010). The purpose of the C4SLs is to identify a concentration in soil indicative of Category 4 status as defined by Part 2a Statutory Guidance on the definition of contaminated land. In September 2014, further clarification was published in a letter from Lord DeMauley to Local Authorities instructing them to use C4SLs in planning. Where available C4SLs have been used as the preferred choice of screening criteria.

For those constituents where no C4SL has been published, Tt have screened soil against Suitable for Use Levels (S4ULs).

For the purposes of this risk assessment, human health criteria for soils applicable to a school end use have been used in order to screen the site data. The TSVs applied are based on a 'residential without plant uptake' scenario and whilst this is conservative for the end use, it is considered protective of school pupils.

A number of TSVs are dependent on the Soil Organic Matter (SOM) content, and as such TSVs are typically calculated for a SOM of 1%, 2.5%, and 6%. An average SOM of 0.21% was calculated for samples taken. For this reason, GACs corresponding to a SOM of 1% have been used for the screening of the samples.

6.2.1.2 Tier 1 – Soil Screening

8No. soil samples obtained from the near surface materials on site were submitted for chemical laboratory analysis.

A single exceedance of the TSVs was recorded when using the screening criteria defined in S.6.2.1. Beryllium was recorded at a concentration of 3.1mg/kg with position IP05 at a depth of 0.20mbgl, compared to the TSV of 1.7mg/kg. All other analysed contaminants were recorded at concentrations below the corresponding TSVs within all soil samples.

It is considered that the exceedance of beryllium is relatively marginal and with the associated sample taken from Made Ground soils at a depth of 0.2mbgl, it is unlikely school end users would come into direct contact with these soils. It should also be noted that the analysed soils from that same position at a depth of 0.1mbgl did not show any exceedances above the TSV.

Full copies of laboratory certificates for all soil analyses are as well as the screened results are included as **Appendix 8**.

6.2.1.3 Asbestos Screening

8No. samples were analysed for the presence of asbestos comprising samples from a range of shallow depths. No Asbestos was identified in any of the samples.

6.2.2 Groundwater

The superficial geology is classified by the Environment Agency (EA) as a Secondary Undifferentiated Aquifer (Oadby Member) overlying a Secondary A Aquifer (Wolston Sand and

Gravel). There are no groundwater abstraction points within 500m of the site and the site is not located within a groundwater Source Protection Zone.

6.2.2.1 Leachate

2No. soil samples obtained from Made Ground soils were scheduled for leachate testing to assess the mobility of constituents from soil samples collected from the site. The results of this analysis have been compared with Tt's inhouse Freshwater TSV (the most conservative screening value from River Water Environmental Quality Standards (EQS), Drinking Water Standards (DWS) or Freshwater Lake TSVs). **No exceedances of the TSVs** were recorded, indicating limited potential for contaminants to leach from the soils.

6.2.2.2 Groundwater

The groundwater screening assessment has been undertaken is to identify the chemical constituents analysed which might potentially pose unacceptable levels of risk to the groundwater underlying the site. Measured concentrations from a single round of groundwater sampling have been compared with Tt's inhouse Freshwater TSV (the most conservative screening value from River Water Environmental Quality Standards (EQS), Drinking Water Standards (DWS) or Freshwater Lake TSVs). Where measured concentrations exceed these levels, this does not necessarily indicate a requirement for remediation; it can however, be the trigger for the undertaking of a more detailed quantitative assessment in accordance with the current UK tiered risk assessment framework.

A single groundwater sample was collected from BH01 (all other installations were dry) during the first round of water monitoring and scheduled for laboratory analysis for a suite of commonly elevated potential contaminants.

The results were screened using the adopted TSV (as defined above) and only the dissolved Zinc concentration (32µg/l) showed an exceedance of the respective screening value (10.9 µg/l). With the assumption that the concentration is 100% bioavailable, the Zinc concentration is slightly above typical ambient background concentrations of UK rivers which ranges between 1.2 and 7.1 µg/l.

7.0 GROUND GAS ASSESSMENT

7.1 INTRODUCTION

Three rounds of gas monitoring have been undertaken to date on the 2nd and 8th of December 2021, and 8th February 2022.

A full factual record of the monitoring visits is presented in Section 3.9 and **Appendix 6**.

7.2 POTENTIAL SOURCES

Based on the desk-based assessment ^{ref 1} and the findings of the site investigation, limited potential ground gas sources have been identified on the site and in the surrounding areas which include:

- Made Ground of variable thickness associated with creating level development platforms for the school buildings on the sloping site. Up to 3.9m thickness of Made Ground has been proven during these works.

7.3 DATA SUMMARY

Tables 5 and 6 summarise the ground gas concentrations and flows obtained during the two monitoring visits undertaken to date. Using the CIRIA C665 ^{ref 9} guidance on Ground Gas the greatest flow rate and greatest concentrations of ground gases are combined to reflect a worst-case scenario. The ranges of concentrations at each location do not necessarily correspond to the same monitoring date but represent the maximum readings across the monitoring programme to allow an assessment of the gas concentrations on a worst-case scenario basis. It is noted, however, that a worst-case scenario cannot be wholly achieved without falling atmospheric pressure during the monitoring period.

7.4 GROUND GAS RISK ASSESSMENT

A semi-quantitative land gas assessment has been undertaken using the guidance provided in BS8485 ^{ref 10} and CIRIA C665 ^{ref 9} which provides a framework for assessment of ground gas risk to buildings/structures with a range of foundation designs.

Using peak flow rates and gas concentrations recorded over both monitoring visits, a semi-quantitative, worst-case scenario GSV (ltr/gas/hr) derived from the peak concentration (% volume) x peak flow (ltr/hr) is summarised in Table 13.

⁹ CIRIA - C665 Assessing Risks posed by hazardous ground gases to buildings (2007)

¹⁰ BS 8485 (2015) Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings

Table 13 GSV Worst Case Scenario Summary

Gas	Peak Concentration (%)	Peak Flow (l/hr)	Maximum Gas Flow (l/hr)	GSV Worst Case Scenario
CO ₂	3.50	-0.026	0.00091	CS1 (Very Low Risk)
CH ₄	0.10	-0.026	0.000026	CS1 (Very Low Risk)

The resultant GSV calculations indicate the site is currently representative of Characteristic Situation 1, and therefore it is unlikely that special ground gas protection measures to new buildings will be required. If further monitoring indicates higher concentrations of ground gas or greater flows, consideration should be given to incorporating a gas membrane into new buildings.

8.0 CONCEPTUAL SITE MODEL

8.1 INTRODUCTION

A preliminary conceptual site model (CSM) and qualitative risk assessment was provided as part of the Tt desk-based assessment ^{ref 1}. Updates to the CSM and risk assessment of potential contamination linkages to receptors made based on the intrusive site investigation works and monitoring and laboratory assessment undertaken to date are discussed as follows.

8.2 SUMMARY OF POTENTIAL GROUND CONTAMINATION RISK

8.2.1 Sources

Based on a review of the available desk-based information ^{ref 1} and ground investigation data available to date, the following potential sources have been identified

- S1 – Made Ground associated with historical development / earthworks to create level development platforms. Some anthropogenic materials were noted within the Made Ground including ceramic tile, concrete and asphalt and brick fragments. These likely originate from former buildings that were historically present on site (farmstead and earlier school buildings).

8.2.2 Pathways

The primary pathways by which sensitive receptors may come into contact with ground contamination are considered to be the following:

- P1 – Direct dermal contact with and / or ingestion of contaminated soil;
- P2 – Atmospheric transport and inhalation of airborne dusts, vapours and fibres;
- P3 – Lateral and vertical migration of gases / vapours through the underlying strata;
- P4 – Leaching of potential onsite sources of contamination;
- P5 – Lateral and vertical migration of dissolved phase contamination in the Secondary Aquifers;
- P6 – Contaminant migration through preferential pathways (e.g. underground service ducts, drains, etc.);
- P7 – Surface water runoff;
- P8 – Direct contact with buildings / structures leading to chemical attack and damage;
- P9 – Accumulation of hazardous gas in buildings; and
- P10 – Leaching of potential offsite sources of contamination.

8.2.3 Receptors

The following are considered to be sensitive receptors:

- R1 - Groundworkers
- R2 - Future School Users
- R3 - Surface Water Features – on site pond, inland rivers, Thurlaston Brook and Soar River
- R4 - Secondary A Superficial Aquifers and Secondary B Bedrock Aquifer

8.3 RISK ASSESSMENT

A qualitative risk assessment has been undertaken using the matrix approach defined within CIRIA C552 ^{ref 11} as detailed in Table 14 which evaluates the pollutant linkages and the assigned risk rating and updates the preliminary CSM identified in the Tt desk based assessment ^{ref 1}. The CIRIA C552 risk categories and the assessment methodology are detailed in Appendix 9.

¹¹ Contaminated Land Risk Assessment, A Guide to Good Practice (Rudland et al., 2001).

Table 14 Updated CSM

Potential Source	Potential Pollutant	Potential Receptor	Potential Pathway to Receptor	Associated Hazard (Severity)	Likelihood of Occurrence	Risk
S1: Made Ground associated historic development and earthworks	No contaminants identified at concentrations that would be considered hazardous (with the exception of an isolated and limited instance of beryllium, although this is not considered to pose a significant risk) but occasional anthropogenic fragments of ceramic, brick and concrete were recorded	R1 Groundworkers	Direct contact/ingestion, atmospheric transport and inhalation, migration, and accumulation of hazardous gases/vapours. (P1, P2, P3, P9)	Human Health (Medium)	Low Likelihood Groundworks increase the chance of construction site workers encountering sub-surface soils impacted during earthworks. Limited evidence of contamination has been encountered. No asbestos fibres were recorded but anthropogenic materials were noted including brick and ceramic fragments which may present an injury hazard if found to be angular/sharp fragments Risks can be further reduced with the introduction of a Construction & Environmental Management Plan (CEMP) and adoption of appropriate PPE.	Low / Moderate
		R2 Future School Site Users			Low Likelihood Areas of soft landscaping in future developments will act as continuous pathways between underlying Made Ground and site users, however no significant contamination has been identified during the investigation. The anthropogenic materials identified, whilst not a mobile contamination sources, may be present as sharp/angular fragments that may be injurious if encountered near the surface in playing fields	Low / Moderate
		R3 Surface Water Features	Leaching of on-site contamination, lateral and vertical migration of contamination, migration through preferential pathways, surface runoff. (P4, P5, P6, P7)	Controlled Waters (Mild)	Unlikely Given the limited evidence of mobile contamination and the distance between the source and receptor, contamination of surface waters is highly unlikely.	Very Low
		R4 Secondary Superficial Aquifers	Leaching of on-site contamination, lateral and vertical migration of contamination, migration through preferential pathways. (P4, P5, P6)	Controlled Waters (Mild)	Unlikely Limited evidence of contamination and potential for leachate to impact groundwater.	Very Low

9.0 CONCLUSIONS

9.1 CONTAMINATION RISK ASSESSMENT SUMMARY

Based on the data collated during the ground investigation and the desk based review of the site in the Tetra Tech Phase 1 Report (Aug 2021), no contamination of any significance has been recorded within the ground on site. However, fragments of anthropogenic materials such as ceramics, brick, concrete etc. were noted within the Made Ground which may present a risk of injury if in shallow soils within playing fields. The groundwater table is deep (10.40m bgl) significantly reducing the risk of any contaminant linkages to the underlying Secondary A aquifer.

Ground gas has not been recorded in concentrations that are likely to present a significant risk at this site.

9.2 GEOTECHNICAL ASSESSMENT SUMMARY

The adoption of conventional spread foundations (e.g pad or strip foundations) is likely to be viable for light loads associated with the temporary modular classrooms. However, due to potential variability in composition and consistency of the near surface soils in the area of Block D, it is likely that Piled foundations will be required.

9.3 RECOMMENDATIONS

No significant sources of contamination have been identified on site and contamination of the shallow soils was not observed. However, for any areas of proposed playing fields (e.g. grass covered sports pitches), care will be required to make sure that fragments of former demolition rubble (concrete, brick etc) are not present near the surface which may cause injury to the users of these playing fields. In this instance, a cover of imported topsoil may be required to prevent any contact with the underlying Made Ground.

However, it is also acknowledged that variable conditions may be present in between investigation locations and on this basis, groundworkers undertaking construction works (foundations, site levelling, installing services etc) should be vigilant for any signs of contamination during their works and if such should be encountered, works halted whilst the advice of a contaminated land consultant is sought. Groundworkers should also use appropriate PPE and employ standard environmental management practices.

It is not considered that ground gas protection measures are required for new buildings based on the current data, however, further monitoring is recommended, particularly during falling atmospheric pressure, to confirm the ground gas regime.

The limited data available has resulted in a cautious approach to the geotechnical characterisation and ground model. Further efficiency in design and risk elimination could be achieved through additional investigations, particularly in the area around block D, where constraints prevented a standard triangulation of the deeper conditions of the site to inform pile design. This would be

achieved via the drilling of an additional 2No cable percussive boreholes to depths of between 15 to 20m bgl in areas targeted based on the emerging design and anticipated structural loads.

APPENDICES

1 REPORT CONDITIONS

This report is produced solely for the benefit of the **Department for Education** and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing otherwise.

This report refers, within the limitations stated, to the condition of the site at the time of the inspections. No warranty is given as to the possibility of future changes in the condition of the site.

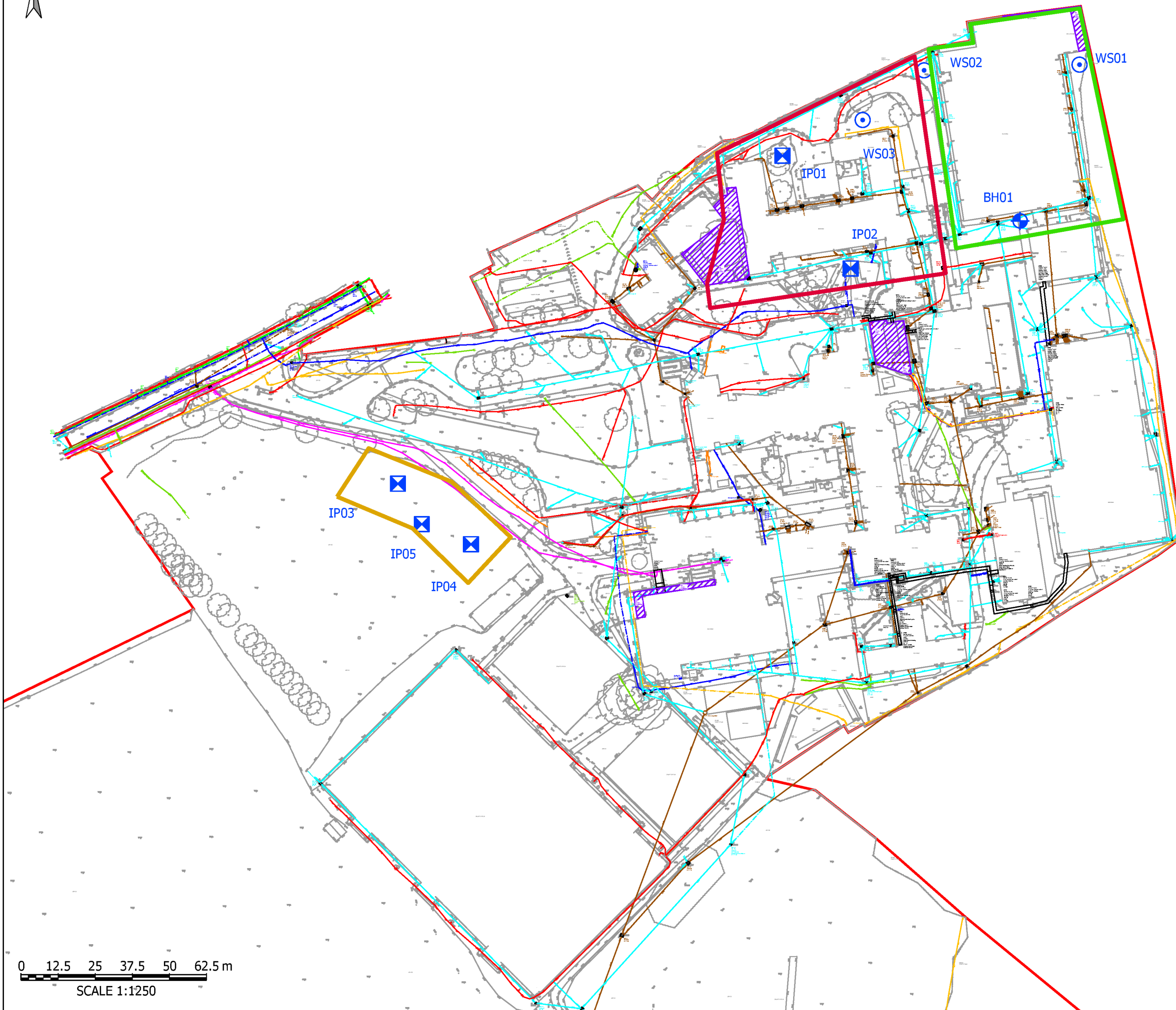
This report is based on a visual site inspection, reference to accessible referenced historical records, information supplied by those parties referenced in the text and preliminary discussions with local and Statutory Authorities. Some of the opinions are based on unconfirmed data and information and are presented as the best that can be obtained without further extensive research. Where ground contamination is suspected but no physical site test results are available to confirm this, the report must be regarded as initial advice only, and further assessment should be undertaken prior to activities related to the site. Where test results undertaken by others have been made available these can only be regarded as a limited sample. The possibility of the presence of contaminants, perhaps in higher concentrations, elsewhere on the site cannot be discounted.

Whilst confident in the findings detailed within this report because there are no exact UK definitions of these matters, being subject to risk analysis, we are unable to give categorical assurances that they will be accepted by Authorities or Funds etc. without question as such bodies often have unpublished, more stringent objectives. This report is prepared for the proposed uses stated in the report and should not be used in a different context without reference to Tetra Tech. In time improved practices or amended legislation may necessitate a re-assessment.

The assessment of ground conditions within this report is based upon the findings of the study undertaken. We have interpreted the ground conditions in between locations on the assumption that conditions do not vary significantly. However, no investigation can inspect each and every part of the site and therefore changes or variances in the physical and chemical site conditions as described in this report cannot be discounted.

The report is limited to those aspects of land contamination specifically reported on and is necessarily restricted and no liability is accepted for any other aspect especially concerning gradual or sudden pollution incidents. The opinions expressed cannot be absolute due to the limitations of time and resources imposed by the agreed brief and the possibility of unrecorded previous use and abuse of the site and adjacent sites. The report concentrates on the site as defined in the report and provides an opinion on surrounding sites. If migrating pollution or contamination (past or present) exists further extensive research will be required before the effects can be better determined.

2 FIGURES



KEY

- BOREHOLE
- WINDOW SAMPLE
- INSPECTION PIT
- PROPOSED LOCATION OF MODULAR UNITS
- DEMOLITION/LANDSCAPING
- BLOCK D PROPOSED DEVELOPMENT

DRAFT ISSUE

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Client:
GLEEDS ADVISORY LIMITED

Project Name:
HINCKLEY

Sheet Title:
GROUND INVESTIGATION LAYOUT PLAN

TTE Project Number	Drawn By	Date	Checked By	Date	Approved By	Date	Scale @ A3	Suitability
B030162	CM/PP	17.12.21	RT	20.12.21	CC	20.12.21	1:1,250	SD
Client Project Number	Originator	Volume/System	Level/Location	Type/Code	Role	Number	Revision	
B030162	- TTE	- 00	- XX	- DR	- U	- 0001	D01	

3 BOREHOLE LOGS

Tt TETRA TECH Project: Hinckley Location: Hinckley Academy, LE10 1LE Client: Department for Education						Location Details Easting: 444079.00 Northing: 294592.00 Level: 123.46 mAOD Depth: 15.00 m Logger: Type: CP Orientation: ° Inclination: 90°						Status FINAL		Borehole Number BH01			
												Sheet 1 of 1					
Method, Plant and Crew						Diameter		Casing		Drilling Progress by Time						Scale: 1:75	
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)	Checked By:	HA		
0.00	15.00	Cable Percussion	Dando 2500 Mk2 Rig 10	SI Drilling			14.50	150						Approved By:	RT		
														Start Date:	20/11/2021		
														Finish Date:	21/11/2021		
Strata Description							Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing					
												Depth (m)	Ref	Tests / Results			
MADE GROUND: Mortared herringbone brick.								0.10	123.36								
MADE GROND: Medium dense orange brown slightly gravelly SAND. Sand is fine to coarse. Gravel comprises fine medium flint. (BASE FILL)								0.30	123.16			0.50	D1				
MADE GROUND: Firm brown slightly sandy gravelly CLAY. Gravel is subangular to subrounded, fine to coarse flint with occasional brick, concrete and asphalt fragments. Sand is fine to coarse.												0.80 - 1.20	B1				
Stiff reddish brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to medium flint. Sand is fine to coarse. (OADBY MEMBER)								1.30	122.16			1.30	D2				
											1.50 - 1.95	D3	SPT(S) 1.50m, N=19 (2,3/4,4,5,6)				
											2.50 - 2.95	U1	Ublows=81 Recovery=100%				
											3.00	D4					
											3.50 - 3.95	D5	SPT(S) 3.50m, N=25 (2,3/5,5,7,8)				
Medium dense reddish brown slightly silty fine to coarse SAND. (WOOLSTON SAND and GRAVEL)								4.60	118.86			4.50 - 4.95	U2	Ublows=100 Recovery=80%			
											5.00	D6					
											6.00 - 6.45	B2	SPT(S) 6.00m, N=23 (2,3/4,6,6,7)				
											6.00 - 6.45	D7					
											7.50 - 7.95	D8	SPT(S) 7.50m, N=25 (3,3/4,6,7,8)				
Medium dense reddish brown slightly silty fine to coarse SAND and fine to coarse, subangular sandstone GRAVEL. (WOOLSTON SAND and GRAVEL)								8.70	114.76			9.00 - 9.45	B3	SPT(S) 9.00m, N=28 (2,3/5,7,7,9)			
Loose reddish brown fine to medium SAND. (WOOLSTON SAND and GRAVEL)								10.40	113.06			10.50 - 10.95	D9	SPT(S) 10.50m, N=6 (1,0/1,1,2,2)			
...from 12.00m bgl: medium dense.											12.00 - 12.45	D10	SPT(S) 12.00m, N=24 (2,3/4,6,6,8)				
Dense grey brown fine SAND with 40 to 120mm bands of stiff grey brown CLAY. (WOOLSTON SAND and GRAVEL)								13.90	109.56			13.50 - 13.95	D11	SPT(S) 13.50m, N=29 (3,4/5,7,8,9)			
													14.00 - 14.40	B4			
													14.50 - 14.95	D12	SPT(S) 14.50m, N=35 (3,4/6,8,9,12)		
EOH at 15.00m - Target depth								15.00	108.46								
Observations / Remarks										Chiselling			Water Added		Hammer Information		
1. Location cleared with CAT and GPR scanning. 2. Groundwater strike occurred at 13.20 rising to10.71m bgl (20 minutes). 3. Installed with 50mm diameter HDPE standpipe, slotted with filter and 10mm diameter pea-shingle surround from 14.50 to 1.00m bgl. Bentonite seal from 1.00 to 0.50m bgl. Finished with a gas tap and flush fitting concreted steel cover.										From (m)	To (m)	Time (mins)	From (m)	To (m)	Serial No.	Energy Ratio %	
													4.60	13.20			
										Groundwater						Project Number	
										Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks	784-B030162	
										13.20	12	-	0	10.71			

4 WINDOW SAMPLE AND INSPECTION PIT LOGS

Tt TETRA TECH	Project: Hinckley		Location Details Easting: 443999.00 Northing: 294614.00 Level: 130.84mAOD Depth: 1.00m Logger: Type: IP				Status FINAL		Pit Number IP01		
	Location: Hinckley Academy, LE10 1LE									Sheet 1 of 1	
	Client: Department for Education										
Pit Dimensions 0.30m 0.30m	Hole Information		Groundwater						Scale: 1:10		
		Orientation: °	Strike (m)	Rose To (m)	After (mins)	Remarks		Checked By: HA			
		Shoring: None						Approved By: RT			
		Stability: Stable						Start Date: 20/11/2021			
	Plant: Hand Tools							Finish Date: 20/11/2021			
Strata Description			Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing			
MADE GROUND: Grass over soft dark brown slightly gravelly sandy SILT with frequent rootlets and rare fragments of brick. Gravel is subangular to subrounded fine to medium flint. Sand is fine to coarse.				0.20	130.64			0.50	ES1	Tests / Results	
MADE GROUND: Soft brown slightly gravelly sandy SILT with occasional rootlets. Gravel is subangular to subrounded fine to medium flint. Sand is fine to coarse.											
EOH at 1.00m - Target depth				1.00	129.84						

[illegible]

Tt TETRA TECH	Project: Hinckley		Location Details				Status		Pit Number	
	Location: Hinckley Academy, LE10 1LE		Easting: 443857.00 Northing: 294494.00				FINAL		IP03	
Client: Department for Education		Level: 128.70mAOD Depth: 1.00m								Sheet 1 of 1
		Hole Information		Groundwater				Scale: 1:10		
Pit Dimensions		Orientation: °		Strike (m)	Rose To (m)	After (mins)	Remarks		Checked By: HA	
0.30m		Shoring: None							Approved By: RT	
0.30m		Stability: Stable							Start Date: 20/11/2021	
		Plant: Hand Tools							Finish Date: 20/11/2021	
Strata Description			Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing		
								Depth (m)	Ref	Tests / Results
MADE GROUND: Grass over soft dark brown slightly gravelly sandy SILT with frequent rootlets. Gravel is subangular to subrounded fine to medium flint. Sand is fine to coarse.										
MADE GROUND: Soft dark brown slightly gravelly sandy SILT with frequent rootlets. Gravel is subangular to subrounded fine to medium flint. Sand is fine to coarse. (Disturbed OADBY MEMBER)				0.30	128.40			0.50	ES1	
EOH at 1.00m - Target depth				1.00	127.70					
								</		

Tt TETRA TECH	Project: Hinckley		Location Details				Status		Pit Number	
	Location: Hinckley Academy, LE10 1LE		Easting: 443882.00 Northing: 294474.00				FINAL		IP04	
Client: Department for Education		Level: 128.70mAOD Depth: 1.00m								
		Logger: Type: IP						Sheet 1 of 1		
Hole Information Pit Dimensions 0.30m 0.30m Orientation: ° Shoring: None Stability: Stable Plant: HAnd Tools		Groundwater						Scale: 1:10		
		Strike (m)		Rose To (m)		After (mins)		Remarks		Checked By: HA
								Approved By: RT		
								Start Date: 20/11/2021		
								Finish Date: 20/11/2021		
Strata Description			Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing		
MADE GROUND: Grass over soft dark brown slightly gravelly sandy SILT with frequent rootlets. Gravel is subangular to subrounded fine to medium flint. Sand is fine to coarse.				0.30	128.40			Depth (m)	Ref	Tests / Results
MADE GROUND: Soft dark brown slightly gravelly sandy SILT with frequent rootlets. Gravel is subangular to subrounded fine to medium flint. Sand is fine to coarse. (DIsurbed OADBY MEMBER)								0.50	ES1	
EOH at 1.00m - Target depth				1.00	127.70					
Observations / Remarks								11th Floor, Angel Court, London EC2R 7HJ 020 7250 7500		
1. Location cleared with CAT and GPR scanning. 2. No groundwater encountered. 3. Backfilled with arisings								Project Number 784-B030162		

	Project: Hinckley		Location Details Easting: 443861.00 Northing: 294480.00 Level: 128.70mAOD Depth: 1.00m Logger: SC Type: IP				Status FINAL		Pit Number IP05 Sheet 1 of 1		
	Location: Hinckley Academy, LE10 1LE								Scale: 1:10		
	Client: Department for Education								Checked By: HA Approved By: RT Start Date: 02/12/2021 Finish Date: 02/12/2021		
		Hole Information		Groundwater							
Pit Dimensions 0.35m 0.35m		Orientation: ° Shoring: None Stability: Stable Plant: Hand Tools		Strike (m)		Rose To (m)		After (mins)		Remarks	
Strata Description				Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing		
									Depth (m)	Ref	Tests / Results
MADE GROUND: Soft dark brown slightly gravelly slightly sandy silty CLAY with abundant rootlets. Gravel is angular to sub-rounded fine to medium quartzite and flint. Sand is fine to coarse.					0.18	128.52			0.10 0.10	D1 ES2	
MADE GROUND: Dark grey to black slightly ashy slightly sandy angular to sub-angular fine to coarse GRAVEL of quartzite, sandstone and coal with rare metal.									0.20	ES3	
Soft brown to reddish brown slightly gravelly sandy CLAY. Gravel is sub-angular to sub-rounded fine to coarse quartzite and sandstone. Sand is fine to coarse. (QADBY MEMBER)					0.26	128.44			0.30 0.30	D4 ES5	
							0.40 - 0.80	B6			
EOH at 1.00m - Target depth					1.00	127.70			1.00	D7	

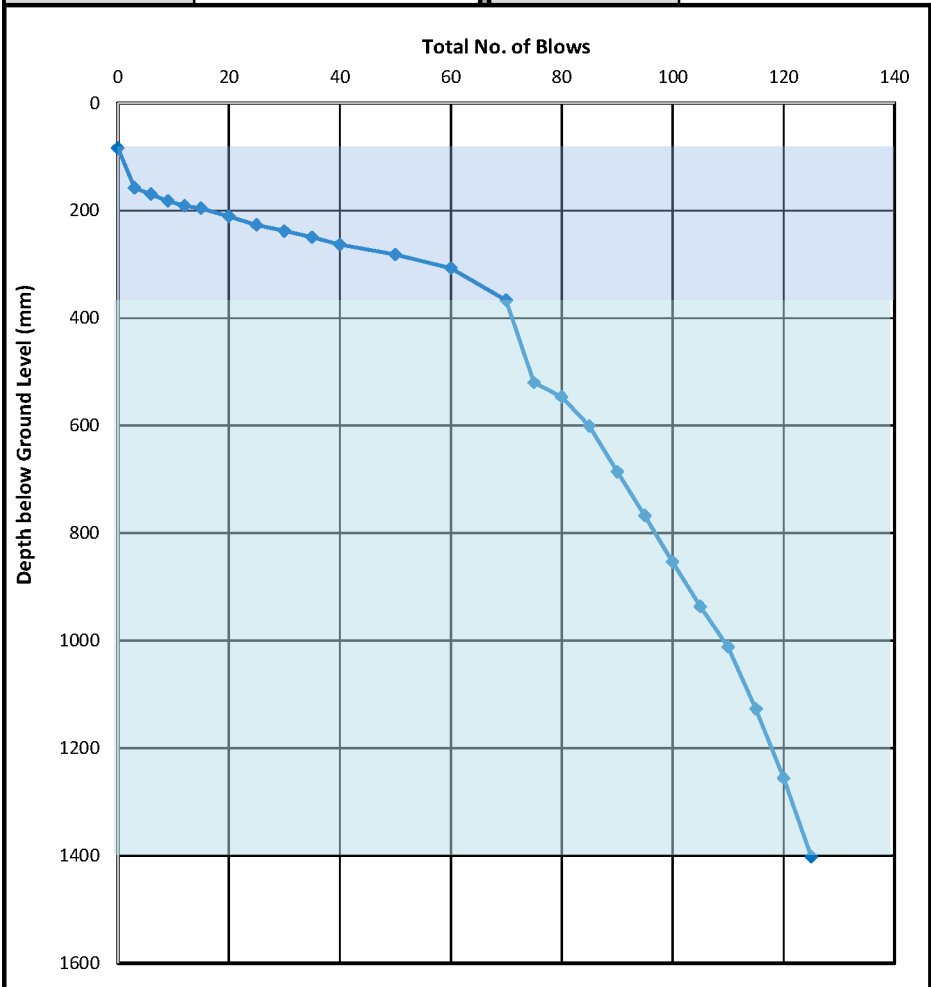
Tt TETRA TECH Project: Hinckley Location: Hinckley Academy, LE10 1LE Client: Department for Education						Location Details Easting: 444099.00 Level: 123.72mAOD Logger: Northing: 294657.00 Depth: 5.00m Type: WLS Inclination: °						Status FINAL		Borehole Number WS01		
						Sheet 1 of 1										
Method, Plant and Crew					Diameter		Casing		Groundwater					Scale: 1:25		
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Strike (m)	Casing (m)	Sealed (m)	Rose To (m)	Time (mins)	Remarks	Checked By: HA	
0.00	1.00	Inspection Pit	Dynamic Windowless Sampling		1.00	300	2.00	120							Approved By: RT	
1.00	5.00				2.00	110									Start Date: 20/11/2021	
					3.00	100									Finish Date: 20/11/2021	
					4.00	90										
					5.00	80										
Strata Description						Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing					
											Depth (m)	Ref	Tests / Results			
MADE GROUND: Soft to firm dark brown, slightly gravelly silty CLAY. Gravel comprises subangular to subrounded, fine to medium flint with concrete, asphalt and brick fragments. (TOPSOIL) MGR											0.20	ES1				
MADE GROUND: Stiff dark brown slightly gravelly silty CLAY. Gravel is subangular to subrounded, fine to medium flint with rare brick fragments and pockets of orangish brown sand.							1.00	122.72			0.90	ES2	SPT(S) 1.00m, N=11 (2,2/3,3,2,3)			
...at 2.00m bgl: cobble size part brick fragment.											1.20 - 1.60	B1				
MADE GROUND: Stiff to very stiff reddish brown slightly gravelly silty CLAY. Gravel is subangular to subrounded, fine to medium flint with rare asphalt and brick fragments and occasional roots.							2.20	121.52			2.50 - 3.00	B2	SPT(S) 2.00m, N=12 (2,2/3,3,3,4)			
											3.50 - 4.00	B3	SPT(S) 3.00m, N=20 (3,3/3,5,6,6)			
											4.60 - 5.00	B4	SPT(S) 4.00m, N=21 (4,4/5,5,5,6)			
Medium dense orangish brown silty fine to medium SAND. Gravel is subangular to subrounded fine to medium flint. (WOOLSTON SAND and GRAVEL)							4.60	119.12								
							5.00	118.72					SPT(S) 5.00m, N=25 (5,5/6,6,6,7)			
EOH at 5.00m - Refusal																
Observations / Remarks										Sampling Runs				Hammer Information		
1. Location cleared with CAT and GPR scanning.										From (m)	To (m)	Diam (mm)	Recovery %	Remarks	Serial No.	Energy Ratio %
2. No groundwater encountered.										1.00	2.00	110	100			
3. Installed with 50mm diameter HDPE standpipe, slotted with filter and 10mm diameter pea-shingle surround from 4.60 to 1.00m bgl. Bentonite seal from 1.00 to 0.50m bgl. Finished with a gas tap and flush fitting concreted steel cover.										2.00	3.00	100	100			
										3.00	4.00	90	100			
										4.00	5.00	80	100			
										Project Number						
										784-B030162						

5 DCP DATA

[illegible]

DCP w. In Situ CBR v1.1 (03/09/2018)

Client	Department for Education	Tetra Tech 11th Floor, Angel Court, London EC2R 7HJ Tel: 020 7250 7500  TETRA TECH					
Project No:	784-B030162						
Hole Number:	TRL02						
Final Depth (m):	1.49						
Easting (x):	443879						
Northing (y):	294470.00	Start Depth (mm)	0	Zero Reading (mm)	0	Test Number	1
Elevation (m AOD):	128.70	Logged by:	SC				
Weather:	Cold Dry	Logged Date:	02/12/2021				

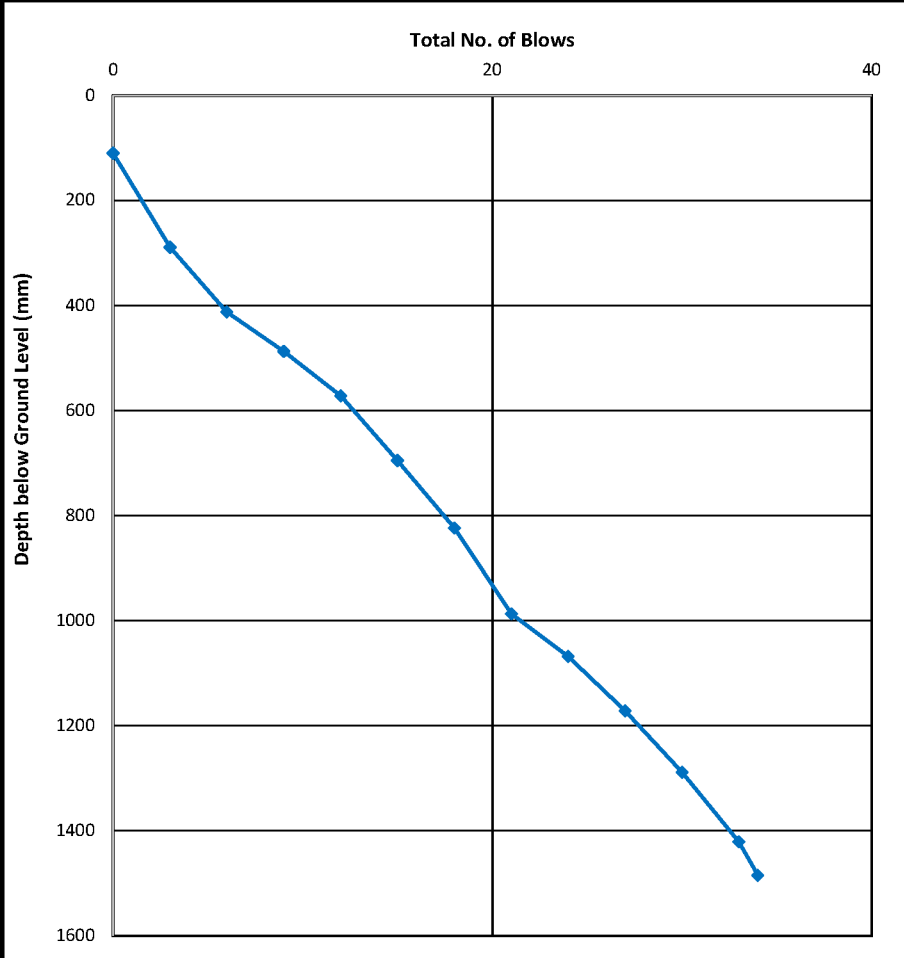
[illegible]

Final

CBR values derived from DCP by Highways specification: $\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 (\text{Log}_{10}(\text{mm/blow}))$

DCP w. In Situ CBR v1.1 (03/09/2018)

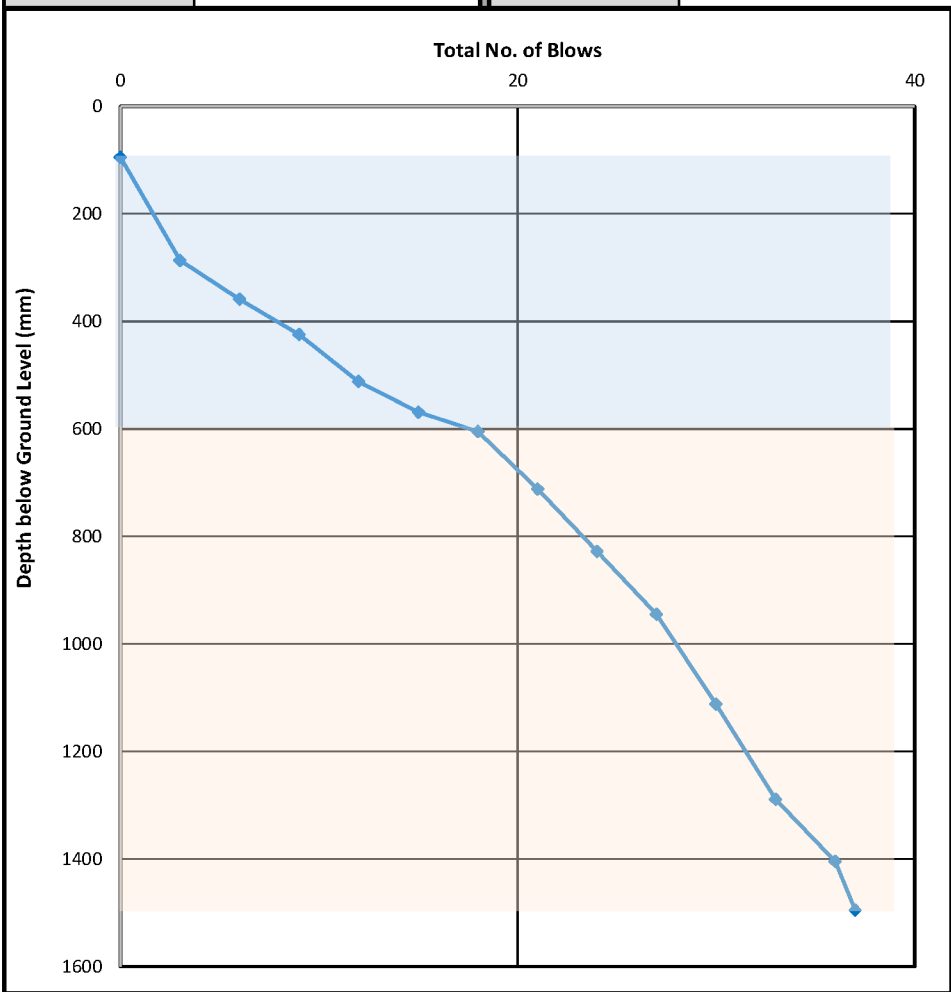
Client	Department for Education	Tetra Tech 11th Floor, Angel Court, London EC2R 7HJ Tel: 020 7250 7500  TETRA TECH					
Project No:	784-B030162						
Hole Number:	TRL03						
Final Depth (m):	1.49						
Easting (x):	443861						
Northing (y):	294480.00	Start Depth (mm)	0	Zero Reading (mm)	0	Test Number	1
Elevation (m AOD):	128.70	Logged by:	SC				
Weather:	Cold Dry	Logged Date:	02/12/2021				



Depth Range Start (mm BGL)	Depth Range End (mm BGL)	Average penetration / blow (mm)	Average CBR value (%)				
0	1485	38.00	6.459				
Checked by : RT			Final				
CBR values derived from DCP by Highways specification: $\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 (\text{Log}_{10}(\text{mm/blow}))$							

DCP w. In Situ CBR v1.1 (03/09/2018)

Client	Department for Education	Tetra Tech Tt TETRA TECH 11th Floor, Angel Court, London EC2R 7HJ Tel: 020 7250 7500					
Project No:	784-B030162						
Hole Number:	TRL04						
Final Depth (m):	1.49						
Easting (x):	443882						
Northing (y):	294474.00	Start Depth (mm)	0	Zero Reading (mm)	0	Test Number	1
Elevation (m AOD):	128.70	Logged by:	SC				
Weather:	Cold Dry	Logged Date:	02/12/2021				

[illegible]

CBR values derived from DCP by Highways specification: $\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 (\text{Log}_{10}(\text{mm/blow}))$

6 GROUNDWATER & GROUND GAS & MONITORING RESULTS

TETRA TECH ENVIRONMENT

Geneva Building, Lakeview Drive, Sherwood Business Park, Annesley, Nottingham, NG15 0ED
Tel: 01623 684550



TETRA TECH

GROUNDWATER / GAS MONITORING RECORD SHEET

Client:	D of E	Job No.:	784-B030162	Instruments Used:	Infrared gas analyser
Project:	Hinckley	Date:	02-Dec-21	Make / Model:	GA5000
Weather:	Clear, sunny	Monitored By:	SC	Serial Number:	

Installation No.	Elevation of cover (m agl)	Peak ¹		Steady ²					PID (ppm)	Total gas flow rate (l/hr)	Peak CH ₄ flow rate (l/hr)	Peak CO ₂ flow rate (l/hr)	Atmospheric Pressure (mbar)	Water Depth (mbgl)	Base Depth (m bgl)	Remarks
		CH ₄	CO ₂	CH ₄	CO ₂	O ₂	CO	H ₂ S								
		(% vol)	(% vol)	(% vol)	(% vol)	(% vol)	(ppm)	(ppm)								
BH01	0.00	0.1	2.9	0.1	2.9	15.5	0	0	1.1	-0.9	-0.001	-0.026	998	10.44	13.39	
WS01	0.00	0.1	0.3	0.1	0.3	21.1	0	0	0.2	0.0	0.000	0.000	999	DRY	4.35	
WS02	0.00	0.1	1.6	0.1	1.5	20.6	0	0	0.4	0.0	0.000	0.000	998	DRY	3.20	
WS03	0.00	0.1	3.5	0.1	3.2	18.5	0	0	0.2	0.0	0.000	0.000	997	DRY	3.71	

Background Gas Levels:

	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	Atmos (mbar)
Before Monitoring	0.1	0.1	21.1	998
After Monitoring	0.1	0.1	21.0	999

Characteristic Gas Situation	
1	
2	
3	
4	

¹ The peak reading is the maximum recorded level during a monitoring event.

² The steady reading is the level which remained constant after approximately 1 minute.

TETRA TECH ENVIRONMENT

Geneva Building, Lakeview Drive, Sherwood Business Park, Annesley, Nottingham, NG15 0ED
Tel: 01623 684550



TETRA TECH

GROUNDWATER / GAS MONITORING RECORD SHEET

Client:	D of E	Job No.:	784-B030162	Instruments Used:	Infrared gas analyser
Project:	Hinckley	Date:	8.12.21	Make / Model:	GA5000
Weather:	Overcast	Monitored By:	SC	Serial Number:	

Installation No.	Elevation of cover (m agl)	Peak ¹		Steady ²					PID (ppm)	Total gas flow rate (l/hr)	Peak CH ₄ flow rate (l/hr)	Peak CO ₂ flow rate (l/hr)	Atmospheric Pressure (mbar)	Water Depth (mbgl)	Base Depth (m bgl)	Remarks
		CH ₄	CO ₂	CH ₄	CO ₂	O ₂	CO	H ₂ S								
		(% vol)	(% vol)	(% vol)	(% vol)	(% vol)	(ppm)	(ppm)								
BH01	0.00	0.1	3.1	0.1	3.1	16.4	0	0	0.3	0.0	0.000	0.000	973	10.39	13.38	
WS01	0.00	0.1	0.2	0.1	0.2	20.5	0	0	0.2	0.0	0.000	0.000	973	DRY	4.34	
WS02	0.00	0.1	1.8	0.1	1.8	19.8	0	0	0.4	0.0	0.000	0.000	973	DRY	3.20	
WS03	0.00	0.1	2.0	0.1	2.0	17.8	1	0	0.3	0.0	0.000	0.000	972	DRY	3.69	

Background Gas Levels:

	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	Atmos (mbar)
Before Monitoring	0.1	0.1	20.9	972
After Monitoring	0.1	0.1	21.1	973

Characteristic Gas Situation	
1	
2	
3	
4	

¹ The peak reading is the maximum recorded level during a monitoring event.

² The steady reading is the level which remained constant after approximately 1 minute.