



Phase II Geoenvironmental Site Assessment
Chapel Lane, Widnes

Reference:13-759-R1-2
Date: January 2023



PHASE II GEOENVIRONMENTAL SITE ASSESSMENT

Land off Chapel Lane
Widnes
WA8 4NX

Prepared for:

Taylor
Wimpey

Report Ref: 13-759-R1-2
Date Issued: January 2023

Chapel Lane, Widnes

Phase II Geoenvironmental Site Assessment

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QUALITY ASSURANCE

PROJECT NUMBER	13-759-R1		
VERSION	Version 1	Version 2	
REMARKS	Draft for Comment	Updated Proposed Development	
DATE	18 th January 2023	18 th January 2023	
PREPARED BY	V Wilkinson	G. Brennan	
QUALIFICATIONS	MESci (Hons), FGS	MESci (Hons), FGS	
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QUALIFICATIONS	MeSci, FGS	MeSci, FGS	
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QUALIFICATIONS	BSc (Hons), FGS, PIEMA, MIEEnvSci, CEnv	BSc (Hons), FGS, PIEMA, MIEEnvSci, CEnv	

EXECUTIVE SUMMARY

Site Address	Land off Chapel Lane, Widnes, WA8 4NX	
Grid Reference	E 349898, N 387838	
Site Area	21.68 Ha.	
Current Site Use	The site is roughly divided into two areas; land to the east of Sandy Lane, which comprises a field with an area of overgrown vegetation along the east boundary; and, the land to the west of Sandy Lane which comprises fields and Rose Farm (active) in the far west, containing large silos, farming machinery and above ground storage tanks. A footpath orientated roughly East – West connects Rose Farm with Sandy Lane. The site is generally flat with the undulations/depressions in the southern field.	
Proposed Development	It is understood proposals allow for the development of up to 350 dwellings, public open space, landscaping and associated infrastructure works.	
Environmental Setting	Drift Geology	Till (Devensian – CLAY) across the site.
	Bedrock Geology	Chester Formation - SANDSTONE
	Faults	Two faults present to the east of site.
	Hydrogeology	Secondary Undifferentiated aquifer (drift), underlain by a Principal aquifer (bedrock). There are no licenced water abstractions within 250 m of site.
	Hydrology	An unnamed brook is present adjacent to the northern boundary.
	Flood Risk	Unaffected by flooding from rivers.
Site History	Historically, the site is shown to be utilised as agricultural fields with several ponds and field boundaries present throughout. Sandy Lane (formerly known as Upton Lane) is present in the east, orientated roughly north-south, bisecting the site. A public footpath is also present oriented roughly east-west from Chapel Lane to Sandy Lane. No significant changes occurred on the site until Pre 1989 when Rose Farm is shown on mapping with associated farm buildings in the west, with all ponds now infilled with the exception of one located in the south.	
Previous Reports	E3P has been provided with a Phase 1 desk study 'Desk Study Report for Chapel Lane, Widnes' by Betts Geo Consulting Engineers (report number: 19TAY046/DS). A full summary is provided in Section 2.1, with the key contaminant sources, receptors and human health risk assessment summarised below: Possible Contamination Sources; Current/Historical Site Use Ponds Agricultural use Pathways and Receptors Aquifers – Significant Risk; Low probability. The Shropshire Union Canal is also listed as a potential receptor, however, on review of the surroundings, this is considered to be well outside of influencing distance.	



	The qualitative risk assessment concludes a generally Low – Moderate (Localised) risk for contamination and ground gas.
Utility Locations	Online plans show a sewer present in the western sector of site with a trunk main present though Chapel lane to the west of site. Anecdotal information from the agricultural tenant also indicates presence of the following: - Private water pipes in the west of site supplying all farm buildings. - Electricity in the farmyard creating a loop from the cattle shed, south, then back north towards the farm buildings. - A foul drainage pipe is also present in the west, orientated north-south, fed from the farm to a septic tank near the access track, then out falling at the northern boundary. - A surface water drain roughly orientated east-west is also present within the central and eastern field.
Landfill Sites and Ground Gases	There are no present or historical landfill sites located within 500 m of site.
Radon	Unaffected – no special precautions required.
Coal Mining/Land Stability	The site is located within a Coal Mining Reporting Area; however, it is not located within an area deemed as high risk.
Brine Workings	The proposed development is not located within the Cheshire Brine Compensation District; therefore, is unaffected by brine workings.
Hazardous Installations	No hazardous installations that could potentially prejudice the proposed construction of highly sensitive residential dwellings have been identified within influencing distance of the subject site.

SITE INVESTIGATION

Ground Investigation Works	E3P has completed an intrusive ground investigation comprising: 44 No Mechanically excavated trial pits 36 No Window sample boreholes 2 No Cable percussion boreholes 10 No Dynamic cone penetrometer tests 6 No BRE365 soakaway tests 1 No hand excavated pit to investigate existing surface water drain Selected window sample boreholes were fitted with environmental monitoring installations to enable gas and groundwater monitoring.
Ground Conditions	MADE GROUND – 0.00 m bgl to 1.80 m bgl Made Ground deposits were encountered within thirteen exploratory hole locations to depths of between 0.30 m and 1.80 m bgl although, in general, Made Ground was encountered to a depth of less than 0.80 m bgl. Made Ground deposits comprise a reworked topsoil of dark brown sandy clay with gravel of mudstone and sandstone with selected areas containing fragments of occasional brick and concrete. The majority of locations were underlain by a black sandy mudstone gravel (land drain bedding). A hand excavated pit was conducted to investigate existing surface water drain. The top of the drain was located 0.40 m bgl. The material above comprised of a reworked topsoil underlain by brown mottled grey slightly gravelly sandy clay.



	TOPSOIL – 0.00 m bgl to 0.70 m bgl Topsoil was encountered within the majority of location between 0.00 m bgl and 0.70 m bgl, comprising dark brown slightly gravelly sandy clay with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone. DRIFT – 0.30 m bgl to 16.95 m bgl Drift generally comprises firm brown mottled grey slightly gravelly sandy CLAY with gravel of mudstone, underlain by a stiff brown slightly gravelly sandy CLAY where gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Some locations encountered occasional cobbles of subrounded to rounded mudstone and sandstone. Low strength clays were encountered within 8 locations across the site. Seven locations were between a depth of 1.00 m and 1.65 m bgl (CP101, CP102, WS101, WS105, WS121, WS128 and WS132) with WS114 recording soft clays between 2.00 m and 3.45 m bgl. Medium dense SAND was encountered within two locations WS104 (0.30 m–0.40 m bgl) and WS136 (1.00 m–3.40 m bgl) Gravel with sand bands was encountered between 12.00 m and 13.10 m bgl within CP102.
	SOLID – 2.00 m bgl to 5.30 m bgl Weathered bedrock comprising reddish brown SANDSTONE was encountered within the east of the site between 2.00 m (WS101) and 5.30 m bgl (CP101). Bedrock was not encountered in the central or western areas of site, with one location (CP102) advancing to 16.95 m bgl in Clay drift deposits, indicating the bedrock is significantly deeper within these areas.
	GROUNDWATER – Groundwater was encountered between 0.40 m bgl and 12.00 m bgl during the site investigation with monitoring recording groundwater levels between ground level and 3.43 m bgl

CONTAMINATED LAND ASSESSMENT

Human Health	The Tier 1 human health risk assessment identified the concentrations of the following in exceedance of screening criteria relevant to a residential end use with plant uptake: ▪ Chromium VI – TP125 Made Ground at 0.1 m bgl; ▪ Lead – TP138 Made Ground at 0.1 m bgl; and, ▪ Asbestos (<0.001%) – TP145 Made Ground at 0.80 m bgl Which present unacceptable degrees of theoretical risk to the identified receptors associated with ingestion of soils and inhalation of particulate, respectively. Delineation and segregation of this impacted material will be required to ensure it is placed in an area of reduced sensitivity such as: ▪ Beneath 600 mm clean cover within private gardens;
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	- Within POS – Material from TP125 and TP138 will be suitable for use as topsoil within areas of POS. However, asbestos impacted material would need to be placed below 300 mm clean cover); or, - Beneath plots/hardstanding/roads. With the exception of the locations noted above, topsoil and subsoil deposits on site are considered suitable for re-use, subject to further chemical validation testing. Further post-demolition investigations are required in the farmyard area in the west of the site to confirm the findings of this initial assessment as and when full and unrestricted access is available.
Controlled Waters	Exceedances of EQS and DWS values have been detected within leachate and water samples analysed including arsenic, copper, total cyanide, lead, nickel and zinc. M-BAT and Pb assessment has confirmed the determinands to be of low bioavailability and thus do not pose a risk to surface water courses. Soakaway testing undertaken at the site has confirmed that the infiltration rate is very low, and the low permeability of the material will therefore significantly reduce the potential for downward or lateral migration. Based on the above, there is considered to be no unacceptable level of risk to the controlled waters receptors.
Ground Gas	Current assessment based on initial monitoring visit confirms one area of the site (WS102) identifies levels of CO₂ that would require CS2/Amber 1 classification. The monitoring well is located within Made Ground strata; therefore, delineation of the Made Ground would remove the source of CO₂ decreasing the classification to CS1/Green. WS114 has encountered levels of methane that have been assessed as CS4/Red classification. This area was historically a pond; therefore, the infill material is thought to be the source of high methane levels, although the monitoring well was noted to be flooded on recent occasions and thus results be not be reflective of the true gassing regime. Completion of ground gas monitoring is required, ensuring water is removed from wells beforehand. If high concentrations persist, delineation and removal of the source of elevated carbon dioxide and methane (made ground/pond) within the vicinity of these locations may be required to mitigate the risk to end users.
Potable Water Infrastructure	Based on the assessment of current site conditions it is likely that PE pipe can be used at the proposed development. This will need to be confirmed following the completion of a UKWIR risk assessment. Post-remediation and enabling works ground conditions may be different from those identified during this site investigation.

GEOTECHNICAL ASSESSMENT

Underground Obstructions	No obstructions were encountered during site investigations; however, there is potential for obstructions to be present below current farm buildings and hard standing areas in the west. Further investigation will be required post-demolition.
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	During a phase of cut-and-fill enabling works to create a developable platform, all below-ground obstructions (if encountered) will require grubbing out to the base of the Made Ground to enable the construction of proposed plots.
Allowable Bearing Pressure	The underlying cohesive deposits generally comprise firm to very stiff brown slightly gravelly CLAY circa 0.5 m bgl – 4.0 m bgl which would provide a net ABP in the order of >100 kN/m². Localised areas of soft/firm (low strength) clays were encountered in 8 locations across site (CP101, CP102, WS101, WS105, WS115, WS121, WS128 and WS132) with an ABP of 10–40 kN/m² which will require removal and replacement with suitable engineered fill. The weathered SANDSTONE if encountered at foundation depth is anticipated to provide an ABP >400 kN/m².
Foundation Options	Based on existing levels is considered that the optimum foundation solution for the proposed residential development would be as follows: - Standard strip/trench foundations bearing onto firm/stiff CLAY or weathered SANDSTONE (suitably deepened in areas of tree influence and locally softer clays); - Piles in areas of soft/loose soils and in close proximity of trees. However, a programme of remediation and enabling works may be required to provide suitable development platform levels. Therefore, upon completion of these enabling works, it is possible that a deeper/abnormal foundation solution may be required in areas of the site where levels have been raised.
Building Floor Slabs	Suspended floor slabs considered most suitable.
Heave Precautions	Given that the underlying clay is of low volume change potential, heave precautions will not be required to the internal face of a foundation less than 1.5 m in depth. Heave precautions will be required to the underside of floor slabs (where there is no 200 mm void).
Soakaway Drainage	Soakaway tests indicate the underlying CLAY soils will not be suitable for soakaway drainage and alternative means of suitable surface water disposal will be required.
Sulphate Assessment	Concrete classification will be DS1 AC1s.
CBR Design %	Natural clay soils will provide a CBR in the order of 3–5% during drier climatic periods; however, if water is allowed to shed onto the formation, the CBR will reduce to < 2%, which will require specialist engineering of the subgrade.
Cut/Fill	A phase of cut-and-fill enabling works may be required in order to create a proposed development platform suitable for a residential development. Proposed levels are currently unknown but are expected to remain similar to current.
Civil Engineering Excavations	Shallow bedrock has been identified within the east at a minimum depth of 2.0 m bgl, which may impede foundations/service excavations if levels are to be reduced or deep installations are proposed.
Waste Characterisation	Any material that is to be disposed off-site should undergo assessment using Technical Guidance WM3: <i>Waste Classification – Guidance on the classification and assessment of waste</i> .



RECOMMENDATIONS

Based on the findings of the geoenvironmental site assessment, the following additional works are recommended to be completed in due course:

-  Further post-demolition investigation in the farmyard area in the west of the site;
-  Plot-specific foundation schedule (upon receipt of the final development levels and layout);
-  Arboricultural survey;
-  Materials management plan;
-  Geotechnical earthworks strategy (infrastructure);
-  Remediation and enabling works strategy; and,
-  Full three-dimensional earthworks cut/fill model.



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	APPENDIX XII FINAL PB SCREENING TOOL RESULTS	ERROR! BOOKMARK NOT DEFINED.

DRAWING LIST

13-759-R1-001 - Site Location Plan
13-759-R1-002 - Proposed Development Plan
13-759-R1-003 - Historical Features Plan
13-759-R1-004 - Site Features Plan
13-759-R1-005 - Exploratory Hole Location Plan
13-759-R1-007 - Depth of Topsoil Plan
13-759-R1-010 - Conceptual Site Model
13-759-R1-012 - Depth to Bedrock Plan
13-759-R1-015 - Development Constraints Plan



1. INTRODUCTION

1.1. BACKGROUND

E3P has been commissioned by Taylor Wimpey NW to undertake a detailed Phase II Geoenvironmental Site Assessment for a parcel of agricultural land to the east of Chapel Lane, Widnes.

This report is required to determine potential contaminated land liabilities, remediation requirements and geotechnical engineering works that will be required as part of the proposed low-rise residential development.

The scope of work includes the following elements:

- ✳ Detailed review of historic information;
- ✳ Design of suitable intrusive ground investigation;
- ✳ 36 no. window sample probeholes with 24 no. environmental monitoring installations;
- ✳ 2 no. deep cable percussive boreholes;
- ✳ 45 no. mechanically excavated trial pits;
- ✳ 6 no. BRE365 soakaway tests;
- ✳ 10 no. dynamic Cone Penetrometer (DCP) tests to determine in-situ CBR % using a TRL probe;
- ✳ 1 no. hand dig pit to confirm the location and condition of an existing surface water drain;
- ✳ Chemical and geotechnical laboratory analysis;
- ✳ Groundwater monitoring and sampling;
- ✳ Ground gas monitoring;
- ✳ Contamination risk assessment and conceptual site model;
- ✳ Geotechnical assessment and interpretation; and,
- ✳ Factual and interpretive reporting.

1.2. PROPOSED DEVELOPMENT

It is understood that an outline planning application (with all matters other than access reserved) has been submitted for the development of up to 350 dwellings, public open space, landscaping and associated infrastructure works. Site access proposals are situated within Knowsley Borough Council authority area (emergency access in Halton Borough Council authority area via Sandy Lane).

Full planning permission granted for the access arrangements only, via a new junction on Chapel Lane (to be determined by Knowsley Borough Council only) and emergency access via Sandy Lane (to be determined by Halton Borough Council). All of the outline proposals are situated within Halton Borough Council authority area and are to be determined by Halton Borough Council only.

Drawing 13-759-002 (Appendix III) presents the proposed development layout.



A snapshot of the proposed development layout is indicated in Figure 1.1.

FIGURE 1.1 SNAPSHOT OF PROPOSED DEVELOPMENT MASTERPLAN



1.3. OBJECTIVES

The objectives of the geoenvironmental assessment are as follows:

- ✿ Undertake a preliminary stage of sampling and analysis to provide an overview of environmental issues identified.
- ✿ Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site in relation to the future use of the site and in relation to off-site receptors.
- ✿ Assess the geotechnical information and provide preliminary recommendations in relation to foundations, pavement construction and floor slabs.
- ✿ Provide recommendations regarding future works required.

1.4. LIMITATIONS

The limitations of this report are presented in Appendix I.



1.5. CONFIDENTIALITY

E3P has prepared this report solely for the use of the client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from E3P; a charge may be levied against such approval.



2. GROUND INVESTIGATION

2.1. PHASE I DESK STUDY SUMMARY

E3P has been provided with a Phase 1 desk study 'Desk Study Report for Chapel Lane, Widnes' by Betts Geo Consulting Engineers (report number: 19TAY046/DS). A summary of the report is provided below.

CURRENT SITE

- ✳ The site is roughly divided into two areas, the first area lies to the East of Sandy lane and comprises a field with an area of overgrown vegetation along the east boundary. The second area lies to the west of Sandy lane and comprises the active Rose Farm in the far west of site containing large silos, potential fuel storage.
- ✳ A footpath orientated roughly East – West connects Rose Farm with Sandy Lane at an area of overgrown vegetation fronting Sandy Lane.
- ✳ Depressions were noted in the surface potentially indicating infilled ponds.
- ✳ Site is generally flat with the previously mentioned undulations/depressions in the southern field.

SITE HISTORY

- ✳ 1849-1850 – The site comprises agricultural fields. Two footpaths, five ponds and field boundaries are also shown across site. Upton Lane is present in the east oriented roughly north-south, dissecting the agricultural fields.
- ✳ 1891 – Many of the field boundaries are no longer present and Upton Lane is now marked as Sandy Lane.
- ✳ 1925-1926 – A watercourse is shown running along the north boundary of site from east to west. A possible watercourse/ditch line is also shown through the centre of site, possibly culverted to the west.
- ✳ 1985-1989 – Rose Farm is shown in the west of site with buildings and glasshouse. To the east of site, a watercourse is shown with Sinks. A pond in the centre of site is no longer shown.
- ✳ 2002 – Additional Issues and Sinks are marked along the north boundary of site. No further major changes occur on-site until the 2010 1:10,000 map when a new pond is also shown in the north east of site.

HYDROGEOLOGY AND HYDROLOGY

- ✳ The superficial deposits (Glacial Till) are designated as Secondary (Undifferentiated) aquifer.
- ✳ The bedrock deposits (Chester Sandstone Formation) are designated as Principal aquifer.
- ✳ The site lies within Groundwater Source Protection Zone 3 – Total Catchment as defined by the Environment Agency.
- ✳ There are no licenced water abstractions within 250 m of site.



RADON PROTECTION

- ✳ The site lies within a low risk area of radon less than 1% of homes are estimated to be above the action level, therefore no radon protection measures are required for new dwellings or extensions.

SUMMARY OF ENVIRONMENTAL DATA

- ✳ Possible Contamination Sources;
 - Current/Historical Site Use
 - Ponds
 - Agricultural use

PATHWAYS AND RECEPTORS

- ✳ Aquifers – Significant Risk; Low likelihood.
- ✳ *Shropshire Union Canal, Adjacent to Site – Significant Risk; Possible.

*The Shropshire Union Canal is listed as a potential receptor, however, on review of the surroundings, this is considered to be well outside of influencing distance and has therefore not been considered further.

QUALITATIVE RISK ASSESSMENT

- ✳ In this qualitative risk assessment, a generally Low - Moderate (Localised) risk for contamination.

2.2. GENERAL OVERVIEW

A ground investigation has been designed based on the findings of the desk study, with exploratory holes advanced to target specific potential contaminant sources summarised in Table 2.1. The investigation has also been used to collect geotechnical information to assist in the design and construction of the proposed development.

Exploratory fieldwork was completed between 24th August 2020 and 26th August 2020. The works are summarised in Table 2.1.



TABLE 2.1 SUMMARY OF FIELDWORK

POTENTIAL SOURCE/RATIONALE	LOCATION HOLE	TYPE	MAXIMUM DEPTH (m bgl)	MONITORING WELLS RESPONSE ZONE (m bgl)
General Ground Conditions Including the Presence/Nature of Obstructions	WS101	Window Sample Probehole	2.45	0.50–2.00
	WS102		2.30	0.50–1.50
	WS103		4.61	1.00–4.00
	WS105		3.30	N/A
	WS106		4.40	1.0–4.0
	WS107		4.45	N/A
	WS109		4.40	0.50–2.50
	WS110		5.45	N/A
	WS111		5.45	1.00–4.00
	WS112		5.45	1.00–4.00
	WS113		5.45	1.00–5.00
	WS115		5.45	1.00–5.00
	WS116		5.45	N/A
	WS117		5.45	1.00–5.00
	WS118		5.45	N/A
	WS119		5.45	1.00–4.00
	WS120		5.45	1.00–5.00
	WS121		5.45	1.00–5.00
	WS122		5.45	N/A
	WS124		5.45	1.00–5.00
	WS125		5.45	1.00–5.00
	WS126		5.45	1.00–4.00
	WS127		5.45	1.00–5.00
	WS128		5.45	1.00–5.00
	WS129		5.45	1.00–5.00
	WS130		3.40	1.00–3.00
	WS131		5.45	1.00–5.00
	WS132		5.45	1.00–5.00
	WS133		5.45	N/A
	WS134		5.45	N/A
	WS135		3.10	N/A
	WS136		3.40	N/A
	TP102	Mechanically Excavated Trial Pit	2.10	N/A
	TP109		2.00	N/A
	TP110		2.00	N/A



POTENTIAL SOURCE/RATIONALE	LOCATION HOLE	TYPE	MAXIMUM DEPTH (m bgl)	MONITORING WELLS RESPONSE ZONE (m bgl)
	TP111		2.10	N/A
General Ground Conditions Including the Presence/Nature of Obstructions	TP112	Mechanically Excavated Trial Pit	1.90	N/A
	TP113		2.20	N/A
	TP114		2.20	N/A
	TP115		2.10	N/A
	TP116		2.20	N/A
	TP117		2.00	N/A
	TP118		2.10	N/A
	TP119		2.40	N/A
	TP120		2.00	N/A
	TP121		2.40	N/A
	TP122		2.40	N/A
	TP123		2.20	N/A
	TP124		2.30	N/A
	TP125		2.20	N/A
	TP126		2.20	N/A
	TP127		2.10	N/A
	TP128		2.20	N/A
	TP129		2.30	N/A
	TP130		2.20	N/A
	TP131		2.30	N/A
	TP132		2.50	N/A
	TP133		2.40	N/A
	TP134		2.40	N/A
	TP135		1.70	N/A
	TP136		2.00	N/A
	TP137		2.80	N/A
	TP138		2.00	N/A
	TP139		0.90	N/A
	TP140		2.00	N/A
	TP141		0.90	N/A
	TP142		2.00	N/A
	TP143		0.80	N/A
	TP144		2.00	N/A
	TP145		1.00	N/A



POTENTIAL SOURCE/RATIONALE	LOCATION HOLE	TYPE	MAXIMUM DEPTH (m bgl)	MONITORING WELLS RESPONSE ZONE (m bgl)
Investigation of Historically Infilled Ponds	WS104	Window Sample Probehole	3.80	1.00–3.00
Investigation of Historically Infilled Ponds	WS108	Window Sample Probehole	2.70	0.50–1.50
	WS114		5.45	1.00–4.00
	TP103	Mechanically Excavated Trial Pit	2.30	N/A
	TP111		2.10	
Investigation of Above Ground Storage Tank and General Ground Conditions Including the Presence/Nature of Obstructions	WS123	Window Sample Probehole	5.45	1.00–5.00
General Deep Ground Conditions Including the Presence/Nature of Obstructions	CP101	Cable Percussive Boreholes	5.95	N/A
	CP102		16.95	N/A
Inspection of surface water drain	HP101	Hand Excavated Pit	0.40	N/A
General Ground Conditions /Investigation of Soakaway Potential	TP101/SA101	Mechanically Excavated Trial Pits	1.80	N/A
	TP104/SA102		1.80	
	TP105/SA103		1.80	
	TP106/SA104		1.70	
	TP107/SA105		1.90	
	TP108/SA106		1.80	

Mechanically excavated trial pits were advanced to investigate ground conditions and to retrieve environmental samples, spatially distributed to offer the maximum site coverage whilst also being advanced to target specific contaminant sources.

Soakaway tests were conducted within TP101/SA101, TP104/SA102, TP105/SA103, TP106/SA104, TP107/SA105 and TP108/SA106 generally in accordance with BRE365 methodology.

Window sample probeholes and cable percussive boreholes were advanced to undertake in-situ detailed geotechnical testing, obtain environmental samples and install groundwater and ground gas monitoring wells.

A hand excavated pit was conducted to investigate the existing surface water drain that is present in the central and eastern fields.

The sampling locations are illustrated in Drawing 13-759-005 (Appendix III). The ground conditions encountered are indicated on the logs, which are provided in Appendix V.

Return visits were made to monitor installations for groundwater level and gas concentrations. In addition, selected wells were purged and samples of groundwater recovered for chemical analysis.



2.3. IN-SITU STANDARD PENETRATION TESTING (SPT)

In-situ geotechnical testing was conducted using the standard penetration test (SPT) and, where the ground is granular, a 60° cone (SPT(C)) was used instead of the sampling tube.

The results are shown in the probehole logs in Appendix V and presented in Table 3.5 and discussed in Section 5.

2.4. IN-SITU CALIFORNIA BEARING RATIO (CBR)

In-situ CBR tests were undertaken at selected locations using a TRL probe. Tests were undertaken at depths of between 0.3 m and 1.0 m below ground level in order to intersect the likely pavement sub formation level.

The results are presented in Table 3.9 and test certificates are included within Appendix VIII.

2.5. PERMEABILITY TESTS

Six soakaway tests were undertaken (SA101–SA106) in order to assess the likely permeability of the underlying strata to determine the potential suitability for soakaway drainage within the proposed development.

The results are presented in Table 3.7 and the test certificates are included within Appendix IX.

2.6. LABORATORY ANALYSIS

Selected soil samples were submitted for a range of chemical analysis comprising:

- ✳ Metals;
- ✳ pH, total sulphate, water-soluble sulphate (2:1 extract);
- ✳ Sulphide;
- ✳ Cyanide;
- ✳ Phenols;
- ✳ Total and speciated polycyclic aromatic hydrocarbons (PAHs);
- ✳ Semi Volatile Organic Compounds (SVOC);
- ✳ Asbestos identification and quantification; and,
- ✳ Speciated and banded total petroleum hydrocarbon (TPH).

I2 Analytical undertook the analytical work and the testing results are included in Appendix VI and discussed in Section 4.

Selected samples were submitted to PSL Laboratory where the following geotechnical tests were undertaken:

- ✳ Atterberg limits determinations;



-  Moisture content;
-  Particle Size Density tests;
-  2.5kg Compaction Tests;
-  One Dimensional Consolidation Test;
-  Multistage triaxial test; and,
-  Single-stage triaxial tests.

Laboratory analysis sheets are included in Appendix X and are summarised in Section 3.



3. GROUND AND GROUNDWATER CONDITIONS

3.1. SUMMARY OF GROUND CONDITIONS

The ground investigation generally confirms the published geology and identifies the strata set out in Table 3.1.

TABLE 3.1 SUMMARY OF STRATA

HOLE	DEPTH TO STRATUM (m bgl)						
	TOPSOIL	MADE GROUND	FIRM TO STIFF CLAY	VERY STIFF CLAY	SAND	VERY SOFT TO SOFT CLAY	BED ROCK
TP101	0.00–0.40	–	0.40–0.80	–	–	–	–
TP102	0.00–0.30	–	0.30–2.10	–	–	–	–
TP103	0.00–0.30	–	0.30–2.30	–	–	–	–
TP104	0.00–0.40	–	0.40–1.80	–	–	–	–
TP105	0.00–0.30	–	0.30–1.80	–	–	–	–
TP106	0.00–0.30	–	0.30–1.70	–	–	–	–
TP107	0.00–0.30	–	0.30–1.90	–	–	–	–
TP108	0.00–0.40	–	0.40–1.80	–	–	–	–
TP109	0.00–0.60	–	0.60–2.00	–	–	–	–
TP110	0.00–0.30	–	0.30–2.00	–	–	–	–
TP111	0.00–0.40	–	0.40–2.10	–	–	–	–
TP112	0.00–0.30	–	0.30–1.90	–	–	–	–
TP113	0.00–0.40	–	0.40–2.20	–	–	–	–
TP114	0.00–0.30	–	0.30–2.20	–	–	–	–
TP115	0.00–0.30	–	0.30–2.10	–	–	–	–
TP116	0.00–0.40	–	0.40–2.20	–	–	–	–
TP117	0.00–0.40	–	0.30–2.10	–	–	–	–
TP118	0.00–0.30	–	0.30–2.10	–	–	–	–
TP119	0.00–0.30	–	0.30–2.40	–	–	–	–
TP120	0.00–0.30	–	0.30–2.00	–	–	–	–
TP121	0.00–0.40	–	0.40–2.40	–	–	–	–
TP122	0.00–0.30	–	0.30–2.40	–	–	–	–
TP123	0.00–0.40	–	0.40–2.20	–	–	–	–
TP124	–	0.00–0.70	0.70–2.30	–	–	–	–
TP125	0.00–0.30	–	0.30–2.20	–	–	–	–
TP126	0.00–0.30	–	0.30–2.20	–	–	–	–
TP127	0.00–0.30	–	0.60–2.10	–	–	–	–
TP128	0.00–0.60	–	0.70–2.20	–	–	–	–
TP129	0.00–0.30	–	0.40–0.80	–	–	–	–
TP130	0.00–0.20	–	0.20–2.30	–	–	–	–



HOLE	DEPTH TO STRATUM (m bgl)						
	TOPSOIL	MADE GROUND	FIRM TO STIFF CLAY	VERY STIFF CLAY	SAND	VERY SOFT TO SOFT CLAY	BED ROCK
TP131	0.00–0.20	–	0.20–2.30	–	–	–	–
TP132	0.00–0.30	–	0.30–2.50	–	–	–	–
TP133	–	0.00–1.80	1.80–2.40	–	–	–	–
TP134	0.00–0.20	–	0.20–2.40	–	–	–	–
TP135	0.00–0.20	–	0.20–1.70	–	–	–	–
TP136	0.00–0.30	–	0.30–2.00	–	–	–	–
TP137	0.00–0.70	–	0.70–2.80	–	–	–	–
TP138	0.00–0.20	–	–	–	–	–	–
TP139	–	0.00–0.90 full depth not proven	–	–	–	–	–
TP140	0.00–0.30	–	0.30–2.00	–	–	–	–
TP141	–	0.00–0.90 full depth not proven	–	–	–	–	–
TP142	0.00–0.30	–	0.30–2.00	–	–	–	–
TP143	–	0.00–0.80 full depth not proven	–	–	–	–	–
TP144	0.00–0.30	–	0.30–2.00	–	–	–	–
TP145	–	0.00–1.00 full depth not proven	–	–	–	–	–
WS101	0.00–0.50	–	0.50–2.00	–	–	–	2.00–2.45
WS102	–	0.00–1.80	–	1.80–2.30	–	–	–
WS103	0.00–0.70	–	0.70–4.61	–	–	–	–
WS104	0.00–0.30	–	0.40–3.40	3.00–3.40	0.30–0.40	–	3.40–3.80
WS105	0.00–0.40	–	0.40–2.00	2.00–3.30	–	–	–
WS106	0.00–0.30	–	0.40–2.00	2.00–4.40	–	–	–
WS107	0.00–0.30	–	0.30–4.00	4.00–4.45	–	–	–
WS108	0.00–0.40	–	–	1.50–2.50	–	0.40 – 1.50	2.50–2.70
WS109	0.00–0.30	–	0.30–2.00	2.00–4.00	–	–	–
WS110	0.00–0.40	–	0.40–2.00	2.00–5.45	–	–	–
WS111	0.00–0.30	–	0.30–3.00	3.00–5.45	–	–	–
WS112	0.00–0.30	–	0.30–2.00	2.00–5.45	–	–	–
WS113	0.00–0.30	–	0.30–0.40 0.60–3.00	3.00–5.45	–	0.40–0.60	–
WS114	–	0.00–1.50	1.50–5.45	–	–	–	–
WS115	0.00–0.35	–	0.35–3.00	3.00–5.45	–	–	–
WS116	0.00–0.30	–	0.30–2.00	2.00–5.45	–	–	–



HOLE	DEPTH TO STRATUM (m bgl)						
	TOPSOIL	MADE GROUND	FIRM TO STIFF CLAY	VERY STIFF CLAY	SAND	VERY SOFT TO SOFT CLAY	BED ROCK
WS117	–	0.00–0.80	2.00–3.00	0.80–2.00 3.00–5.45	–	–	–
WS118	0.00–0.30	–	0.30–1.00	1.00–3.50	–	–	–
WS119	–	0.00–0.70	0.70–2.00	2.00–5.45	–	–	–
WS120	–	0.00–0.40	0.40–2.00	2.00–5.45	–	–	–
WS121	0.00–0.50	–	0.50–2.00	2.00–5.45	–	–	–
WS122	0.00–0.30	–	0.30–2.00	2.00–5.45	–	–	–
WS123	–	0.00–0.50	0.50–2.00	2.00–5.45	–	–	–
WS124	0.00–0.40	–	0.40–2.00	2.00–5.45	–	–	–
WS125	0.00–0.50	–	0.50–4.00	4.00–5.45	–	–	–
WS126	0.00–0.40	–	0.40–2.00	2.00–5.45	–	–	–
WS127	0.00–0.40	–	0.40–3.00	3.00–5.45	–	–	–
WS128	0.00–0.35	–	0.35–3.00	3.00–4.00	–	–	–
WS129	0.00–0.30	–	0.30–3.00	3.00–5.45	–	–	–
WS130	0.00–0.30	–	0.30–3.00	3.00–3.40	–	–	–
WS131	–	0.00–0.80	0.80–3.00	3.00–5.45	–	–	–
WS132	0.00–0.40	–	0.40–2.00 4.00–5.00	2.00–4.00 5.00–5.45	–	–	–
WS133	0.00–0.40	–	0.40–2.00 4.00–5.00	2.00–4.00 5.00–5.45	–	–	–
WS134	0.00–0.30	–	0.30–3.00	3.00–5.45	–	–	–
WS135	0.00–0.30	–	0.40–3.00	3.00–3.10	–	–	–
WS136	–	0.00–1.00	–	–	1.00–3.40	–	–
CP101	0.00–0.50	–	1.80–5.30	–	–	0.50–1.80	5.30–5.95
CP102	0.00–0.60	–	0.60–12.00	13.10–16.95	12.00–13.10	–	–
HP101		0.00–0.40					

3.2. MADE GROUND

Made Ground deposits were encountered within thirteen exploratory hole locations to depths of between 0.30 m and 1.80 m bgl although, in general, Made Ground was encountered to a depth of less than 0.80 m bgl.

Made Ground deposits comprise a reworked topsoil of dark brown sandy clay with gravel of mudstone and sandstone with selected areas containing fragments of occasional brick and concrete. The majority of locations were underlain by a black sandy mudstone gravel (land drain bedding).

A hand excavated pit was conducted to investigate existing surface water drain. The top of the drain was located 0.40 m bgl. The material above comprised of a reworked topsoil underlain by brown mottled grey slightly gravely sandy clay.



A Depth of Made Ground Plan is presented as drawing no. 13-759-007 in Appendix III.

3.3. TOPSOIL

Topsoil was encountered within the majority of location between ground level and 0.70 m bgl, comprising dark brown slightly gravelly sandy clay with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.

A Depth of Topsoil Plan is presented as drawing no. 13-759-007 in Appendix III.

3.4. DRIFT DEPOSITS

Drift deposits were encountered within the majority of exploratory locations with the exception of four locations where the full depth of Made Ground could not be proven due to fast water ingress from land drains.

Drift generally comprises firm brown mottled grey slightly gravelly sandy CLAY with gravel of mudstone, underlain by a stiff brown slightly gravelly sandy CLAY where gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Some locations encountered occasional cobbles of subrounded to rounded mudstone and sandstone.

Low strength clays were encountered within 8 locations across the whole site. Seven locations were between a depth of 1.00 m and 1.65 m bgl (CP101, CP102, WS101, WS105, WS121, WS128 and WS132) with WS114 experiencing soft clays between 2.00 m and 3.45 m bgl.

Medium dense SAND was encountered within two locations WS104 (0.30 m–0.40 m bgl) and WS136 (1.00 m–3.40 m bgl)

Gravel with sand bands was encountered between 12.00 m and 13.10 m bgl within CP102.

3.5. SOLID GEOLOGY

Weathered bedrock comprising reddish brown SANDSTONE was encountered within the east of the site between 2.00 m within WS101 and 5.30 m bgl within CP101.

Bedrock was not encountered in the central or western areas of site, with one location (CP102) advancing to 16.95 m bgl in Clay drift deposits, indicating the bedrock is significantly deeper within these areas.

3.6. GROUNDWATER

Groundwater strikes were encountered as seepages. The depth of the seepages are shown on the exploratory hole records in Appendix V and are summarised in Table 3.2.

TABLE 3.2 SUMMARY GROUNDWATER STRIKES

LOCATION	DEPTH TO STRIKE (m)	NOTES
WS103	2	N/A
WS105	2.2	N/A
WS108	1	N/A
WS122	3.8	N/A



LOCATION	DEPTH TO STRIKE (m)	NOTES
WS126	4	N/A
WS131	3.5	N/A
TP132	0.4	Steady seepage
TP139	0.9	Inflow from land drain
TP141	0.9	Inflow from land drain
TP143	0.8	Inflow from land drain
CP102	11.8	N/A
CP102	12	N/A

Monitoring was undertaken using an electronic dip meter and interface probe to record the depth to groundwater and the thickness of any free-phase hydrocarbon product if present. These results are summarised in Table 3.12.

3.7. VISUAL AND OLFACTORY EVIDENCE OF CONTAMINATION

Visual and olfactory evidence of potential contamination has not been identified within exploratory hole locations on site; however, remains of a bonfire and burnt animal carcase were observed in the west of the site. The location of this is indicated on Drawing 13-759-004 in Appendix III.

There is a potential for animal burial to present elsewhere on-site; however, no evidence of this was identified during intrusive investigations.

3.8. SOIL CONSISTENCY

Undrained shear strength values were measured using both field hand shear vane tests and laboratory undrained triaxial tests. Results of the tests are presented in Table 3.3 and Table 3.4, which indicate the clay soils to vary between stiff and very stiff. Strength test data is generally consistent with the field descriptions of the aforementioned soils.

TABLE 3.3 SUMMARY OF HAND SHEAR VANE TESTS

LOCATION	DEPTH	SHEAR STRENGTH (kPa)	CALCULATED ALLOWABLE BEARING PRESSURE (kN/m ²)
TP102	1.50	74	170
TP110	1.00	140	322
TP110	1.50	64	147
TP112	1.20	83	191
TP115	1.00	64	147
TP115	1.50	70	161
TP116	1.00	45	104
TP117	1.20	64	147
TP122	1.20	83	191
TP124	1.50	64	147



LOCATION	DEPTH	SHEAR STRENGTH (kPA)	CALCULATED ALLOWABLE BEARING PRESSURE (kN/m ²)
TP124	2.00	70	161
TP125	1.20	108	248
TP125	1.60	83	191
TP126	1.00	95	219
TP126	1.50	83	191
TP126	1.80	76	175
TP128	1.20	70	161
TP128	1.50	76	175
TP129	0.40	105	242
TP129	1.00	101	232
TP133	2.00	64	147
TP129	0.40	105	242
TP129	2.00	101	232
TP133	2.00	64	147
TP142	1.20	103	237

Soils were noted to be soft at shallow depth (0.30 m bgl) in TP133.

TABLE 3.4 SUMMARY OF UNDRAINED SHEAR STRENGTH TEST RESULTS

LOCATION	SAMPLE DEPTH (m)	LAB DESCRIPTION	UNDRAINED SHEAR STRENGTH (kN/m ²)	CONSISTENCY
WS108	0.50–1.00	Stiff brown slightly gravelly sandy CLAY.	79	Stiff
WS125	2.50–3.00	Firm brown slightly gravelly sandy CLAY.	47	Firm
WS133	2.50–3.00	Very stiff brown slightly gravelly very sandy CLAY.	225	Very stiff
CP101	2.00–2.50	Soft brown slightly gravelly very sandy CLAY.	41	Soft

Results of the standard penetration tests, including undrained shear strengths derived from SPTs are included in Table 3.5.

3.9. SIDE STABILITY AND EASE OF EXCAVATION

The sides of the exploratory trial pit excavations appeared to be generally stable during excavation.

One trial pit (TP132) was observed to be unstable where the natural subsoils were saturated.



TABLE 3.5 STANDARD/CONE PENETRATION TEST RESULTS

BOREHOLES	DEPTH (m bgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE (N ₁) ₆₀	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS 5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m ²)	ALLOWABLE BEARING PRESSURE (kN/m ²)*
CP101	1.20	Slightly gravelly sandy CLAY	4	4	N/A	Very low strength	Soft	20	40
CP101	3.00	Slightly gravelly sandy CLAY	35	30	N/A	Very high strength	Very Stiff	152	313
CP101	5.00	Slightly gravelly sandy CLAY	50	41	N/A	Very high strength	Very Stiff	207	426
CP101	5.30	SANDSTONE	50	41	Dense	N/A	N/A	N/A	413
CP102	1.20	Slightly gravelly sandy CLAY	6	6	N/A	Low strength	Firm	29	61
CP102	3.00	Slightly gravelly sandy CLAY	38	33	N/A	Very high strength	Very Stiff	165	340
CP102	5.00	Slightly gravelly sandy CLAY	17	14	N/A	Medium strength	Stiff	71	145
CP102	7.50	Slightly gravelly sandy CLAY	22	18	N/A	High strength	Very Stiff	89	183
CP102	10.50	Slightly gravelly sandy CLAY	16	13	N/A	Medium strength	Stiff	63	130
CP102	13.50	Slightly gravelly sandy CLAY	30	21	N/A	High strength	Very Stiff	105.7314399	217
CP102	15.00	Slightly gravelly sandy CLAY	50	33	N/A	Very high strength	Very Stiff	167.4107496	344



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BOREHOLES	DEPTH (m bgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE (N ₁) ₆₀	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS 5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m ²)	ALLOWABLE BEARING PRESSURE (kN/m ²)*
CP102	16.50	Slightly gravelly sandy CLAY	50	32	N/A	Very high strength	Very Stiff	159.4426577	328
WS101	1.00	Slightly gravelly sandy CLAY	4	4	N/A	Low strength	Soft	20	41
WS101	2.00	SAND	50	46	Dense	N/A	N/A	N/A	457
WS102	1.00	MADE GROUND: slightly gravelly sandy clay	11	11	N/A	Medium strength	Stiff	55	114
WS102	2.00	Slightly gravelly sandy CLAY	50	46	N/A	Very high strength	Very Stiff	228	470
WS103	1.00	Slightly gravelly sandy CLAY	7	7	N/A	Low strength	Firm	35	73
WS103	2.00	Slightly gravelly sandy CLAY	20	18	N/A	High strength	Very Stiff	91	188
WS103	3.00	Slightly gravelly sandy CLAY	28	24	N/A	High strength	Very Stiff	122	250
WS103	4.00	Slightly gravelly sandy CLAY	29	25	N/A	High strength	Very Stiff	123	252
WS104	1.00	Slightly gravelly sandy CLAY	9	9	N/A	Medium strength	Stiff	45	93
WS104	2.00	Slightly gravelly sandy CLAY	15	14	N/A	Medium strength	Stiff	69	141



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BOREHOLES	DEPTH (m bgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE (N ₁) ₆₀	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS 5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m ²)	ALLOWABLE BEARING PRESSURE (kN/m ²)*
WS104	3.00	Slightly gravelly sandy CLAY	24	21	N/A	High strength	Very Stiff	104	215
WS104	3.80	SAND	50	42	Dense	N/A	N/A	N/A	424
WS105	1.00	Slightly gravelly sandy CLAY	7	7	N/A	Low strength	Firm	35	73
WS105	2.00	Slightly gravelly sandy CLAY	40	37	N/A	Very high strength	Very Stiff	183	376
WS105	3.00	Slightly gravelly sandy CLAY	50	43	N/A	Very high strength	Very Stiff	217	447
WS106	1.00	Slightly gravelly sandy CLAY	9	9	N/A	Medium strength	Stiff	45	93
WS106	2.00	Slightly gravelly sandy CLAY	28	26	N/A	High strength	Very Stiff	128	263
WS106	3.00	Slightly gravelly sandy CLAY	37	32	N/A	Very high strength	Very Stiff	161	331
WS106	4.00	Slightly gravelly sandy CLAY	46	39	N/A	Very high strength	Very Stiff	194	400
WS107	1.00	Slightly gravelly sandy CLAY	8	8	N/A	Medium strength	Stiff	40	83
WS107	2.00	Slightly gravelly sandy CLAY	12	11	N/A	Medium strength	Stiff	55	113



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BOREHOLES	DEPTH (m bgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE (N ₁) ₆₀	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS 5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m ²)	ALLOWABLE BEARING PRESSURE (kN/m ²)*
WS107	3.00	Slightly gravelly sandy CLAY	21	18	N/A	High strength	Very Stiff	91	188
WS107	4.00	Slightly gravelly sandy CLAY	50	42	N/A	Very high strength	Very Stiff	211	434
WS108	1.00	Slightly gravelly sandy CLAY	1	1	N/A	Extremely low strength	Very Soft	5	10
WS108	2.00	Slightly gravelly sandy CLAY	33	30	N/A	Very high strength	Very Stiff	151	310
WS108	2.70	SAND	50	44	Dense	N/A	N/A	N/A	440
WS109	1.00	Slightly gravelly sandy CLAY	9	9	N/A	Medium strength	Stiff	45	93
WS109	2.00	Slightly gravelly sandy CLAY	25	23	N/A	High strength	Very Stiff	114	235
WS109	3.00	Slightly gravelly sandy CLAY	23	20	N/A	High strength	Very Stiff	100	206
WS109	4.00	Slightly gravelly sandy CLAY	50	42	N/A	Very high strength	Very Stiff	211	434
WS110	1.00	Slightly gravelly sandy CLAY	9	9	N/A	Medium strength	Stiff	45	93
WS110	2.00	Slightly gravelly sandy CLAY	17	16	N/A	High strength	Very Stiff	78	160



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BOREHOLES	DEPTH (m bgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE (N ₁) ₆₀	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS 5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m ²)	ALLOWABLE BEARING PRESSURE (kN/m ²)*
WS110	3.00	Slightly gravelly sandy CLAY	24	21	N/A	High strength	Very Stiff	104	215
WS110	4.00	Slightly gravelly sandy CLAY	24	20	N/A	High strength	Very Stiff	101	208
WS110	5.00	Slightly gravelly sandy CLAY	37	31	N/A	Very high strength	Very Stiff	153	316
WS111	1.00	Slightly gravelly sandy CLAY	9	9	N/A	Medium strength	Stiff	45	93
WS111	2.00	Slightly gravelly sandy CLAY	15	14	N/A	Medium strength	Stiff	69	141
WS111	3.00	Slightly gravelly sandy CLAY	23	20	N/A	High strength	Very Stiff	100	206
WS111	4.00	Slightly gravelly sandy CLAY	36	30	N/A	Very high strength	Very Stiff	152	313
WS111	5.00	Slightly gravelly sandy CLAY	26	22	N/A	High strength	Very Stiff	108	222
WS112	1.00	Slightly gravelly sandy CLAY	11	11	N/A	Medium strength	Stiff	55	114
WS112	2.00	Slightly gravelly sandy CLAY	18	16	N/A	High strength	Very Stiff	82	169
WS112	3.00	Slightly gravelly sandy CLAY	27	23	N/A	High strength	Very Stiff	117	241



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WS112	4.00	Slightly gravelly sandy CLAY	33	28	N/A	High strength	Very Stiff	139	287
WS112	5.00	Slightly gravelly sandy CLAY	37	31	N/A	Very high strength	Very Stiff	153	316
WS113	1.00	Slightly gravelly sandy CLAY	9	9	N/A	Medium strength	Stiff	45	93
WS113	2.00	Slightly gravelly sandy CLAY	16	15	N/A	Medium strength	Stiff	73	150
WS113	3.00	Slightly gravelly sandy CLAY	25	22	N/A	High strength	Very Stiff	109	224
WS113	4.00	Slightly gravelly sandy CLAY	19	16	N/A	High strength	Very Stiff	80	165
WS113	5.00	Slightly gravelly sandy CLAY	24	20	N/A	High strength	Very Stiff	100	205
WS114	1.00	MADE GROUND: Slightly gravelly sandy CLAY	4	4	N/A	Low strength	Soft	20	41
WS114	2.00	Slightly gravelly sandy CLAY	5	5	N/A	Low strength	Firm	23	47
WS114	3.00	Slightly gravelly sandy CLAY	9	8	N/A	Low strength	Firm	39	80
WS114	4.00	Slightly gravelly sandy CLAY	17	14	N/A	Medium strength	Stiff	72	148



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WS114	5.00	Slightly gravelly sandy CLAY	12	10	N/A	Medium strength	Stiff	50	102
WS115	1.00	Slightly gravelly sandy CLAY	13	13	N/A	Medium strength	Stiff	66	135
WS115	2.00	Slightly gravelly sandy CLAY	15	14	N/A	Medium strength	Stiff	69	141
WS115	3.00	Slightly gravelly sandy CLAY	20	17	N/A	High strength	Very Stiff	87	179
WS115	4.00	Slightly gravelly sandy CLAY	24	20	N/A	High strength	Very Stiff	101	208
WS116	1.00	Slightly gravelly sandy CLAY	13	13	N/A	Medium strength	Stiff	66	135
WS116	2.00	Slightly gravelly sandy CLAY	18	16	N/A	High strength	Very Stiff	82	169
WS116	3.00	Slightly gravelly sandy CLAY	19	17	N/A	High strength	Very Stiff	83	170
WS116	4.00	Slightly gravelly sandy CLAY	23	19	N/A	High strength	Very Stiff	97	200
WS116	5.00	Slightly gravelly sandy CLAY	37	31	N/A	Very high strength	Very Stiff	153	316
WS117	1.00	Slightly gravelly sandy CLAY	16	16	N/A	High strength	Very Stiff	81	166



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WS117	2.00	Slightly gravelly sandy CLAY	14	13	N/A	Medium strength	Stiff	64	131
WS117	3.00	Slightly gravelly sandy CLAY	20	17	N/A	High strength	Very Stiff	87	179
WS117	4.00	Slightly gravelly sandy CLAY	20	17	N/A	High strength	Very Stiff	84	174
WS117	5.00	Slightly gravelly sandy CLAY	24	20	N/A	High strength	Very Stiff	100	205
WS118	1.00	Slightly gravelly sandy CLAY	15	15	N/A	High strength	Very Stiff	76	155
WS118	2.00	Slightly gravelly sandy CLAY	32	29	N/A	High strength	Very Stiff	146	301
WS118	3.00	Slightly gravelly sandy CLAY	20	17	N/A	High strength	Very Stiff	87	179
WS118	4.00	Slightly gravelly sandy CLAY	17	14	N/A	Medium strength	Stiff	72	148
WS118	5.00	Slightly gravelly sandy CLAY	24	20	N/A	High strength	Very Stiff	100	205
WS119	1.00	Slightly gravelly sandy CLAY	11	11	N/A	Medium strength	Stiff	55	114
WS119	2.00	Slightly gravelly sandy CLAY	19	17	N/A	High strength	Very Stiff	87	178



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WS119	3.00	Slightly gravelly sandy CLAY	23	20	N/A	High strength	Very Stiff	100	206
WS119	4.00	Slightly gravelly sandy CLAY	23	19	N/A	High strength	Very Stiff	97	200
WS119	5.00	Slightly gravelly sandy CLAY	24	20	N/A	High strength	Very Stiff	100	205
WS120	1.00	Slightly gravelly sandy CLAY	13	13	N/A	Medium strength	Stiff	66	135
WS120	2.00	Slightly gravelly sandy CLAY	28	26	N/A	High strength	Very Stiff	128	263
WS120	3.00	Slightly gravelly sandy CLAY	21	18	N/A	High strength	Very Stiff	91	188
WS120	4.00	Slightly gravelly sandy CLAY	15	13	N/A	Medium strength	Stiff	63	130
WS120	5.00	Slightly gravelly sandy CLAY	15	12	N/A	Medium strength	Stiff	62	128
WS121	1.00	Slightly gravelly sandy CLAY	7	7	N/A	Low strength	Firm	35	73
WS121	2.00	Slightly gravelly sandy CLAY	31	28	N/A	High strength	Very Stiff	142	291
WS121	3.00	Slightly gravelly sandy CLAY	22	19	N/A	High strength	Very Stiff	96	197



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WS121	4.00	Slightly gravelly sandy CLAY	22	19	N/A	High strength	Very Stiff	93	191
WS121	5.00	Slightly gravelly sandy CLAY	23	19	N/A	High strength	Very Stiff	95	196
WS122	1.00	Slightly gravelly sandy CLAY	13	13	N/A	Medium strength	Stiff	66	135
WS122	2.00	Slightly gravelly sandy CLAY	24	22	N/A	High strength	Very Stiff	110	225
WS122	3.00	Slightly gravelly sandy CLAY	24	21	N/A	High strength	Very Stiff	104	215
WS122	4.00	Slightly gravelly sandy CLAY	27	23	N/A	High strength	Very Stiff	114	234
WS122	5.00	Slightly gravelly sandy CLAY	16	13	N/A	Medium strength	Stiff	66	136
WS123	1.00	Slightly gravelly sandy CLAY	14	14	N/A	Medium strength	Stiff	71	145
WS123	2.00	Slightly gravelly sandy CLAY	29	26	N/A	High strength	Very Stiff	132	272
WS123	3.00	Slightly gravelly sandy CLAY	23	20	N/A	High strength	Very Stiff	100	206
WS123	4.00	Slightly gravelly sandy CLAY	15	13	N/A	Medium strength	Stiff	63	130



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WS123	5.00	Slightly gravelly sandy CLAY	27	22	N/A	High strength	Very Stiff	112	230
WS124	1.00	Slightly gravelly sandy CLAY	9	9	N/A	Medium strength	Stiff	45	93
WS124	2.00	Slightly gravelly sandy CLAY	20	18	N/A	High strength	Very Stiff	91	188
WS124	3.00	Slightly gravelly sandy CLAY	15	13	N/A	Medium strength	Stiff	65	134
WS124	4.00	Slightly gravelly sandy CLAY	19	16	N/A	High strength	Very Stiff	80	165
WS124	5.00	Slightly gravelly sandy CLAY	22	18	N/A	High strength	Very Stiff	91	188
WS125	1.00	Slightly gravelly sandy CLAY	8	8	N/A	Medium strength	Stiff	40	83
WS125	2.00	Slightly gravelly sandy CLAY	16	15	N/A	Medium strength	Stiff	73	150
WS125	3.00	Slightly gravelly sandy CLAY	14	12	N/A	Medium strength	Stiff	61	125
WS125	4.00	Slightly gravelly sandy CLAY	19	16	N/A	High strength	Very Stiff	80	165
WS125	5.00	Slightly gravelly sandy CLAY	20	17	N/A	High strength	Very Stiff	83	171



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WS126	1.00	Slightly gravelly sandy CLAY	11	11	N/A	Medium strength	Stiff	55	114
WS126	2.00	Slightly gravelly sandy CLAY	17	16	N/A	High strength	Very Stiff	78	160
WS126	3.00	Slightly gravelly sandy CLAY	15	13	N/A	Medium strength	Stiff	65	134
WS126	4.00	Slightly gravelly sandy CLAY	15	13	N/A	Medium strength	Stiff	63	130
WS126	5.00	Slightly gravelly sandy CLAY	20	17	N/A	High strength	Very Stiff	83	171
WS127	1.00	Slightly gravelly sandy CLAY	10	10	N/A	Medium strength	Stiff	50	104
WS127	2.00	Slightly gravelly sandy CLAY	11	10	N/A	Medium strength	Stiff	50	103
WS127	3.00	Slightly gravelly sandy CLAY	13	11	N/A	Medium strength	Stiff	57	116
WS127	4.00	Slightly gravelly sandy CLAY	19	16	N/A	High strength	Very Stiff	80	165
WS127	5.00	Slightly gravelly sandy CLAY	16	13	N/A	Medium strength	Stiff	66	136
WS128	1.00	Slightly gravelly sandy CLAY	6	6	N/A	Low strength	Firm	30	62



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WS128	2.00	Slightly gravelly sandy CLAY	13	12	N/A	Medium strength	Stiff	59	122
WS128	3.00	Slightly gravelly sandy CLAY	20	17	N/A	High strength	Very Stiff	87	179
WS128	4.00	Slightly gravelly sandy CLAY	22	19	N/A	High strength	Very Stiff	93	191
WS128	5.00	Slightly gravelly sandy CLAY	17	14	N/A	Medium strength	Stiff	71	145
WS129	1.00	Slightly gravelly sandy CLAY	10	10	N/A	Medium strength	Stiff	50	104
WS129	2.00	Slightly gravelly sandy CLAY	14	13	N/A	Medium strength	Stiff	64	131
WS129	3.00	Slightly gravelly sandy CLAY	19	17	N/A	High strength	Very Stiff	83	170
WS129	4.00	Slightly gravelly sandy CLAY	24	20	N/A	High strength	Very Stiff	101	208
WS129	5.00	Slightly gravelly sandy CLAY	25	21	N/A	High strength	Very Stiff	104	213
WS130	1.00	Slightly gravelly sandy CLAY	12	12	N/A	Medium strength	Stiff	60	124
WS130	2.00	Slightly gravelly sandy CLAY	16	15	N/A	Medium strength	Stiff	73	150



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WS130	3.00	Slightly gravelly sandy CLAY	50	43	N/A	Very high strength	Very Stiff	217	447
WS131	1.00	Slightly gravelly sandy CLAY	12	12	N/A	Medium strength	Stiff	60	124
WS131	2.00	Slightly gravelly sandy CLAY	11	10	N/A	Medium strength	Stiff	50	103
WS131	3.00	Slightly gravelly sandy CLAY	30	26	N/A	High strength	Very Stiff	130	268
WS131	4.00	Slightly gravelly sandy CLAY	17	14	N/A	Medium strength	Stiff	72	148
WS131	5.00	Slightly gravelly sandy CLAY	14	12	N/A	Medium strength	Stiff	58	119
WS132	1.00	Slightly gravelly sandy CLAY	7	7	N/A	Low strength	Firm	35	73
WS132	2.00	Slightly gravelly sandy CLAY	24	22	N/A	High strength	Very Stiff	110	225
WS132	3.00	Slightly gravelly sandy CLAY	24	21	N/A	High strength	Very Stiff	104	215
WS132	4.00	Slightly gravelly sandy CLAY	16	14	N/A	Medium strength	Stiff	68	139
WS132	5.00	Slightly gravelly sandy CLAY	19	16	N/A	High strength	Very Stiff	79	162



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WS133	1.00	Slightly gravelly sandy CLAY	10	10	N/A	Medium strength	Stiff	50	104
WS133	2.00	Slightly gravelly sandy CLAY	20	18	N/A	High strength	Very Stiff	91	188
WS133	3.00	Slightly gravelly sandy CLAY	20	17	N/A	High strength	Very Stiff	87	179
WS133	4.00	Slightly gravelly sandy CLAY	15	13	N/A	Medium strength	Stiff	63	130
WS133	5.00	Slightly gravelly sandy CLAY	19	16	N/A	High strength	Very Stiff	79	162
WS134	1.00	Slightly gravelly sandy CLAY	11	11	N/A	Medium strength	Stiff	55	114
WS134	2.00	Slightly gravelly sandy CLAY	13	12	N/A	Medium strength	Stiff	59	122
WS134	3.00	Slightly gravelly sandy CLAY	20	17	N/A	High strength	Very Stiff	87	179
WS134	4.00	Slightly gravelly sandy CLAY	19	16	N/A	High strength	Very Stiff	80	165
WS134	5.00	Slightly gravelly sandy CLAY	20	17	N/A	High strength	Very Stiff	83	171
WS135	1.00	Slightly gravelly sandy CLAY	9	9	N/A	Medium strength	Stiff	45	93



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WS135	2.00	Slightly gravelly sandy CLAY	11	10	N/A	Medium strength	Stiff	50	103
WS135	3.00	Slightly gravelly sandy CLAY	50	43	N/A	Very high strength	Very Stiff	217	447
WS136	1.00	Slightly gravelly sandy CLAY	11	11	Medium Dense	N/A	N/A	N/A	111
WS136	2.00	Very clayey SAND	14	13	Medium Dense	N/A	N/A	N/A	128
WS136	3.00	Very clayey SAND	50	43	Dense	N/A	N/A	N/A	435

Notes

*The Allowable Bearing Pressure (ABP) should be considered indicative.



3.10. CONSOLIDATION

Four undisturbed samples of Glacial Till were submitted for oedometer analysis. The results are provided in Table 3.6.

TABLE 3.6 OEDOMETER CONSOLIDATION RESULTS

LOCATION	DEPTH (m)	SAMPLE TYPE	MOISTURE CONTENT (%)	OEDOMETER CONSOLIDATION		
				PRESSURE RANGE (kPa)	M _v (m ² /MN)	C _v (m ² /year)
CP102	0.50–1.00	U	19	0–5	Swelling	Swelling
				5–10	1.109	0.394
				10–20	0.668	0.382
				20–5	0.067	0.802
WS125	2.50–3.00	U	14	0–25	0.070	9.054
				25–50	0.228	13.855
				50–100	0.182	12.438
				100–25	0.035	5.853
WS133	2.50–3.00	U	11	0–25	Swelling	Swelling
				25–50	0.130	41.225
				50–100	0.139	35.700
				100–25	0.051	6.691
CP101	2.00–2.50	U	16	0–20	0.423	0.612
				20–40	0.460	0.968
				40–80	0.352	1.024
				80–20	0.073	13.235

When considered at overburden pressure with an additional load of 100 kPa the coefficient of volume compressibility (M_v) ranged from 0.139 m²/MN up to 0.182 m²/MN. The material is considered to be low to medium compressibility.

The rate at which settlement is likely to occur is determined by the coefficient of consolidation (C_v). As shown in Table 3.6, the coefficient ranges from 12.44 m²/yr to 35.70 m²/yr. The rate at which settlement will occur is increased by the presence of sand within the Glacial Till and it is likely that settlement will occur over a period of months to years.

3.11. SOIL INFILTRATION

In-situ BRE 365 Soakaway tests were undertaken over a 48 hour period within trial pits completed as SA101-SA106.

The results are presented in Table 3.7 below and the test certificates are included within Appendix IX.



TABLE 3.7 BRE365 SOAKAWAY TESTING RESULTS

LOCATION	DEPTH (m)	MATERIAL	TEST NO.	SOIL INFILTRATION RATE (m/s)
TP101/SA101	1.80	Slightly sandy gravelly CLAY	Test No.1	N/A
TP104/SA102	1.70	Slightly sandy gravelly CLAY	Test No.1	N/A
TP105/SA103	1.80	Slightly sandy gravelly CLAY	Test No.1	N/A
TP106/SA104	1.70	Slightly sandy gravelly CLAY	Test No.1	N/A
TP107/SA105	1.90	Slightly sandy gravelly CLAY	Test No.1	N/A
TP108/SA106	1.80	Slightly sandy gravelly CLAY	Test No.1	N/A

Soil infiltration was taken over the wetted area from between 75% and 25% of the effective depth. An insufficient fall in water level was recorded in the trial pits over the duration of the tests and as such it has not been possible to calculate a rate for infiltration. The cohesive drift deposits have therefore demonstrated very poor soakage potential.

Therefore, considering the significant volumes of low permeability CLAY on the site, it is considered that soakaway drainage will not be suitable for the proposed development.

3.12. SOIL PLASTICITY

The liquid and plastic limits of samples of natural in-situ clay are determined using the cone penetrometer method and the rolling thread test. These tests enable determination of an average plasticity index (PI) for each “type” of clay, although judgement is applied where variable results are reported.

PI can be related to shrinkability (low, medium or high) and then to minimum founding depth.

E3P typically only consider a soil to be shrinkable if the proportion finer than 63 µm is > 35%.

PI results are compared against guidance given in the NHBC standards, Chapter 4.2 (revised January 2014), which advocates the use of modified plasticity index (I_p), defined as:

$$I_p = I_p \times (\% < 425 \mu\text{m}/100)$$

In other words, if PI is 30%, but the soil contains 80% < 425 µm, then I_p = 30 × 80/100 = 24%.

It should be noted that in accordance with the requirements of BS 1377, the % passing the 425 µm sieve is routinely reported by testing labs.

E3P apply engineering judgement where PI results are spread over a range of classifications. Consideration is given to the average values for each particular soil type (differentiate between residual soil and alluvium), the number of results in each class and the actual values.

The Atterberg limits determinations, summarised in Table 3.8, show the clay to be of predominantly low plasticity with discrete areas of moderate plasticity clay.



TABLE 3.8 SUMMARY OF PLASTICITY INDEX TEST RESULTS

LOCATION	DEPTH (m)	NATURAL MOISTURE CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	PASSING 425 µm SIEVE (%)	MODIFIED PLASTICITY INDEX	NHBC VOLUME CHANGE POTENTIAL
TP102	0.80	20	16	33	17	89	15.13	Low
TP107	1.80	17	15	31	16	83	13.28	Low
WS104	1.50	14	13	27	14	87	12.18	Low
WS122	1.00	12	14	29	15	98	14.70	Low
WS127	0.50	14	14	27	13	86	11.18	Low
WS112	2.00	12	12	25	13	98	12.74	Low
WS131	1.00	13	14	30	16	96	15.36	Low
WS133	2.00	12	13	25	12	93	11.16	Low

The results of the Atterberg limits testing confirmed that the soils would be deemed to be “Low Volume Change Potential” in accordance with the classification system utilised by the LABC/NHBC industry guidance.

3.13. CALIFORNIA BEARING RATIO

The California bearing ratio (CBR) for the soils were measured using an in-situ TRL probe. The results are summarised in Table 3.9.

The result sheets are included in Appendix VIII and the locations are shown on Drawing 13-759-005 (Appendix III). CBR results have been averaged from the blow counts across the strata tested and any abnormally high blow counts ignored as these are likely to be from larger granular material and so represent anomalies.



TABLE 3.9 SUMMARY OF DCP RESULTS

LOCATION	DEPTH (m)	STRATA	IN-SITU OR LAB TEST	CBR (%)
DCP101	0.74–0.84	Stiff slightly gravelly sandy CLAY	In-Situ	7.42
DCP102	0.17–0.31	Stiff slightly gravelly sandy CLAY	In-Situ	5.32
DCP103	0.33–0.60	Stiff slightly gravelly sandy CLAY	In-Situ	7.44
DCP104	0.58–0.66	Stiff slightly gravelly sandy CLAY	In-Situ	23.21
DCP105	0.39–0.63	Stiff slightly gravelly sandy CLAY	In-Situ	10.64
DCP106	0.39–0.61	Stiff slightly gravelly sandy CLAY	In-Situ	5.56
DCP107	0.26–0.51	Stiff slightly gravelly sandy CLAY	In-Situ	3.72
DCP108	0.71–0.79	Stiff slightly gravelly sandy CLAY	In-Situ	12.56
DCP109	0.38–0.50	Stiff slightly gravelly sandy CLAY	In-Situ	7.94
DCP110	0.38–0.63	Stiff slightly gravelly sandy CLAY	In-Situ	5.96

It should be noted that the reported CBR results were obtained from soils in a highly undisturbed state. If, however, the topsoil and surface cover is removed during periods of wetter climatic condition, the formation will soften, reducing the CBR.

3.14. pH AND SULPHATE

Chemical analyses for pH and soluble sulphate content contained in Appendix V (summarised in Table 3.10), shows that the soils at the site meet Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE *Special Digest 1* (2005).

TABLE 3.10 SUMMARY OF pH AND SULPHATE DATA

LOCATION	DEPTH (m)	SO ₄ IN 2:1 WATER/SOIL (g/l)	pH VALUE	CLASSIFICATION
TP122	0.10	0.0066	7.3	DS-1, AC-1
WS102	0.95	0.0140	7.8	DS-1, AC-1
WS113	0.50	0.0100	7.6	DS-1, AC-1
WS117	0.30	0.0140	7.2	DS-1, AC-1
TP134	0.10	0.0150	7.0	DS-1, AC-1
TP139	0.40	0.0130	6.9	DS-1, AC-1
TP145	0.80	0.0170	7.5	DS-1, AC-1
WS124	0.20	0.0310	7.4	DS-1, AC-1

3.15. GROUND GAS

A ground gas assessment has been completed in accordance with guidance provided within CIRIA 665 – *Assessing risk posed by hazardous ground gases to buildings*.



3.16. INVESTIGATION RATIONALE

The ICSM has identified that the underlying Made Ground/infilled ponds may represent potential sources of ground gas generation. Based on the identification of these sources, E3P has determined that the site represents a moderate ground gas source generation potential.

Within the context of the proposed residential end use and ground gas generation potential, the gas assessment requires that nine visits are required over three months, with at least two sets of readings at low or falling atmospheric pressure as set out within CIRIA 665 Tables 5.5a and 5.5b.

The spacing requirements for monitoring wells are detailed within CIRIA 665 Table 4.2, which indicates that for moderate gas hazard sites (older domestic landfill sites, disused shallow mine workings, hydrocarbon vapour sources) and a high sensitivity development, nominal well spacing should be between 25 m and 50 m.

The spacing requirements for high gas hazard sites (domestic landfill sites) and a high sensitivity development, nominal well spacing should be less than 25 m.

TABLE 3.11 GROUND GAS MONITORING LOCATION RATIONALE

LOCATION	GROUND GAS SOURCE	DEPTH OF MONITORING WELL (m)
WS101	Made Ground	0.50–2.00
WS102	Natural Strata	0.50–1.50
WS103	Natural Strata	1.00–4.00
WS104	Natural Strata	1.00–4.00
WS106	Natural Strata	1.00–4.00
WS108	Natural Strata	0.50–1.50
WS109	Natural Strata	0.50–2.50
WS111	Natural Strata	1.00–4.00
WS112	Natural Strata	1.00–4.00
WS113	Natural Strata	1.00–5.00
WS114	Made Ground/Natural Strata	1.00–4.00
WS115	Natural Strata	1.00–5.00
WS117	Natural Strata	1.00–5.00
WS119	Natural Strata	1.00–4.00
WS123	Natural Strata	1.00–5.00
WS124	Natural Strata	1.00–5.00
WS125	Natural Strata	1.00–5.00
WS126	Natural Strata	1.00–4.00
WS127	Natural Strata	1.00–5.00
WS128	Natural Strata	1.00–5.00
WS129	Natural Strata	1.00–5.00
WS130	Natural Strata	1.00–3.00



LOCATION	GROUND GAS SOURCE	DEPTH OF MONITORING WELL (m)
WS131	Natural Strata	1.00–5.00
WS132	Natural Strata	1.00–5.00

3.17. MONITORING METHODOLOGY

Concentrations of methane (CH₄), carbon dioxide (CO₂) and oxygen (O₂) were measured using a calibrated infra-red gas analyser (GFM435) with gas flow rates were measured using an integrated flow meter.

Gas measurements were recorded for a minimum of 60 seconds at each location, at which point the maximum concentration of CH₄ and CO₂, together with the lowest concentration of O₂ were recorded. The results of the ground gas monitoring are presented in Table 3.12.



TABLE 3.12 SUMMARY OF GROUND GAS MONITORING RESULTS

WELL	DATE	CH ₄ INITIAL (%V/V)	CH ₄ STEADY (%V/V)	CH ₄ GSV (l/hr)	CO ₂ INITIAL (%V/V)	CO ₂ STEADY (%V/V)	CO ₂ GSV (l/hr)	O ₂ (%V/ V)	ATMOS (mb)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)
WS101	08/09/20	Could not locate												
	09/10/20													
	22/10/20													
	05/11/20													
	09/11/20													
	20/11/20													
WS102	08/09/20	Could not locate												
	09/10/20	0.1	0.1	0.0001	0.1	0.1	0.0001	20.2	1006	steady	0.10	0.50–1.50	1.35	0.75
	22/10/20	-0.1	-0.1	-0.0001	2.4	2.4	0.0024	16.5	996	rising	0.10		1.44	0.84
	05/11/20	0.1	0.1	0.0001	4.8	4.8	0.0048	14.7	1035	falling	0.1		1.45	0.67
	09/11/20	0.1	0.1	0.0001	6.3	6.3	0.0063	11.6	1015	steady	0.1		1.45	0.63
	20/11/20	0.1	0.1	0.0001	4.8	4.8	0.0048	17.5	1025	falling	0.1		1.45	0.58
WS103	08/09/20	Could not locate												
	09/10/20	0.1	0.1	0.0001	0.1	0.1	0.0001	20.2	1006	steady	0.10	1.00–4.00	3.90	0.40
	22/10/20	Could not locate												
	05/11/20													
	09/11/20													
	20/11/20													
WS104	08/09/20	0.1	0.1	0.00028	0.3	0.3	0.00084	20.3	1020	steady	0.28	1.00–4.00	3.76	dry
	09/10/20	0.1	0.1	0.0093	0.1	0.1	0.0093	20.1	1006	steady	9.30		3.60	dry



WELL	DATE	CH ₄ INITIAL (%V/V)	CH ₄ STEADY (%V/V)	CH ₄ GSV (l/hr)	CO ₂ INITIAL (%V/V)	CO ₂ STEADY (%V/V)	CO ₂ GSV (l/hr)	O ₂ (%V/ V)	ATMOS (mb)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)
	22/10/20	0.1	0.1	0.0001	0.3	0.3	0.0003	20.3	996	rising	0.10		3.76	dry
WS104	05/11/20	0.1	0.1	-0.0041	0.1	0.1	-0.0041	20.5	1035	falling	-4.1	1.00–4.00	3.70	dry
	09/11/20	0.1	0.1	0.0001	0.6	0.6	0.0006	19.4	1015	steady	0.1		3.70	dry
	20/11/20	0.1	0.1	0.0001	1.4	1.4	0.0014	18.9	1025	falling	0.1		3.70	dry
WS106	08/09/20	Could not locate												
	09/10/20	0.1	0.1	0.0001	0.1	0.1	0.0001	20.2	1006	steady	0.10	1.00–4.00	3.75	2.20
	22/10/20	Could not locate												
	05/11/20													
	9/11/20	0.1	0.1	0.0001	3.8	3.8	0.0038	14.1	1015	steady	0.1	1.00–4.00	3.75	1.60
	20/11/20	0.1	0.1	0.0001	3.5	3.5	0.0035	15.3	1025	falling	0.1		3.75	1.21
WS108	08/09/20													
	09/10/20	Could not locate												
	22/10/20													
	05/11/20	0.1	0.1	0.0001	3.8	3.8	0.0038	10.5	1033	falling	0.1	0.50–1.50	0.50	0.50
	09/11/20	0.1	0.1	0.0001	3.8	3.8	0.0038	10.5	1015	steady	0.1		0.50	0.50
	20/11/20	0.1	0.1	0.0001	1.1	1.1	0.0011	17.6	1024	falling	0.1		0.20	0.42
WS109	08/09/20	0.1	0.1	-0.01136	3.7	3.7	-0.42032	16.1	1020	steady	-11.36	0.50–2.50	3.91	3.43
	09/10/20	0.1	0.1	0.0001	0.1	0.1	0.0001	20.1	1006	steady	0.10		3.90	0.40
	22/10/20	0.1	0.1	0.0001	3.6	3.6	0.0036	16.3	996	rising	0.10		3.90	3.42
	05/11/20	0.1	0.1	0.0001	1.2	1.2	0.0012	18.0	1033	falling	0.1		3.90	0.45



WELL	DATE	CH ₄ INITIAL (%V/V)	CH ₄ STEADY (%V/V)	CH ₄ GSV (l/hr)	CO ₂ INITIAL (%V/V)	CO ₂ STEADY (%V/V)	CO ₂ GSV (l/hr)	O ₂ (%V/ V)	ATMOS (mb)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)
	09/11/20	0.1	0.1	0.0001	1.2	1.2	0.0012	18.2	1015	steady	0.1		3.90	0.49
	20/11/20	0.1	0.1	0.0001	0.7	0.7	0.0007	19.7	1024	falling	0.1		3.90	0.45
WS111	08/09/20	Could not locate												
	09/10/20													
	22/10/20	0.1	0.1	0.0001	4.4	4.4	0.0044	15.9	996	rising	0.10	1.00–4.00	Unable to remove bung	
	05/11/20	0.1	0.1	0.0001	4.2	4.2	0.0042	16.2	1033	falling	0.1			
	09/11/20	0.1	0.1	0.0001	4.4	4.4	0.0044	15.8	1015	steady	0.1			
	20/11/20	0.1	0.1	0.0001	4.1	4.1	0.0041	17.0	1025	falling	0.1			
	WS112	08/09/20	0.1	0.1	0.00026	4.6	4.6	0.01196	14.7	1020	steady	0.26	1.00–4.00	Unable to remove bung
09/10/20		0.1	0.1	0.0001	0.1	0.1	0.0001	20.1	1006	steady	0.10			
22/10/20		0.1	0.1	0.0001	3.8	3.8	0.0038	18.9	996	rising	0.10			
5/11/20		0.1	0.1	0.0001	3.8	3.5	0.0038	18.8	1035	falling	0.1			
9/11/20		0.1	0.1	0.0001	3.9	3.9	0.0039	18.6	1015	steady	0.1			
20/11/20		Monitoring well destroyed												
WS113	08/09/20	Could not locate												
	09/10/20													
	22/10/20	0.1	0.1	0.0001	4.0	4.0	0.004	12.5	996	rising	0.10	1.00–5.00	4.90	1.90
	5/11/20	0.1	0.1	0.0001	4.6	4.6	0.0046	11.9	1035	falling	0.1		4.90	1.76
	9/11/20	0.1	0.1	0.0001	3.7	3.7	0.0037	13.1	1015	steady	0.1		4.90	1.44
	20/11/20	0.1	0.1	0.0001	5.1	5.1	0.0051	12.4	1025	falling	0.1		4.90	1.51



WELL	DATE	CH ₄ INITIAL (%V/V)	CH ₄ STEADY (%V/V)	CH ₄ GSV (l/hr)	CO ₂ INITIAL (%V/V)	CO ₂ STEADY (%V/V)	CO ₂ GSV (l/hr)	O ₂ (%V/ V)	ATMOS (mb)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)
WS114	08/09/20	0.1	0.1	-0.00088	7.5	7.5	-0.066	9.7	1020	steady	-0.88	1.00–4.00	3.63	1.33
	09/10/20	0.1	0.1	0.0001	0.1	0.1	0.0001	20.2	1006	steady	0.10		3.65	0.52
	22/10/20	22.0	21.8	0.0218	3.9	3.9	0.0039	11.2	996	rising	0.10		3.60	1.15
WS114	5/11/20	27.1	27	0.0270	4.1	4.1	0.0041	9.8	1035	falling	0.1	1.00–4.00	3.60	0.96
	9/11/20	25.2	25.2	0.0252	4.1	4.0	0.0041	10.1	1015	steady	0.1		3.60	0.92
	20/11/20	41.2	41.2	0.0412	4.3	4.3	0.0043	5.7	1025	falling	0.1		3.60	0.97
WS115	08/09/20	Could not locate												
	09/10/20													
	22/10/20	0.1	0.1	0.0001	2.4	2.4	0.0024	12.8	996	rising	0.1	1.00–5.00	4.70	0.70
	5/11/20	0.1	0.1	0.0001	2.3	2.3	0.0023	14.5	1035	falling	0.1		4.70	0.68
	9/11/20	0.1	0.1	0.0001	2.4	2.4	0.0024	13.8	1015	steady	0.1		4.70	0.64
	20/11/20	0.1	0.1	0.0001	2.4	2.4	0.0024	12.8	1025	falling	0.1		4.70	0.64
WS117	08/09/20	Could not locate												
	09/10/20													
	22/10/20	0.1	0.1	0.0001	6.0	6.0	0.006	12.2	996	rising	0.10	1.00–5.00	4.40	0.75
	5/11/20	0.1	0.1	0.0001	5.9	5.9	0.0059	10.4	1035	falling	0.1		4.40	0.68
	9/11/20	0.1	0.1	0.0001	6.3	6.3	0.0063	11.3	1015	steady	0.1		4.40	0.65
	20/11/20	0.1	0.1	0.0001	5.6	5.3	0.0056	10.7	1025	falling	0.1		4.40	0.66
WS119	08/09/20	0.1	0.1	0.00183	2.5	2.5	0.04575	16.0	1020	steady	1.83	1.00–4.00	3.94	1.05
	09/10/20	0.1	0.1	0.0001	0.1	0.1	0.0001	20.3	1006	steady	0.10		3.80	0.20



WELL	DATE	CH ₄ INITIAL (%V/V)	CH ₄ STEADY (%V/V)	CH ₄ GSV (l/hr)	CO ₂ INITIAL (%V/V)	CO ₂ STEADY (%V/V)	CO ₂ GSV (l/hr)	O ₂ (%V/ V)	ATMOS (mb)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)
	22/10/20	0.1	0.1	-0.0352	0.8	0.8	-0.2816	19.8	998	rising	-35.2		3.80	0.55
	5/11/20	0.1	0.1	0.0001	4.1	4.1	0.0041	15.5	1035	falling	0.1		3.80	0.47
	9/11/20	0.1	0.1	-0.0165	2.7	2.7	-0.4455	16.8	1016	steady	-16.5		3.80	0.49
	20/11/20	0.1	0.1	0.0123	4.1	4.1	0.5043	15.1	1025	falling	12.3		3.80	0.35
WS121	08/09/20	0.1	0.1	-0.00133	2.1	2.1	-0.02793	16.8	1020	steady	-1.33	1.00–5.00	4.00	0.97
	09/10/20	0.1	0.1	0.0001	0.1	0.1	0.0001	20.3	1006	steady	0.10		4.60	0.60
	22/10/20	0.1	0.1	0.0001	0.8	0.8	0.0008	20.2	998	rising	0.10		4.70	0.75
	5/11/20	0.1	0.1	0.0001	2.0	2.0	0.002	18.1	1035	falling	0.1		4.70	0.78
	9/11/20	0.1	0.1	0.0001	1.6	1.6	0.0016	18.7	1016	steady	0.1		4.70	0.77
	20/11/20	0.1	0.1	0.0001	2.1	2.1	0.0021	17.8	1027	falling	0.1		4.70	0.69
WS123	08/09/20	Could not locate												
	09/10/20	0.1	0.1	0.0001	0.1	0.1	0.0001	20.2	1006	steady	0.1	1.00–5.00	4.55	0.40
	22/10/20	-0.1	-0.1	0.0321	2.5	2.5	-0.8025	18.6	998	rising	-32.1		4.70	0.66
	5/11/20	0.1	0.1	0.0001	4.9	4.6	0.0049	15.9	1035	falling	0.1		4.70	0.59
	9/11/20	0.1	0.1	-0.0122	4.1	4.1	-0.5002	16.8	1016	steady	-12.2		4.70	0.58
	20/11/20	0.1	0.1	0.0053	5.3	5.3	0.2809	14.9	1027	falling	5.3		4.70	0.62
WS124	08/09/20	0.1	0.1	0.00137	2.4	2.4	0.03288	14.0	1020	steady	1.37	1.00–5.00	4.70	1.34
	09/10/20	0.1	0.1	0.0571	0.1	0.1	0.0571	20.2	1006	steady	57.10		4.50	0.60
	22/10/20	-0.1	-0.1	-0.0001	1.7	1.7	0.0017	18.6	998	rising	0.10		4.70	0.71
	5/11/20	-0.1	0.1	0.0001	1.7	1.7	0.0017	18.0	1033	falling	0.1		4.00	0.63



WELL	DATE	CH ₄ INITIAL (%V/V)	CH ₄ STEADY (%V/V)	CH ₄ GSV (l/hr)	CO ₂ INITIAL (%V/V)	CO ₂ STEADY (%V/V)	CO ₂ GSV (l/hr)	O ₂ (%V/V)	ATMOS (mb)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)
	9/11/20	0.1	0.1	0.0001	1.5	1.5	0.0015	18.3	1016	steady	0.1		4.00	0.63
	20/11/20	Monitoring Well Destroyed												
WS125	08/09/20	Could not locate												
	09/10/20													
	22/10/20	Waterlogged												
WS125	5/11/20	Waterlogged												
	9/11/20													
	20/11/20													
WS126	08/09/20	Could not locate												
	09/10/20													
	22/10/20													
	5/11/20													
	9/11/20													
	20/11/20													
WS127	08/09/20	Could not locate												
	09/10/20													
	22/10/20													
	5/11/20													
	9/11/20	0.1	0.1	0.0001	3.1	3.1	0.0031	14.5	1015	steady	0.1	1.00–5.00	4.75	0.69
	20/11/20	0.1	0.1	0.0001	2.8	2.8	0.0028	15.0	1025	falling	0.1		4.45	0.71



WELL	DATE	CH ₄ INITIAL (%V/V)	CH ₄ STEADY (%V/V)	CH ₄ GSV (l/hr)	CO ₂ INITIAL (%V/V)	CO ₂ STEADY (%V/V)	CO ₂ GSV (l/hr)	O ₂ (%V/ V)	ATMOS (mb)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)
WS129	08/09/20	Could not locate												
	09/10/20													
	22/10/20													
	5/11/20	0.1	0.1	0.0112	4.3	4.3	0.4816	14.9	1033	falling	11.2	1.00–5.00	4.75	0.88
	9/11/20	0.1	0.1	0.0001	3.4	3.4	0.0034	16.2	1015	steady	0.1		4.75	0.79
	20/11/20	0.1	0.1	0.0001	3.9	3.9	0.0039	14.8	1025	falling	0.1		4.75	0.83
WS130	8/9/20	Could not locate												
	9/10/20													
	22/10/20													
	5/11/20	0.1	0.1	0.0001	1.7	1.7	0.0017	16.1	1033	falling	0.1	1.00–3.00	3.00	0.82
	9/11/20	0.1	0.1	0.0001	1.9	1.9	0.0019	16.0	1015	steady	0.1		3.00	0.81
	20/11/20	0.1	0.1	0.0001	1.9	1.9	0.0019	15.6	1025	falling	0.1		3.00	0.75
WS131	8/9/20	Could not locate												
	9/10/20													
	22/10/20													
	5/11/20	0.1	0.1	0.0001	5.5	5.5	0.0055	18.1	1033	falling	0.1	1.00–5.00	4.50	0.81
	9/11/20	0.1	0.1	0.0001	4.8	4.8	0.0048	18.5	1015	steady	0.1		4.50	0.82
	20/11/20	0.1	0.1	0.0001	5.5	5.5	0.0055	18.6	1025	falling	0.1		4.50	0.76
WS133	8/9/20	Could not locate												
	9/10/20													



Chapel Lane, Widnes

Phase II Geoenvironmental Site Assessment

January 2023

WELL	DATE	CH ₄ INITIAL (%V/V)	CH ₄ STEADY (%V/V)	CH ₄ GSV (l/hr)	CO ₂ INITIAL (%V/V)	CO ₂ STEADY (%V/V)	CO ₂ GSV (l/hr)	O ₂ (%V/ V)	ATMOS (mb)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)
	22/10/20													
	5/11/20	0.1	0.1	0.0001	3.5	3.5	0.0035	12.8	1033	falling	0.1	1.00–5.00	4.80	0.75
	9/11/20	0.1	0.1	0.0001	3.5	3.5	0.0035	13.1	1015	steady	0.1		4.80	0.78
	20/11/20	0.1	0.1	0.0001	3.2	3.2	0.0032	14.7	1025	falling	0.1		4.80	0.75



NOTES

NHBC Traffic Light System		Typical Max CH4 Concentration	GSV CH4	Typical Max CO2 Concentration	GSV CO2
	Amber 1	1	0.16-0.63	5	0.78-1.56
	Amber 2	5	0.63-1.56	10	1.56-3.13
	Red	20	1.56+	30	3.13+

Values in **BOLD** exceed Amber 1 Thresholds

Values in **BLUE** denote water above monitoring well



4. TIER I QUALITATIVE CONTAMINATED LAND RISK ASSESSMENT

E3P has undertaken a Tier 1 qualitative risk assessment to determine if any potential contaminants within the underlying soils and groundwater pose an unacceptable level of risk to the identified receptors.

4.1. HUMAN HEALTH RISK ASSESSMENT

At Tier 1 stage, the long term (chronic) human health toxicity of the soil has been assessed by comparing the on-site concentrations of organic and inorganic compounds with reference values published in LQM/CIEH S4UL (S4UL3267).

The results of this comparison have been summarised within Table 4.1.



TABLE 4.1 SUMMARY OF INORGANIC AND HYDROCARBON TOXICITY ASSESSMENT FOR A RESIDENTIAL END USE

DETERMINANT	UNIT	GAC	N	MC	LOC. OF EX	PATH-WAY	ASSESSMENT
Arsenic	mg/kg	37	28	26	N/A	1	No Further Action
Cadmium	mg/kg	17	28	0.7	N/A	1	No Further Action
Chromium (VI)	mg/kg	6.1	28	7	TP125 0.10	1	Further Action
Lead	mg/kg	200	28	300	TP138 0.10	1	Further Action
Mercury	mg/kg	1.2	28	0.50	N/A	3	No Further Action
Nickel	mg/kg	180	28	44	N/A	1	No Further Action
Selenium	mg/kg	250	28	< 1.0	N/A	1	No Further Action
Copper	mg/kg	2400	28	120	N/A	1	No Further Action
Zinc	mg/kg	3700	28	140	N/A	1	No Further Action
Cyanide – Total	mg/kg	791	8	< 1.0	N/A	1	No Further Action
Phenols – Total	mg/kg	210	8	< 1.0	N/A	1	No Further Action
Asbestos	Fibres	NFD	28	Chrysotile <0.001	TP145 0.80	4	Further Action
Naphthalene	mg/kg	2.3	28	< 0.05	N/A	3	No Further Action
Acenaphthylene	mg/kg	170	28	< 0.05	N/A	2	No Further Action
Acenaphthene	mg/kg	210	28	< 0.05	N/A	1	No Further Action
Fluorene	mg/kg	170	28	< 0.05	N/A	1	No Further Action
Phenanthrene	mg/kg	95	28	0.29	N/A	2	No Further Action
Anthracene	mg/kg	2400	28	< 0.05	N/A	2	No Further Action
Fluoranthene	mg/kg	280	28	0.64	N/A	2	No Further Action
Pyrene	mg/kg	620	28	0.46	N/A	2	No Further Action
Benzo(a)Anthracene	mg/kg	7.2	28	0.44	N/A	2	No Further Action
Chrysene	mg/kg	15	28	0.43	N/A	2	No Further Action
Benzo(b)Fluoranthene	mg/kg	2.6	28	0.39	N/A	2	No Further Action
Benzo(k)Fluoranthene	mg/kg	77	28	0.31	N/A	2	No Further Action
Benzo(a)Pyrene**	mg/kg	2.2	28	0.44	N/A	2	No Further Action
Indeno(123-cd)Pyrene	mg/kg	27	28	0.22	N/A	2	No Further Action
Dibenzo(a,h)Anthracene	mg/kg	0.24	28	< 0.05	N/A	2	No Further Action
Benzo(ghi)Perylene	mg/kg	320	28	0.24	N/A	2	No Further Action
TPH C5-C6 (aliphatic)*	mg/kg	42	28	< 1.0	N/A	3	No Further Action
TPH C6-C8 (aliphatic)*	mg/kg	100	28	< 0.1	N/A	3	No Further Action
TPH C8-C10 (aliphatic)*	mg/kg	27	28	< 0.1	N/A	3	No Further Action
TPH C10-C12 (aromatic)*	mg/kg	74	28	< 2.0	N/A	3	No Further Action
TPH C12-C16 (aromatic)*	mg/kg	140	28	< 4.0	N/A	3	No Further Action



DETERMINANT	UNIT	GAC	N	MC	LOC. OF EX	PATH-WAY	ASSESSMENT
TPH C16-C21 (aromatic)*	mg/kg	260	28	< 1.0	N/A	1	No Further Action
TPH C21-C35 (aromatic)*	mg/kg	1100	28	< 1.0	N/A	1	No Further Action

Notes

Main exposure pathways: 1 = soil ingestion, 2 = dermal contact and ingestion, 3 = vapour inhalation (indoor), 4 = dust inhalation.

Abbreviations: GAC = general assessment criteria, n = number of samples, MC = maximum concentration; Loc of Ex = location of exceedance; NFD = no fibres detected.

Referring to Table 4.1, the results of this direct comparison indicates that the data exceeds the screening criteria for a residential end use for the following contaminants:

- ☛ Chromium (VI) in TP125 at 0.10m bgl;
- ☛ Lead in TP138 at 0.10 m bgl; and,
- ☛ Chrysotile in TP145 at 0.80 m bgl.

Asbestos in the form of loose chrysotile fibres has been identified in the granular Made Ground in TP145 with a quantification <0.001%.

No significant concentrations of SVOCs were identified in the soils submitted for chemical analysis.

The laboratory analysis confirms the assessment within the initial conceptual site model that the main constituents of concern were likely to be asbestos, PAHs, hydrocarbon compounds and heavy metals.

In relation to these exceedances, the following can be determined:

- ☛ The main exposure pathways based on the Tier I exceedances are:
 - Soil ingestion;
 - Fibre/dust inhalation.

The exceedances in relation to human health Risk Assessment and Mitigation for contaminants with exposure pathway of soil ingestion are associated with Topsoil (0.10 m). Elevated asbestos has an exposure pathway of inhalation of particulates and has been identified within Made Ground at a depth of 0.80 m.

Elevated concentrations within topsoil samples from TP125 at 0.10 m and TP138 at 0.10 m bgl have primary exposure pathways related to ingestion of soils and inhalation of particulate. Hotspot delineation and segregation of soils in these isolated areas should be undertaken during remediation and enabling works. The materials should then be placed either within public open space (POS), below 600 mm clean cover in private gardens, or beneath plots, hand standing to remove any potential for direct exposure to impacted soils.

Asbestos in the form of chrysotile has also been identified within localised areas in shallow Made Ground deposits within TP145 (0.80 m) at <0.001%. Hotspot delineation should be undertaken within this area to identify the full extent of contamination. Due to materials containing <0.001%, they can be placed below 600 m within private gardens, below 300 m within POS areas, or below highways and plots. No visual signs of ACM were encountered during the ground investigation; it is therefore likely that only trace fibres are present. Impacted soils should be managed according to the asbestos risk mitigation conceptual site model shown in Figure 4.1.



FIGURE 4.1 ASBESTOS RISK MITIGATION CONCEPTUAL SITE MODEL



Notes

ND None Detect

0.001% Soils may contain $\leq 0.001\%$ asbestos using composite testing to ensure there is no potential risk to human health. This value is present within areas where there may be a short term low level exposure of soils containing trace asbestos fibres by construction workers where an appropriate level of asbestos management is employed (dust suppression)

0.1% Soils at a depth of $>1.00\text{m}$ bgl may contain $<0.1\%$ asbestos using composite testing where they will not be likely to be disturbed in the future and will therefore be in an area of low sensitivity. Risk assessment completed in accordance with Asbestos JIWG risk assessment tools.

Undefined- this will be dependent upon soils encountered during earthworks, which may be placed at these depths to ensure no potential risk to human health.

Chemical analysis of the natural clay drift deposits have identified these soils to be acceptable for use as subsoil within the proposed garden areas; however, further chemical validation samples will be required to confirm this.

Natural topsoil has been identified as acceptable for reuse within private gardens with the exception of isolated areas TP125 and TP138. Hotspot delineation of these isolated areas should be undertaken during remediation and enabling works. Once delineated the risk to chronic human health associated with the localised marginally elevated concentrations of inorganic heavy metals can be mitigated by placing them within an area of reduced sensitivity.



4.2. CONTROLLED WATERS RISK ASSESSMENT

The site sensitivity with respect to controlled waters is summarised within Table 4.2.

TABLE 4.2 CONTROLLED WATERS SENSITIVITY PROFILE

RISK PROFILE	DISCUSSION	SENSITIVITY RATING
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	The site is located within Groundwater Source Protection Zone 3 – Total Catchment as defined by the Environment Agency.	Moderate
Distance to the Closest Groundwater Abstraction Point	There are no licensed water abstractions within 250 m of site.	Low
Aquifer Classification in Superficial Drift Deposits	The superficial deposits of the Glacial Till are designated as Secondary (Undifferentiated) aquifer.	Low
Aquifer Classification in Bedrock	The bedrock deposits of the Chester Sandstone Formation are designated as Principle aquifer.	High
Viability for Anthropogenic Soil in Direct Contact with Aquifer (Drift or Bedrock)	The site is generally underlain by low permeability clays to depths of between 2.00 m (north east) and >16.95 m bgl (central). Made Ground deposits have been encountered within isolated areas across site. These are not representative of the site as a whole.	Low
Is the Site Located Within 50 m of a Surface Watercourse?	An unnamed brook/ditch is present along the northern boundary along with a ditch present in the centre of site orientated roughly east-west.	High
SUMMARY The ICSM developed within the context of the site setting has only identified two viable pollutant risks, which would be the downward migration of potentially mobile phase-soluble contaminants towards the underlying principal aquifer and lateral migration to the unnamed brook/ditch present along the northern boundary. However, the overall sensitivity of this receptor is reduced given the absence of any groundwater abstraction and thus the potential for the creation of a complete pollutant linkage.		

To further refine the ICSM, E3P has undertaken an initial qualitative assessment of the soil data analysis to assess the potential for a source of separate-phase or dissolved-phase contamination originating from either a defined on-site source or from impacted soils.

This assessment is summarised in Table 4.3.



TABLE 4.3 QUALITATIVE RISK TO CONTROLLED WATERS FROM SOIL ANALYTICAL RESULTS

BTEX > 1 mg/kg	The soil data analysis has not identified any detectable concentrations of TPH C5 to C6 that might otherwise be indicative of VOC impact
Total VOC > 1 mg/kg	
Total SVOC > 1 mg/kg	PAH analysis recorded concentrations below the laboratory LOD. Where detected, PAH concentrations were <1 mg/kg.
C5-C10 > 5 mg/kg	All concentrations are below the laboratory LOD.
C10-C12 > 10 mg/kg	All concentrations are below the laboratory LOD.
C12-C16 > 50 mg/kg	All concentrations are below the laboratory LOD.
Phenols > 2 mg/kg	All concentrations are below the laboratory LOD.
Naphthalene > 2 mg/kg	The most soluble SVOC (naphthalene) has been not identified at concentrations greater than 2 mg/kg
Total PAH > 10 mg/kg	Total combined concentrations of low-solubility PAH compounds greater than 10 mg/kg have not been detected in the soil analysis.
PCB > 1 mg/kg	No potential sources of PCB have been identified.
Heavy metals > 500 mg/kg	Concentrations of heavy metals are all below 500 mg/kg.

In due consideration of the ICSM, which has identified two potential pollutant linkages associated with the migration towards the underlying principal aquifer and drainage ditches, E3P has undertaken a Tier I controlled waters risk assessment.

The Tier I assessment has included a comparison of leachate analysis from samples of the Made Ground in west and groundwater samples to environmental quality standards (EQS) due to the adjacent unnamed brook and drinking water standards (DWS) due to the underlying aquifer.

These are presented in Table 4.4.



TABLE 4.4 COMPARISON OF GROUNDWATER ANALYSIS WITH TIER 1 SCREENING LEVELS

DETERMINAND	UNIT	EQS ^{1,2,3}	DWS ^{3,4,5}	NO. OF GW SAMPLES	MAX CONC. IN GROUND-WATER	LOCATION OF EXCEEDANCE	NO. OF LEACHATE SAMPLES	MAX CONC. IN LEACHATE	LOCATION OF EXCEEDANCE	ASSESSMENT
		AA								
Arsenic	µg/l	50	10	4	109	WS114 (DWS & EQS)	2	3.7	N/A	No Further Action
Cadmium	µg/l	0.08-0.25	5	4	0.03	N/A	2	<0.08	N/A	No Further Action
Chromium (VI)	µg/l	3.4	–	4	<5.0	N/A	2	<5.0	N/A	No Further Action
Chromium (III)	µg/l	4.7	50	4	1.2	N/A	2	4	N/A	No Further Action
Copper	µg/l	1	2000	4	0.9 4.5 5.6 7.4	WS114 (EQS) WS127 (EQS) WS131 (EQS) WS103 (EQS)	2	8.2 35	WS120 (DWS) TP140 (DWS)	Further Action
Total Cyanide	µg/l	1	50	4	13	WS114 (EQS)	2	<1.0	N/A	No Further Action
Lead	µg/l	1.2	10	4	15	WS103 (DWS & EQS)	2	2 6.2	WS120 (EQS) TP140 (EQS)	Further Action
Mercury	µg/l	–	1.0	4	<0.05	N/A	2	<5.0	N/A	No Further Action
Nickel	µg/l	4	20	4	5	WS114 (EQS)	2	3	N/A	No Further Action
Selenium	µg/l	–	10	4	2.5	N/A	2	<4.0	N/A	No Further Action
Zinc	µg/l	10.9	–	4	13 14	WS103 (EQS) WS131 (EQS)	2	23	TP140 (EQS)	Further Action
pH	6–9			4	6.7–7.5	N/A	2	6.5–7.2	N/A	No Further Action
Naphthalene	µg/l	2	10*	4	<0.01	N/A	2	< 0.01	N/A	No Further Action
Anthracene	µg/l	0.1	10*	4	<0.01	N/A	2	< 0.01	N/A	No Further Action
Benzo[b]fluoranthene	µg/l	0.00017*	10*	4	<0.01	N/A	2	< 0.01	N/A	No Further Action
Benzo[k]fluoranthene	µg/l	0.00017*	10*	4	<0.01	N/A	2	< 0.01	N/A	No Further Action



DETERMINAND	UNIT	EQS 1, 2, 3	DWS 3,4,5	NO. OF GW SAMPLES	MAX CONC. IN GROUND- WATER	LOCATION OF EXCEEDANCE	NO. OF LEACHATE SAMPLES	MAX CONC. IN LEACHATE	LOCATION OF EXCEEDANCE	ASSESSMENT
		AA								
Benzo(a)pyrene	µg/l	0.00017*	10*	4	<0.01	N/A	2	< 0.01	N/A	No Further Action
Indeno(123-cd)pyrene	µg/l	0.00017*	10*	4	<0.01	N/A	2	< 0.01	N/A	No Further Action
Fluoranthene	µg/l	0.0063	10*	4	<0.01	N/A	2	< 0.01	N/A	No Further Action
Benzo(ghi)perylene	µg/l	1.7–4	10*	4	<0.01	N/A	2	< 0.01	N/A	No Further Action
TPH C5-C6 (benzene)	µg/l	10	1	4	< 1.0	N/A	2	< 1.0	N/A	No Further Action
TPH C6-C8 (toluene)	µg/l	74	700	4	< 1.0	N/A	2	< 1.0	N/A	No Further Action
TPH C8-C10 (ethyl benzene)	µg/l	20	300	4	< 1.0	N/A	2	< 1.0	N/A	No Further Action
TPH C10-C12 (xylene)	µg/l	30	500	4	< 10	N/A	2	< 10	N/A	No Further Action
TPH C12-C16	µg/l	2	905	4	< 10	N/A	2	< 10	N/A	No Further Action
TPH C16-C35	µg/l	50#	905	4	< 10	N/A	2	< 10	N/A	No Further Action
TPH C5-C6	µg/l	–	15000	4	< 1.0	N/A	2	< 1.0	N/A	No Further Action
TPH C6-C8	µg/l	–	15000	4	< 1.0	N/A	2	< 1.0	N/A	No Further Action
TPH C8-C10	µg/l	–	300	4	< 1.0	N/A	2	< 1.0	N/A	No Further Action
TPH C10-C12	µg/l	–	300	4	< 10	N/A	2	< 10	N/A	No Further Action
TPH C12-C16	µg/l	–	300	4	< 10	N/A	2	< 10	N/A	No Further Action
TPH C16-C21	µg/l	–	300**	4	< 10	N/A	2	< 10	N/A	No Further Action
TPH C21-C35	µg/l	–	300**	4	< 10	N/A	2	< 10	N/A	No Further Action
Tetrachloroethylene	µg/l	0.4	10	0	N/A	N/A	0	N/A	N/A	No Further Action
Trichloroethylene	µg/l	10	10	0	N/A	N/A	0	N/A	N/A	No Further Action



DETERMINAND	UNIT	EQS 1, 2, 3	DWS 3,4,5	NO. OF GW SAMPLES	MAX CONC. IN GROUND- WATER	LOCATION OF EXCEEDANCE	NO. OF LEACHATE SAMPLES	MAX CONC. IN LEACHATE	LOCATION OF EXCEEDANCE	ASSESSMENT
		AA								
Trichlorobenzene	µg/l	0.4	–	4	<1.0	N/A	0	N/A	N/A	No Further Action
Trichloromethane	µg/l	2.5	–	4	<1.0	N/A	0	N/A	N/A	No Further Action
Dichloromethane	µg/l	20	200	0	N/A	N/A	0	N/A	N/A	No Further Action
Carbon Tetrachloride	µg/l	12	3	0	N/A	N/A	0	N/A	N/A	No Further Action
Vinyl Chloride	µg/l	–	0.3	4	<1.0	N/A	0	N/A	N/A	No Further Action

Notes

Solubility <0.01µg/l

AA – Annual Average

* Polyaromatic hydrocarbons (PAH) - Benzo(a)pyrene (BaP), Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)-perylene and Indeno(1,2,3-cd)-pyrene. Benzo(a)pyrene can be considered as a marker for the other PAHs, hence only benzo(a)pyrene needs to be monitored for comparison with the biota EQS or the corresponding AA-EQS in water

** There are no WHO Guideline Values for aliphatic fractions C16-C21 and C21-C35, therefore the guideline value for aliphatic fractions inclusive of C8-C16 (300µg/l) has been applied.

1. The Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations (2015)
2. Directive establishing a framework for Community action in the field of water policy (Water Framework Directive)
3. Council Directive on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community (Dangerous Substances Directive) - List II substances
4. Council Directive on the quality of water intended for human consumption (Drinking Water Directive)
5. WHO Guidelines for Drinking Water Quality. Third edition (2004)



CONTROLLED WATER RISK ASSESSMENT AND MITIGATION

This comparison indicates that the data exceeds the EQS and DWS values for the following inorganic compounds:

- ✿ Arsenic (EQS and DWS);
- ✿ Copper (EQS and DWS);
- ✿ Total Cyanide (EQS and DWS);
- ✿ Lead (EQS and DWS);
- ✿ Nickel (EQS); and,
- ✿ Zinc (EQS).

4.2.1. M-BAT ASSESSMENT

Due to EQS exceedances in both soils and leachate samples for copper, nickel and zinc, an m-BAT assessment has been completed to assess the bioavailability of the metals with respect to surface water receptors (adjacent brook/drainage ditches). The chemical values from the groundwater analysis have been input into the assessment and the following Risk Characterisation Ratios (RCR) have been calculated.

1. W114
 - Copper (0.01)
 - Nickel (0.15)
2. WS127
 - Copper (0.54)
3. WS131
 - Copper (0.37)
 - Zinc (0.59)
4. WS103
 - Copper (0.27)
 - Zinc (0.35)

The Risk Characterisation Ratio (RCR) for all elevated compounds has been found to be less than 1, which indicates the bioavailable concentrations are below the EQS and the receptor is therefore not at risk from copper, nickel or zinc. In this instance, groundwater chemical data for DOC was input into the m-BAT for the onsite locations.

4.2.2. FINAL PB SCREENING TOOL

Lead is not included in the M-BAT tool as it is not a full bioavailable EQS, however, a separate assessment using the Pb screening tool has been completed for lead for elevated levels noted in WS103. The assessment confirms that there is not a risk within WS103 (RCR- 0.09), as the concentrations do not exceed the site specific PNEC and the risk characterisation ratio is less than 1.0.

In light of the above assessment, E3P do not consider the site to pose an unacceptable level of risk to surface waters for lead.



With regards to the elevated arsenic and total cyanide within WS114, they are general low solubility and therefore mobility, suggesting that these will not migrate to controlled water receptors. Furthermore, soakaway testing undertaken at the site has confirmed that the infiltration rate is very low, and the low permeability of the material will therefore significantly reduce the potential for downward or lateral migration.

Based on the above, there is considered to be no unacceptable level of risk to the controlled water receptors.

4.3. GROUND GAS

The potential impact on the development from ground gases has been assessed with reference to standards and guidelines published in CIRIA Report 665 – *Assessing risks posed by hazardous ground gases to buildings* (2007). However, it is recommended that the full ground gas assessment and recommended protection measures are agreed with the local authority prior to their adoption on site. Furthermore, all protection measures adopted should be validated by a suitably qualified engineer.

CIRIA C665 and NHBC Report No 10627-R01 provide assessments for carbon dioxide and methane based upon gas screening values (GSVs) utilising flow rates and concentrations. The site-based GSVs for steady state methane and carbon dioxide are based upon the following equation:

$$GSV = \frac{\text{concentration (by vol)}}{100} \times \text{flowrate (1 / hr)}$$

The GSVs within CIRIA C665 are based upon all buildings other than standard residential houses. The NHBC GSVs are based upon standard residential houses with precast concrete floors (block and beam). The CIRIA 665 report author (Steve Wilson) since provided further clarification regarding which guidance should be adopted for residential houses that have suspended cast in-situ concrete floor slab: for the avoidance of doubt, it was confirmed that the GSVs within the CIRIA 665 guidance should be adopted. The thresholds for GSVs based upon NHBC and CIRIA guidance are provided within Table 4.5.

TABLE 4.5 RESIDENTIAL THRESHOLDS FOR GAS SCREENING VALUES (GSV) IN ACCORDANCE WITH CIRIA C665 AND NHBS REPORT NO 10627-R01 – RESIDENTIAL END USE

CIRIA – NO SUBFLOOR VOID		NHBC – SUBFLOOR VOID		
CLASSIFICATION	GSV (METHANE AND CARBON DIOXIDE)	CLASSIFICATION	GSV (METHANE)	GSV (CARBON DIOXIDE)
CS1	< 0.07	Green	< 0.13	< 0.76
CS2	< 0.70	Amber 1	< 0.63	< 1.60
CS3	< 3.5	Amber 2	< 1.60	< 3.10
CS4	< 15	Red	> 1.60	> 3.10
CS5	< 70	N/A	N/A	N/A
CS6	> 70	N/A	N/A	N/A

4.3.1. SOURCES OF GROUND GAS

The Phase I report and subsequent ground investigation has identified the following potential sources of ground gas:

- ✳ Made Ground deposits; and,



 Infilled ponds.

4.3.2. GROUNDWATER

Monitoring wells WS103, WS114, WS115, WS117, WS121, WS123, WS127, WS129, WS130, WS131 and WS133 were flooded on a number of occasions and cannot therefore be included within the gas assessment.

Within the remaining wells, groundwater levels were observed to fluctuate over the monitoring period. The greatest groundwater change occurred within WS109 where levels increased by 3.03 m over the monitoring period. WS109 was set within a low-permeability clay stratum and groundwater may be a result of surface water collecting in the well rather than a measure of true groundwater.

4.3.3. GAS FLOW

During the monitoring, a positive flow was noted in all wells. The highest flow was recorded within WS124 at 57.10l/hr, this well was noted to be flooded at the time of this recording and is therefore not considered to be representative of true active flow.

The measure of positive flow is considered to be the result of groundwater fluctuations and flooding of the well causing compression – as opposed to gas generation – as the highest flows are generally recorded during periods of high groundwater levels.

Negative flows are indicative of back pressure from wind being greater than the active flow from the wells. Negative flows were recorded in WS104, WS109, WS114, WS119, WS121 and WS123.

4.3.4. GAS CONCENTRATIONS

Methane has been recorded in within non-flooded monitoring all wells at maximum concentrations of 0.1%.

However, methane has been recorded at concentrations of between 21.8 and 41.2% v/v within monitoring well WS114 during the last four monitoring visits. This monitoring well is located in the vicinity of a historical (potentially infilled) pond; however, no obvious organic material was encountered. This location was also noted to be flooded on three of these occasions, so the elevated concentrations may be the result of gases being compressed within the well headspace and therefore the results should be treated with caution/discounted from the overall assessment.

Carbon dioxide concentrations were recorded within non-flooded monitoring wells at concentrations ranging from 0.1% v/v to 7.5% v/v (WS114 – not flooded on this occasion). Concentrations above 5% were also recorded in WS102, WS113 (flooded), WS117 (flooded) and WS131.

4.3.5. GAS ASSESSMENT

In accordance with the methodology outlined with the CIRIA publication C665, E3P have utilised the results of the ground gas monitoring surveys to calculate a tentative gas screening value (GSV). The GSVs for the monitoring positions are summarised in Table 4.6.



TABLE 4.6 GAS RISK PROFILE AND LOCATION

LOCATION	MAX CH ₄ (% v/v)	GSV (l/hr)	MAX CO ₂ (% v/v)	GSV (l/hr)	CLASSIFICATION
WS102	0.1	0.00010	6.3	0.00630	CS2/Amber 1
WS104	0.1	0.00930	1.4	0.00140	CS1/Green
WS106	0.1	0.00010	3.8	0.00380	CS1/Green
WS109	0.1	0.00010	3.7	-0.42032	CS1/Green
WS111	0.1	0.00010	4.4	0.00440	CS1/Green
WS112	0.1	0.00026	4.6	0.01196	CS1/Green
WS113	0.1	0.00010	4.0	0.00400	CS1/Green
WS114*	22.0	0.02180	7.5	-0.06600	CS4/Red
WS119	0.1	0.00183	2.5	0.04575	CS1/Green
WS124	0.1	0.05710	2.4	0.03288	CS1/Green

Notes

*Max concentrations from visits where the monitoring well was not flooded have been included in the assessment

Monitoring is incomplete, but based on the preliminary results to date, the GSV has been compared to the criteria outlined with CIRIA C665 to determine the level of risk to the proposed development and to ensure the appropriate remedial options are incorporated into any future building design in this area.

The results indicate the majority of the site to be classified as CS1/Green

Although the calculated GSVs all fall into the Green/CS1 classification, guidance suggests that where carbon dioxide is >5% or methane is >1%, consideration for increasing the classification should be made. Preliminary ground gas monitoring suggests that the site can be predominantly classified as CS1, and in these areas it is considered that gas protection measures will not be required.

However, concentrations recorded in WS102 indicate a classification of CS2/Amber 1 and are associated with Made Ground deposits. Concentrations recorded in WS114 indicate a classification of CS4/Red, therefore allowance for specialist protection measures within plots in the vicinity of these locations should be made.

With respect to WS114, it was noted that on recent monitoring visits, the water level was recorded above the top of the response zone i.e. flooded. Therefore, for subsequent monitoring visits, it is recommended that water be bailed/removed from the well, prior to monitoring, to determine whether high gas concentrations are genuine, or the result of compression within the reduced headspace.

If high gas concentrations persist after bailing, it may be possible to remove the source of the ground gas (Made Ground) in the vicinity of WS114 where a CS4/Red classification has been noted to eliminate the risk and reduce the classification but would require further assessment post-removal to ensure no further risk remains.

Further assessment and recommendations will be required on completion of the monitoring programme.



4.4. RESIDENTIAL BUILDING GAS RISK MITIGATION

British Standard BS8485 (2015)+A1(2019) provides two types of residential property that require assessment. These building types are:

-  **Type A Building** – Private ownership with no building management controls on alterations to the internal structure, the use of rooms, the ventilation of rooms or the structural fabric of the building. Some small rooms are present. Probably conventional building construction (rather than civil engineering). Examples include private housing and some retail premises.
-  **Type B Building** – Private or commercial property with central building management control of any alterations to the building or its uses but limited or no central building management control of the maintenance of the building, including the gas protection measures. Multiple occupancy. Small- to medium-sized rooms with passive ventilation of rooms and other internal spaces throughout ground floor and basement areas. May be conventional building or civil engineering construction. Examples include managed apartments, multiple occupancy offices, some retail premises and parts of some public buildings (such as schools, hospitals, leisure centres) and parts of hotels.

Based on the ground gas risk assessment and the proposed Type A Building, it is envisaged that a point score of 3.5 will be required for CS2/Amber 1 affected properties, as summarised in Table 4.7.

Residential buildings should not be built on CS4 or higher sites unless the type of construction or site circumstances allow additional levels of protection to be incorporated, for example, high-performance ventilation or pathway intervention measures, and an associated sustainable system of management of maintenance of the gas control system such as in institutional and/or fully serviced contractual situations.

TABLE 4.7 BS 8485 (2015) POINTS REQUIRED FOR TYPE A AND TYPE B BUILDINGS

CHARACTERISTIC SITUATION	NHBC TRAFFIC LIGHT SYSTEM	MINIMUM GAS PROTECTION SCORE (POINTS)	
		HIGH SENSITIVITY	
		TYPE A BUILDING	TYPE B BUILDING
1	Green	0	0
2	Amber 1	3.5	3.5
3	Amber 2	4.5	4
4	Red	6.5	5.5
5	N/A	N/A	6.5
6	N/A	N/A	N/A

The requisite 3.5 points for CS2/Amber 1 plots must be achieved by installation of a suitable combination of measures detailed in Table 4.8.

TABLE 4.8 SUMMARY OF GROUND GAS MITIGATION MEASURES – BS8485 (2015)+A1(2019)

GAS PROTECTION SCORES FOR THE STRUCTURAL BARRIER	SCORE ^A
Floor and Substructure Design	
Precast Suspended Segmental Subfloor (Beam and Block)	0
Cast In-Situ Ground-Bearing Floor Slab (With Only Nominal Mesh Reinforcement)	0.5



Cast In-Situ Monolithic Reinforced Ground-Bearing Raft or Reinforced Cast In-Situ Suspended Floor Slab With Minimal Penetrations		1 or 1.5 ^B
Basement Floor and Walls Conforming to BS 8102:2009, Grade 2 Waterproofing^C		2
Basement Floor and Walls Conforming to BS 8102:2009, Grade 3 Waterproofing^C		2.5
A) The scores are conditional on breaches of floor slabs, etc. being effectively sealed. B) To achieve a score of 1.5 the raft or suspended slab should be well reinforced to control cracking and have minimal penetrations cast in (see A.2.2.2). C) The score is conditional on the waterproofing not being based on the use of a geosynthetic clay liner waterproofing product (see C.3, Note 4).		
Gas protection scores for ventilation protection measures		
(a) Pressure Relief Pathway – Usually formed of low fines gravel or with a thin geocomposite blanket or strips terminating in a gravel trench external to the building.		0.5
Whenever possible a pressure relief pathway (as a minimum) should be installed in all gas protection measures systems. If the layer has a low permeability and/or is not terminated in a venting trench (or similar), then the score is 0.		
(b) Passive Subfloor Dispersal Layer – Media used to provide the dispersal layer are: ☒ Clear void; ☒ Polystyrene void former blanket; ☒ Geocomposite void former blanket; ☒ No-fines gravel layer with gas drains; and ☒ No-fines gravel layer.	Very good performance	2.5
	Good performance	1.5
(c) Active Dispersal Layer – Usually comprising fans with active abstraction (suction) from a subfloor dilution layer with roof-level vents. The dilution layer may comprise a clear void or be formed of geocomposite or polystyrene void formers.		1.5 to 2.5
This system relies on continued serviceability of the pumps, therefore alarm and response systems should be in place. There should be robust management systems in place to ensure the continued maintenance of the system, including pumps and vents. Active ventilation should always be designed to meet at least “good performance”.		



(d) Active Positive Pressurisation – Provided by the creation of a blanket of external fresh air beneath the building floor slab by pumps supplying air to points across the central footprint of the building into a permeable layer, usually formed of a thin geocomposite blanket.	1.5 to 2.5	This system relies on continued operation of the pumps, therefore alarm and response systems should be in place. The score assigned should be based on the efficient “coverage” of the building footprint and the redundancy of the system. Active ventilation should always be designed to meet at least “good performance”.
(e) Ventilated Car Park – Floor slab of occupied part of the building under consideration is underlain by a basement or undercroft car park.	4	Assumes that the car park is vented to deal with car exhaust fumes, designed to Buildings Regulations 2000, Approved Document F [9].
Gas Protection Score for the Gas-Resistant Membrane		
Gas-resistant membrane meeting all of the following criteria: ✳ Sufficiently impervious to the gases with a methane gas transmission rate < 40.0 ml/day/m²/atm (average) for sheet and joints (tested in accordance with BS ISO 15105-1 manometric method); ✳ Sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions; ✳ Sufficiently strong to withstand in-service stresses (e.g. settlement if placed below a floor slab); ✳ Sufficiently strong to withstand the installation process and following trades until covered (e.g. penetration from steel fibres in fibre-reinforced concrete, penetration of reinforcement ties, tearing due to working above it, dropping tools); ✳ Capable, after installation, of providing a complete barrier to the entry of the relevant gas; and ✳ Verified in accordance with CIRIA C735.	2	The performance of membranes is heavily dependent on the quality and design of the installation, resistance to damage after installation and integrity of joints. For example, a minimum 0.4 mm thickness (equivalent to 370 g/m² for polyethylene) reinforced membrane (virgin polymer) meets the performance criteria opposite. If a membrane is installed that does not meet all the criteria opposite, then the score is 0.
This table should be read in conjunction with the notes presented in BS 8485 (2015)+A1 (2019)		



4.5. POTABLE WATER SUPPLY

This section provides a summary of the site investigation data with reference to the selection of potable water supply pipework. The assessment is made with reference to the UK Water Industry Research (UKWIR) publication "Guidance on the selection of Water Supply Pipes to be used in Brownfield Sites"

TABLE 4.9 PIPELINE SELECTION PE THRESHOLD CONCENTRATIONS

Contaminant Group	PE-threshold (mg/kg)	Concentrations at <u>Current</u> pipeline depth (mg/kg)
Total VOC	0.5	<1.0
Total BTEX And MTBE	0.1	N/A
Total SVOCs (Excluding PAH and those substances marked with an *)	2	N/A
EC5-EC10 Aliphatic and Aromatic Hydrocarbons	2	<1.0
EC10-EC16- Aliphatic and Aromatic Hydrocarbons	10	<4.0
EC16-EC40 Aliphatic and Aromatic Hydrocarbons	500	<10
Phenols (From SVOC Analysis)*	2	N/A
Cresols and Chlorinated Phenols (From SVOC Analysis)	2	NA
Ethers*	0.5	NA
Nitrobenzene*	0.5	NA
Ketones*	0.5	NA
Aldehydes*	0.5	NA
Amines	Fail	NA
Other Consideration		
Are there any exceedances of the PE threshold outside of the pipeline depth?	No exceedances have been noted within or outside of pipeline depth.	
Is free product present in soil and groundwater?	No	
Could hydrocarbon impact at greater depth than current pipeline depth be mobilised by rising groundwater levels?	No hydrocarbon impact has been noted across the site.	
Will soils impacted with above determinants likely be utilised elsewhere on site?	No	
Will soils be imported to site as part of any future earth works	Currently unknown, however it is unlikely soils will be required to be imported to site. If materials are to be imported a WIR Risk Assessment will be required after completion.	

Notes

Pipe line depth normally between 0.75m–1.35m

Based on the assessment of current site conditions it is likely that polyethylene pipe will be required at the proposed development.



4.6. CONCEPTUAL SITE MODEL

Following the completion of the intrusive site investigation, chemical analysis and risk assessment, the conceptual model shown in Table 4.10 has been prepared for the site.

TABLE 4.10 CONCEPTUAL MODEL

POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL1 PL2	Heavy metals (Topsoil)	Dermal contact. Dermal contact and ingestion.	Future site users. Off-site receptors.	Likely	High	LOW
Discussion: Heavy metals (chromium VI and Lead) identified in Made Ground between depths of 0.10 m bgl within two isolated locations (TP125 and TP138) Recommendation: At the time of site stripping, a hotspot delineation exercise should be undertaken to ensure impacted materials are segregated and stockpiled separately for placement below a 600 mm cover system or an area of reduced sensitivity e.g. POS/beneath hardstanding. Construction works completed with PPE and provision of welfare.						
PL3	Volatile Contaminants	Inhalation of vapours.	Future site users. Off-site receptors.	Low likelihood	Low	LOW
Assessment: No volatile contamination has been identified. Recommendation: N/A						
PL4	ACM in shallow Made Ground	Inhalation of dust.	Future site users. Buildings. Off-site land users.	Likely	High	LOW



POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
Assessment: Chrysotile has been identified at a quantity of <0.001% within Made Ground deposits within TP145 at 0.80 m bgl. Recommendation: A hotspot delineation exercise should be undertaken to ensure impacted materials are segregated and stockpiled separately for placement below a 600 mm cover system or an area of reduced sensitivity e.g. POS/beneath hardstanding. Construction works completed with PPE and provision of welfare.						
PL5	Methane, carbon dioxide (Made Ground)	Inhalation of gas. Migration through permeable strata and preferential pathways. Explosion in confined spaces.	Future site users. Buildings. Off-site land users.	Low likelihood	High	LOW
Assessment: Current assessment based on initial monitoring visit confirms one area of the site (WS102) identifies levels of CO2 that would require CS2/Amber 1 classification. The monitoring well is located within Made Ground strata; therefore, delineation of the Made Ground would remove the source of CO2 decreasing the classification to CS1/Green. WS114 has encountered levels of methane that have been assessed as CS4/Red classification. This area was historically a pond; therefore, the infill material is thought to be the source of high methane levels, although the monitoring well was noted to be flooded on recent occasions and thus results may not be reflective of the true gassing regime. Recommendation: Completion of ground gas monitoring ensuring water is removed from wells beforehand. If high concentrations persist, delineation and removal of the source of elevated carbon dioxide and methane (made ground/pond) within the vicinity of these locations may be required to mitigate the risk to end users.						



POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL5	Mobile contaminants such as metals	Migration through permeable strata and preferential pathways.	Groundwater (secondary A aquifer). Adjacent unnamed Brook	Likely	Low	LOW
Assessment: Exceedances have been detected within leachate and water samples analysed including arsenic, copper, total cyanide, lead, nickel and zinc. An m-BAT assessment has been completed to assess the bioavailability of the metals with respect to surface water receptors (adjacent unnamed brook/drainage ditches) which indicates the determinands to be of low bioavailability and thus do not pose a risk to surface water courses. A separate assessment using the Pb screening tool has been completed for lead for elevated levels noted in WS103. The assessment confirms that there is not a risk within WS103, as the concentrations do not exceed the site specific PNEC and the risk characterisation ratio is less than 1.0. With regards to the elevated arsenic and total cyanide within WS114, they are general low solubility and therefore mobility, suggesting that these will not migrate to controlled water receptors. Furthermore, soakaway testing undertaken at the site has confirmed that the infiltration rate is very low, and the low permeability of the material will therefore significantly reduce the potential for downward or lateral migration. Based on the above, there is considered to be no unacceptable level of risk to the controlled water receptors. Recommendation: N/A						
PL6	Sulphate (potential ash within Made Ground)	Sulphate attack on concrete.	Building structure.	Low	Low	LOW
Assessment: Chemical analyses for pH and soluble sulphate shows that the soils at the site meet Class DS-1, AC-1. Recommendation: Concrete design meeting Class DS-1, AC-1 classification.						



PL7	Organic contaminants such as hydrocarbons, solvents	Ingestion of tainted water supply.	Future site users. Water pipes.	Low likelihood	Low	LOW
Assessment: No elevated contaminants of concern have been noted at pipeline depth. Recommendation: A WIR Risk Assessment will be required after completion of enabling works.						
PL8	Phytotoxic contaminants (Made Ground)	Direct Contact (plant uptake).	Flora.	Low likelihood	Low	LOW
Assessment Significant contamination is unlikely to be present at the site that might inhibit healthy plant growth.						

Main exposure pathways:

PL1 = soil ingestion, PL2 = dermal contact and ingestion, PL3 = vapour inhalation (indoor), PL4 = dust inhalation; PL5 = Vertical/lateral migration;

PL6 = Corrosion of concrete; PL7=Tainting of water supply; PL8 = Uptake by plants



5. GEOTECHNICAL ASSESSMENT

5.1. PROPOSED DEVELOPMENT

It is understood proposals allow for the development of up to 350 dwellings, public open space, landscaping and associated infrastructure works.

Drawing 13-759-002 (Appendix III) identifies the proposed development layout.

5.2. SUMMARY OF GROUND CONDITIONS

MADE GROUND

Made Ground deposits were encountered within thirteen exploratory hole locations to depths of between 0.30 m and 1.80 m bgl although, generally less than 0.80 m bgl.

Made Ground deposits comprise a reworked topsoil of dark brown sandy clay with gravel of mudstone and sandstone with selected areas containing fragments of occasional brick and concrete. The majority of locations were underlain by a black sandy mudstone gravel (land drain bedding).

DRIFT DEPOSITS

Drift generally comprises firm brown mottled grey slightly gravelly sandy CLAY with gravel of mudstone, underlain by a stiff brown slightly gravelly sandy CLAY where gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Some locations encountered occasional cobbles of subrounded to rounded mudstone and sandstone.

Low strength clays were encountered within 8 locations across the whole site. Seven locations were between a depth of 1.00 m and 1.65 m bgl (CP101, CP102, WS101, WS105, WS121, WS128 and WS132) with WS114 experiencing soft clays between 2.00 m and 3.45 m bgl.

Medium dense SAND was encountered within two locations WS104 (0.30 m–0.40 m bgl) and WS136 (1.00 m–3.40 m bgl)

Gravel with sand bands was encountered between 12.00 m and 13.10 m bgl within CP102.

SOLID GEOLOGY

Weathered bedrock comprising reddish brown SANDSTONE was encountered within the east of the site between 2.00 m (WS101) and 5.30 m bgl (CP101).

Bedrock was not encountered in the central or western areas of site, with one location (CP102) advancing to 16.95 m bgl in Clay drift deposits, indicating the bedrock is significantly deeper within these areas.



GROUNDWATER

Groundwater was encountered between 0.40 m bgl and 12.00 m bgl during the site investigation with monitoring recording groundwater levels between ground level and 3.43 m bgl.

5.3. SITE PREPARATION

The site should be cleared and any vegetation below areas of proposed development stripped in accordance with Series 200 of the *Manual of Contract Documents for Highway Works (MCHW)*. This should include the following:

- ✿ Roots present below the footprint of proposed structures and infrastructure should be grubbed out and the resulting void infilled with suitable compacted engineered fill.
- ✿ Demolition of all existing buildings and removal of all concrete hardstanding.
- ✿ Redundant services should be sealed off and grubbed out and replaced with suitable compacted engineered fill.
- ✿ Buried structures and old foundations have not been encountered on site; however, relic structures and foundations are likely to be present beneath the existing farm buildings to the east. If present, these should be excavated from below the proposed development footprint with the resulting void backfilled.

5.4. FOUNDATION CONDITIONS AND ASSESSMENT OF POTENTIAL BEARING CAPACITIES

In due consideration of the identified ground conditions, in-situ and laboratory geotechnical testing, E3P has undertaken an assessment of the net safe allowable bearing pressure (ABP) within the underlying natural stratum to assist in the detailed design of foundations and infrastructure and determine the target founding stratum. The results of this assessment are summarised in Table 5.1.

TABLE 5.1 SUMMARY OF ABPS

GRANULAR SOILS			
Description	Depth (Range m bgl)	Relative Density	Allowable Bearing Pressure (kN/m ²)
Weathered SANDSTONE (East of site - WS101, WS104, WS108, CP101)	2.00–3.80	Dense/Hard	413–440
Clayey SAND	1.00–3.00	Medium Dense–Dense	110–434
COHESIVE SOILS			
Description	Depth (range m bgl)	Undrained Shear Strength (Cu) (kN/m ²)	Allowable Bearing Pressure (kN/m ²)
Very low strength to low strength CLAY (CP101)	1.00–1.65	20	40



Low strength CLAY (WS101, WS105, WS121, WS128, WS132)	1.00–1.45	20–35	41–73
Low strength CLAY (WS114)	1.00–3.45	20–39	41–80
Medium Strength/Firm to Very Stiff, CLAY	1.00–2.00	45–228	100–470
High Strength Very stiff CLAY	2.00–4.00	80–211	150–434

Based on the assessment of the relative undrained shear strength, relative in-situ densities and corresponding safe net allowable bearing pressure, the suitable target founding stratum has been identified as follows:

- ✿ Firm to very stiff glacial CLAY;
- ✿ Localised areas of medium-dense SAND; and/or,
- ✿ Weathered SANDSTONE in the east of the site.

At this time it is not possible to accurately define the foundation types due to the absence of a detailed tree survey and final development levels; however, based on our extensive experience of similar sites, we would anticipate that the final foundation solution would be a combination of the following:

- ✿ Standard strip/trench foundations (suitably deepened in areas of tree influence and locally softer clays);
- ✿ Plots within close proximity of trees or areas of soft clays/loose sands will require piled foundations.

Foundation options based on existing levels are summarised in Table 5.2.

TABLE 5.2 ANTICIPATED FOUNDATIONS

LOCATION	ANTICIPATED FOUNDING STRATA DEPTH (m bgl)	GROUND WATER (m bgl)	TARGET STRATUM	TREES	FOUNDATION TYPE	TYPE OF CONCRETE
TP101	0.90	N/A	CLAY	Yes	Shallow Strip	DS-1 AC-1s
TP102	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP103	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP104	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP105	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP106	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP107	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP108	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP109	1.05	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP110	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP111	0.90	N/A	CLAY	Yes	Shallow Strip	DS-1 AC-1s



LOCATION	ANTICIPATED FOUNDING STRATA DEPTH (m bgl)	GROUND WATER (m bgl)	TARGET STRATUM	TREES	FOUNDATION TYPE	TYPE OF CONCRETE
TP112	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP113	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP114	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP115	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP116	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP117	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP118	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP119	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP120	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP121	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP122	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP123	1.25	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP124	1.15	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP125	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP126	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP127	1.05	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP128	1.15	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP129	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP130	0.95	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP131	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP132	1.05	0.40	CLAY	No	Shallow Strip	DS-1 AC-1s
TP133	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP134	1.15	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP135	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP136	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP137	1.15	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP138	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP139	1.35*	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP140	0.95	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP141	1.35*	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP142	1.05	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP143	1.35*	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s



LOCATION	ANTICIPATED FOUNDING STRATA DEPTH (m bgl)	GROUND WATER (m bgl)	TARGET STRATUM	TREES	FOUNDATION TYPE	TYPE OF CONCRETE
TP144	0.95	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
TP145	1.35*	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
WS101	2.35	N/A	CLAY	No	Pile	DS-1 AC-1s
WS102	2.25	N/A	CLAY	No	Pile	DS-1 AC-1s
WS103	1.15	2.00	CLAY	No	Shallow Strip	DS-1 AC-1s
WS104	0.90	N/A	CLAY	Yes	Shallow Strip	DS-1 AC-1s
WS105	1.45	2.20	CLAY	No	Mass Trench	DS-1 AC-1s
WS106	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
WS107	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
WS108	>2.50	1.00	CLAY	Yes	Pile	DS-1 AC-1s
WS109	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
WS110	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
WS111	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
WS112	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
WS113	1.45	N/A	CLAY	No	Mass Trench	DS-1 AC-1s
WS114	1.95	N/A	CLAY	No	Mass Trench	DS-1 AC-1s
WS115	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
WS116	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
WS117	1.45	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
WS118	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
WS119	1.15	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
WS120	1.15	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
WS121	1.65	N/A	CLAY	No	Mass Trench	DS-1 AC-1s
WS122	0.95	3.80	CLAY	No	Shallow Strip	DS-1 AC-1s
WS123	0.95	N/A	CLAY	Yes	Shallow Strip	DS-1 AC-1s
WS124	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
WS125	0.95	N/A	CLAY	Yes	Shallow Strip	DS-1 AC-1s
WS126	1.15	4.00	CLAY	No	Shallow Strip	DS-1 AC-1s
WS127	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
WS128	2.45	N/A	CLAY	Yes	Pile	DS-1 AC-1s
WS129	0.90	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
WS130	1.05	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s



LOCATION	ANTICIPATED FOUNDING STRATA DEPTH (m bgl)	GROUND WATER (m bgl)	TARGET STRATUM	TREES	FOUNDATION TYPE	TYPE OF CONCRETE
WS131	1.25	3.50	CLAY	No	Shallow Strip	DS-1 AC-1s
WS132	2.45	N/A	CLAY	No	Pile	DS-1 AC-1s
WS133	1.25	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
WS134	0.95	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
WS135	1.05	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
WS136	0.95	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
CP101	2.45	N/A	CLAY	No	Shallow Strip	DS-1 AC-1s
CP102	1.05	11.80	CLAY	No	Shallow Strip	DS-1 AC-1s

The above foundation depths are indicative and make no consideration for proposed changes in levels or the influence of trees.

It is recommended that at working drawing stage a foundation schedule is prepared for the development, taking account of the physical change of natural clay soils and the current/proposed locations of trees, with foundations deepened locally to mitigate the potential for volumetric instability attributed to fluctuations in moisture content, in accordance with the requirements of NHBC standards.

A programme of remediation and enabling works may be required to provide suitable development platform levels. Therefore, upon completion of these enabling works, it is possible that a deeper/abnormal foundation solution may be required in areas of the site where levels have been raised.

5.5. GROUND FLOOR SLABS

Current building control regulations require that where infilled ground is present to depths in excess of 600 mm, or where the substratum is variable in terms of the structure and settlement potential, or where clay soils are present within the influence of existing or proposed trees, a suspended floor slab is required.

In this instance, it is considered that for the majority of substructures, the underlying stratum would have in excess of 600 mm of Clay deposits and, as such, a suspended floor slab will be required.

Where a cast in-situ suspended slab is utilised with no subfloor void, appropriate compressible material (heave precautions) will be required in the construction of the substructure.

5.6. HEAVE PRECAUTIONS

The site has been proven to be underlain by clay soils, which are susceptible to volumetric instability due to fluctuations in moisture content, particularly within influencing distance of trees as per the NHBC/LABC conjectured zones of influence.

As the clay is deemed to be low plasticity/low volume change potential, heave precautions are not required to the internal face of the external load-bearing walls (outside or within tree influence).



If a ground beam is to be constructed within the zone of tree influence, heave precautions are required to the underside of this and edge beams.

If the ground floor slab is to be constructed with a beam and block floor, a minimum subfloor void of 200 mm is required within any structures located in the zone of conjectured tree influence.

If the ground floor slab is constructed with a cast in-situ suspended floor slab, then heave precautions that can tolerate 50 mm of clay swelling are required within any part of the floor slab to be located within the zone of influence of a tree.

A summary of heave precautions is presented in Table 5.3.



TABLE 5.3 SUMMARY OF HEAVE PRECAUTIONS

		MINIMUM VOID DIMENSION FOR FOUNDATIONS, GROUND BEAMS AND SUSPENDED IN-SITU CONCRETE GROUND FLOORS		MINIMUM VOID DIMENSIONS UNDER PRECAST CONCRETE AND SUSPENDED TIMBER FLOORS
Plasticity Index of Soil	Required Foundation Depth (m)	Thickness of Void Former Against Side of Foundation or Ground Beam (mm)	Thickness of Void Former on Underside of Edge Beam and Floor Slab (mm)	Void Dimension (mm)
High Plasticity (> 40)	> 2.5	Engineer Design		Engineer Design
	2.0–2.5	35	150	300
	1.5–2.0	25	75	
Moderate Plasticity (20–40)	> 2.5	Engineer Design		Engineer Design
	2.0–2.5	25	100	250
	1.5–2.0	25	50	
Low Plasticity (< 20)	2.0–2.5	N/A	50	200
	> 2.0	No Special Precautions		

5.7. HIGHWAYS CONSTRUCTION

In-situ CBR testing from existing ground level suggest an indicative CBR in the range of 3.72% to 23.21%.

However, it is likely that a programme of remediation and enabling works will be required to remediate the proposed road subgrade in accordance with the requirements of the Manual of Contract Documents for Highway Works Volume 1 Specification for Highway Works (Series 600-Earthworks) for a method compaction.

It is considered that the material can be re-engineered using method compaction to achieve a CBR in excess of 5% if works are completed in favourable climatic conditions.

5.8. DRAINAGE

The presence of isolated areas of Made Ground across some areas of the site may result in settlement. It is therefore recommended that drain runs are designed using steeper gradients and flexible joints to allow for some differential settlement.

Furthermore, the site is predominantly underlain by circa 2.00 m to >16.95 m of low-permeability gravelly CLAY. Soakaway tests have confirmed the soils to have very poor soakage potential, therefore it is not recommended that soakaways are utilised for disposal of surface water runoff.



5.9. CONCRETE DURABILITY

Based upon the results of the chemical analyses it is considered that subsurface concrete can be designed in accordance with Design Sulphate Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with the recommendations provided in BRE *Special Digest 1* (2005).

5.10. EXCAVATIONS

Trial pits were generally stable in both Made Ground and natural strata; as such, it is considered that near-surface excavations will be feasible. One location was observed to be unstable to water ingress.

Site observations indicated that excavations should be feasible in the near surface with normal plant; however, obstructions under current farm buildings are thought to be present, however, these areas could not be . It is anticipated that any obstructions will be grubbed out during the reduced-level dig for the substructure works.

If trench collapse is likely it is considered that all excavations are supported or battered back in accordance with guidance contained in CIRIA R97.

If local pumping of groundwater is required during the advancement of excavations for the proposed foundations then consideration should be given to the potential for dewatering gravels in the surrounding areas that may cause structural damage to building substructures in close proximity to the site.

TABLE 5.4 CIVIL ENGINEERING EXCAVATION RISK MATRIX

RISK ITEM	PRESENT	COMMENT
Running Sands	No	No running sand has been identified.
Minor Water Ingress	No	Mine water ingress will require localised dewatering/sump pumping during the construction of site drainage infrastructure. Ingress of water into foundation excavation will potentially flood foundation excavations, limiting the viability of spread foundations to be constructed.
Shallow Bedrock	No	Shallow bedrock has been identified within the east at a minimum depth of 2.0 m bgl, which may impede foundations/service excavations if levels are to be reduced or deep installations are proposed.

5.11. CONSTRUCTION ACTIVITY AND INSPECTION

The following activities and inspections should be incorporated into the site works:

- ✿ Excavations where access is required should be subject to a risk assessment from a competent person and, where appropriate, mitigation measures such as benching back the sides or use of support systems in accordance with CIRIA R97 should be utilised.
- ✿ It is considered that dewatering may be required, especially following periods of heavy rainfall. Removal of surface water and water within trenches should be possible with conventional sump pumping. Discharge of any water should be agreed with the relevant regulatory body and be undertaken under a trade effluent discharge, where required. Measures to remove silt and



suspended solids may be required and consideration should be given to provision of space for settling tanks or an attenuation pond.

- ✳ Where access to confined spaces is required, appropriate mitigation measures should be addressed within the construction stage health and safety plan. Particular account should be taken of the gas results.
- ✳ The presence of potential contamination and mitigation measures should be addressed as part of the construction stage health and safety plan and should include measures to design out the risks, reduce their impact and, finally, to include the use of personnel protective equipment (PPE).



5.12. GEOTECHNICAL RISK REGISTER

POTENTIAL CONSTRAINT	ABNORMAL	LOCATION ON SITE	ESTIMATED AREA OF SITE AT RISK (%)	ASSESSMENT AND MITIGATION
Remediation of contaminated soils		On site	5	Inorganic heavy metals have been encountered in TP125 (0.10 m) and TP138 (0.10 m). Trace Asbestos has also been identified in Made Ground in TP145 at 0.80 m. Delineation and segregation of this impacted topsoil material will be required to ensure it is placed in an area of reduced sensitivity e.g. Beneath 600 mm cover system in private gardens, POS, beneath hardstanding/plots/roads. Further post-demolition investigation in the farmyard area will be required to confirm the ground conditions and potential for contamination.
Bedrock		East	10	Shallow weathered bedrock has been identified at depths of between 2.0 m (WS101) and 5.3 m bgl (CP101); this represents a risk in terms of the viability for excavations to install infrastructure using standard construction equipment and should be considered when finalising development levels.
Obstructions		N/A	N/A	No obstructions were encountered during site investigations; however, there is potential for obstructions to be present below current farm buildings and hard standing areas in the west of the site that could not be investigated at the time.
Artificially levelled and filled platforms		N/A	N/A	N/A
Retaining walls		N/A	N/A	N/A
Trench collapse		On site	N/A	Trial pits were generally stable; however, saturated ground increases the likelihood of trench collapse. Pumping may be required during wetter months.
Mature trees		Periphery	35	Arboriculture survey required to determine areas of potential tree influence.
Volume change potential clay		On site	100	The site is underlain by Clay deposits that have low volume change potential.



POTENTIAL CONSTRAINT	ABNORMAL	LOCATION ON SITE	ESTIMATED AREA OF SITE AT RISK (%)	ASSESSMENT AND MITIGATION
Running sands		N/A	N/A	Running sands were not identified.
Ground dissolution		N/A	N/A	Data searches indicate no hazard.
Concrete design		On site	100	DS-1, AC-1.
Low-permeability ground		On site	100	The site is underlain by low-permeability gravelly CLAY. Therefore, the use of soakaway drainage will not be feasible.
Services/sensitive structures		On site	5	Online plans show a sewer present in the western sector of site with a trunk main present though Chapel lane to the west of site . On site within the east private water pipes are present supplying all farm buildings with one orientated roughly north-south between the cattle shed and the northern boundary. Electricity is also present within this area creating a loop from the cattle shed, south, then back north towards the farm buildings. This could not be located during site investigations A foul drainage pipe is present orientated north-south originating from a septic tank near the access track in the east flowing out towards the northern boundary. All services are associated with Rose Farm. A surface water drain roughly orientated east-west is present within the central and eastern field. This was located during site investigation by a hand excavated pit. The drain was uncovered at 0.40 m bgl and found to be in good condition.
Abnormal foundation solutions		TBC	5	At this time it is not possible to accurately define the foundation types due to the absence of a detailed tree survey and final development levels; however, we would anticipate that the final foundation solution would be a combination of the following: Strip/trench foundations bearing on firm to very stiff gravelly CLAY or medium dense SAND/SANDSTONE (east)



Chapel Lane, Widnes

Phase II Geoenvironmental Site Assessment

January 2023

POTENTIAL CONSTRAINT	ABNORMAL	LOCATION ON SITE	ESTIMATED AREA OF SITE AT RISK (%)	ASSESSMENT AND MITIGATION
				▪ Piled foundations within areas of localised soft/loose soils or deep Made Ground/upfill.
Areas not investigated		East	5	Further post-demolition investigation in the farmyard area in the west of the site will be required to confirm the ground conditions and potential for contamination.
Surface water features		South	2	A pond is located to the central south of site within an area utilised for cattle grazing.
Historically infilled pond		On site	10	Infilled ponds are inferred on site from historical happing, however ground conditions in these areas have been found to be similar to the general wider site. Further assessment at the time of enabling works may be required.



6. CONCLUSIONS AND RECOMMENDATIONS

CONTAMINATED LAND ASSESSMENT

Human Health	The Tier 1 human health risk assessment identified the concentrations of the following in exceedance of screening criteria relevant to a residential end use with plant uptake: - Chromium VI – TP125 Made Ground at 0.1 m bgl; - Lead – TP138 Made Ground at 0.1 m bgl; and, - Asbestos (<0.001%) – TP145 Made Ground at 0.80 m bgl Which present unacceptable degrees of theoretical risk to the identified receptors associated with ingestion of soils and inhalation of particulate, respectively. Delineation and segregation of this impacted material will be required to ensure it is placed in an area of reduced sensitivity such as: - Beneath 600 mm clean cover within private gardens; - Within POS – Material from TP125 and TP138 will be suitable for use as topsoil within areas of POS. However, asbestos impacted material would need to be placed below 300 mm clean cover); or, - Beneath plots/hardstanding/roads. With the exception of the locations noted above, topsoil and subsoil deposits on site are considered suitable for re-use, subject to further chemical validation testing. Further post-demolition investigations are required in the farmyard area in the west of the site to confirm the findings of this initial assessment as and when full and unrestricted access is available.
Controlled Waters	Exceedances of EQS and DWS values have been detected within leachate and water samples analysed including arsenic, copper, total cyanide, lead, nickel and zinc. M-BAT and Pb assessment has confirmed the determinands to be of low bioavailability and thus do not pose a risk to surface water courses. Soakaway testing undertaken at the site has confirmed that the infiltration rate is very low, and the low permeability of the material will therefore significantly reduce the potential for downward or lateral migration. Based on the above, there is considered to be no unacceptable level of risk to the controlled waters receptors.



Ground Gas	Current assessment based on initial monitoring visit confirms one area of the site (WS102) identifies levels of CO₂ that would require CS2/Amber 1 classification. The monitoring well is located within Made Ground strata; therefore, delineation of the Made Ground would remove the source of CO₂ decreasing the classification to CS1/Green. WS114 has encountered levels of methane that have been assessed as CS4/Red classification. This area was historically a pond; therefore, the infill material is thought to be the source of high methane levels, although the monitoring well was noted to be flooded on recent occasions and thus results be not be reflective of the true gassing regime. Completion of ground gas monitoring is required, ensuring water is removed from wells beforehand. If high concentrations persist, delineation and removal of the source of elevated carbon dioxide and methane (made ground/pond) within the vicinity of these locations may be required to mitigate the risk to end users.
Potable Water	Based on the assessment of current site conditions it is likely that PE pipe can be used at the proposed development. This will need to be confirmed following the completion of a UKWIR risk assessment. Post-remediation and enabling works ground conditions may be different from those identified during this site investigation.

GEOTECHNICAL ASSESSMENT

Ground conditions predominantly comprise topsoil (with limited thicknesses of Made Ground/reworked soil) overlying Glacial Till (Clay). Sandstone was encountered in select locations the east and centre of the site at depths of between 2.0 m (WS101) and 5.3 m bgl (CP101).

The underlying cohesive deposits generally comprise firm to very stiff brown slightly gravelly CLAY circa 0.5 m bgl – 4.0 m bgl which has a net ABP in the order of >100 kN/m².

Localised areas of soft/firm (low strength) clays were encountered in CP101, CP102, WS101, WS105, WS115, WS121, WS128 and WS132 with an ABP of 10–40 kN/m². These soils are located across the entire site within isolated areas.

The weathered SANDSTONE if encountered at foundation depth is anticipated to provide an ABP >400 kN/m².

It is considered that the optimum foundation solution for the proposed residential development would therefore be as follows:

- Standard strip/trench foundations bearing onto firm/stiff CLAY or weathered SANDSTONE (suitably deepened in areas of tree influence and locally softer clays);
- Plots within close proximity of trees or areas of soft clays/loose sands will require piled foundations.

A phase of cut-and-fill enabling works may be required in order to create a proposed development platform suitable for a residential development. Proposed levels are currently unknown but are expected to remain similar to current.

Soakaway tests indicate the clays will not be suitable for soakaway drainage and alternative means of suitable surface water disposal will be required.



Investigation in the farmyard in the west of the site was limited due to the presence of buildings and sensitive livestock. Further geoenvironmental and geotechnical investigation in this part of the site should be undertaken to confirm the ground conditions when possible. Deeper Made Ground deposits are anticipated in this part of the site.

Further works to locate / delineate infilled ponds in the south east of the site is also recommended at enabling works stage.

FURTHER WORKS

Based on the findings of the intrusive site investigation, the following additional works are recommended to be completed in due course:

- ✳ Further post-demolition investigation in the farmyard area in the west of the site, together with additional investigations to delineate infilled ponds at enabling works stage;
- ✳ Plot-specific foundation schedule (upon receipt of the final development levels and layout);
- ✳ Arboricultural survey;
- ✳ Materials management plan;
- ✳ Geotechnical earthworks strategy (infrastructure);
- ✳ Remediation and enabling works strategy; and,
- ✳ Full three-dimensional earthworks cut/fill model.

END OF REPORT



APPENDIX I

LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between E3P and the client as indicated in Section 1.3.
2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.
3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.
4. During the site walkover, reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover, no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.
5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.
6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials, this is for indicative purposes only and do not constitute or replace full and proper surveys.
8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
9. E3P cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by E3P is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by E3P in this connection without their explicit written agreement there to by E3P.
10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.



APPENDIX II

GLOSSARY

TERMS

ACM	Asbestos-containing material	MMP	Materials management plan
ADS	Acoustic design statement	ND	Not detected
AST	Above-ground storage tank	NDP	Nuclear density probe
BGS	British Geological Survey	NMP	Noise management plan
BSI	British Standards Institute	NPSE	Noise policy statement for England
BTEX	Benzene, toluene, ethylbenzene, xylenes	NR	Not recorded
CA	Coal Authority	PAH	Polycyclic aromatic hydrocarbon
CBR	California bearing ratio	PCB	Polychlorinated biphenyl
CIEH	Chartered Institute of Environmental Health	PI	Plasticity index
CIRIA	Construction Industry Research Association	PID	Photo ionisation detector
CLEA	Contaminated land exposure assessment	POS	Public open space
CML	Council of Mortgage Lenders	PPE	Personnel protective equipment
CoC	Contaminants of concern	ProPG	Professional practice guidance
CSM	Conceptual site model	QA	Quality assurance
DNAPL	Dense non-aqueous phase liquid (chlorinated solvents, PCB)	SGV	Soil guideline value
DWS	Drinking water standard	SPH	Separate-phase hydrocarbon
EA	Environment Agency	SPT	Standard penetration test
EQS	Environmental quality standard	SVOC	Semi-volatile organic compound
FFL	Finished floor level	TPH	Total and speciated petroleum hydrocarbon
GAC	General assessment criteria	TPH CWG	Total Petroleum Hydrocarbon (Criteria Working Group)
GL	Ground level	UKWIR	United Kingdom Water Infrastructure Risk
GSV	Gas screening value	UST	Underground storage tank
HCV	Health criteria value	VCC	Vibro-concrete column
ICSM	Initial conceptual site model	VOC	Volatile organic compound
LEL	Lower explosive limit	VRSC	Vibro-replacement stone columns
LMRL	Lower method reporting limit	VSC	Vibro-stone columns
LNAPL	Light non-aqueous phase liquid (petrol, diesel, kerosene)	WHO	World Health Organisation
MCV	Moisture condition value	WRAP	Waste and Resources Action Programme



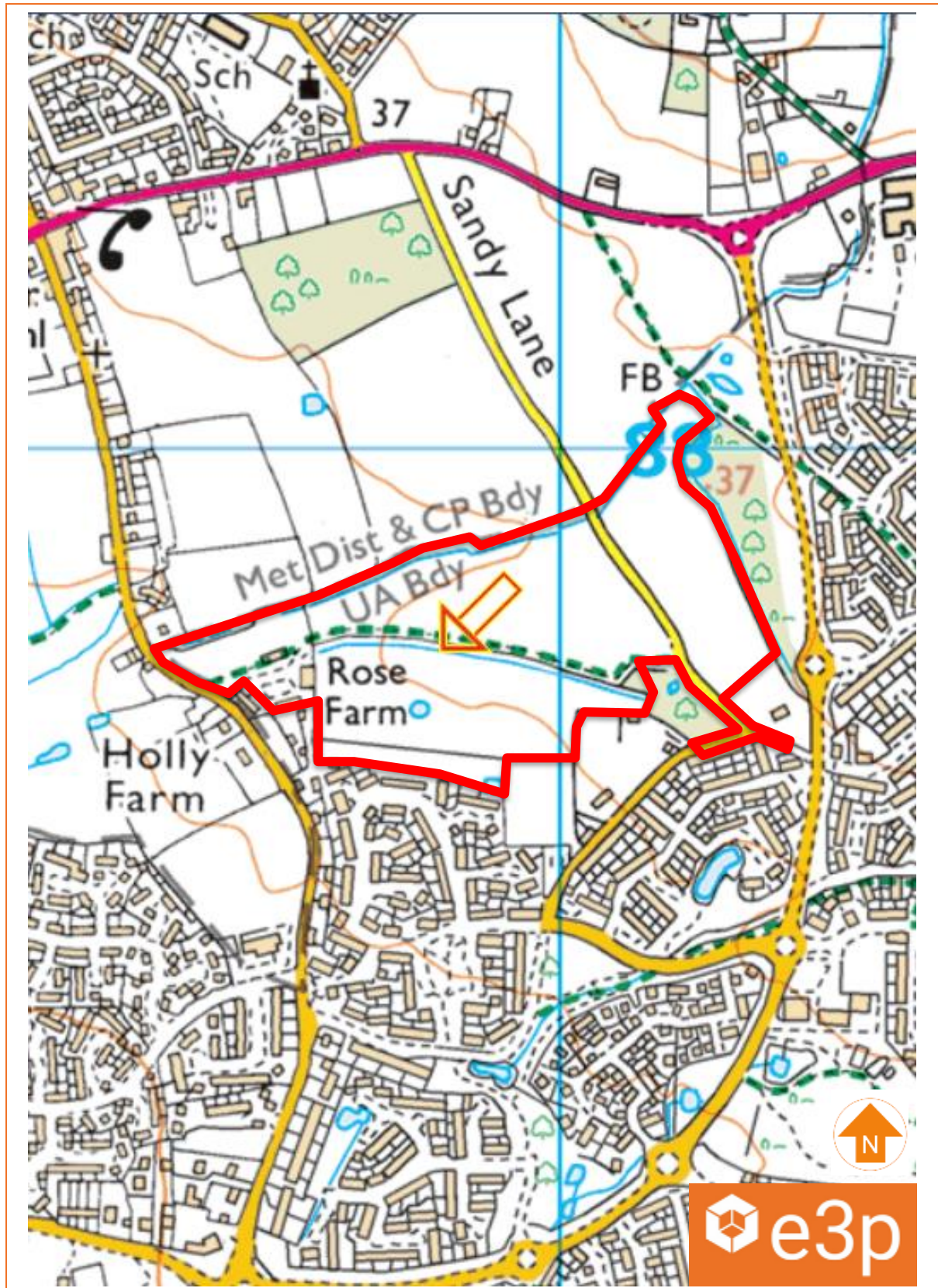
MIBK	Methyl isobutyl ketone	WTE	Water table elevation
m	Metres	ppm	Parts per million
km	Kilometres	mg/m³	Milligram per metre cubed
% v/v	Percent volume in air	m bgl	Metres below ground level
mb	Millibars (atmospheric pressure)	m bcl	Metre below cover level
l/hr	Litres per hour	mAOD	Metres above ordnance datum (sea level)
µg/l	Micrograms per litre (parts per billion)	kN/m²	Kilonewtons per metre squared
ppb	Parts per billion	µm	Micrometre
mg/kg	Milligrams per kilogram (parts per million)	SSRT	Site Specific Remediation Target
PSD	Particle Size Distribution	DD	Dry Density
CL:AIRE	Contaminated Land: Applications in Real Environments	Mc	Moisture Content
ρ	Bulk Density	GPR	Ground Penetrating Radar
NDP	Nuclear Density Probe	FFL	Finished Floor Level
LEL	Lower Explosive Limit	UKWIR	UK Water Industry Research
CIRIA	Construction Industry Research and Information Association	LOD	Limit of Detection



APPENDIX III

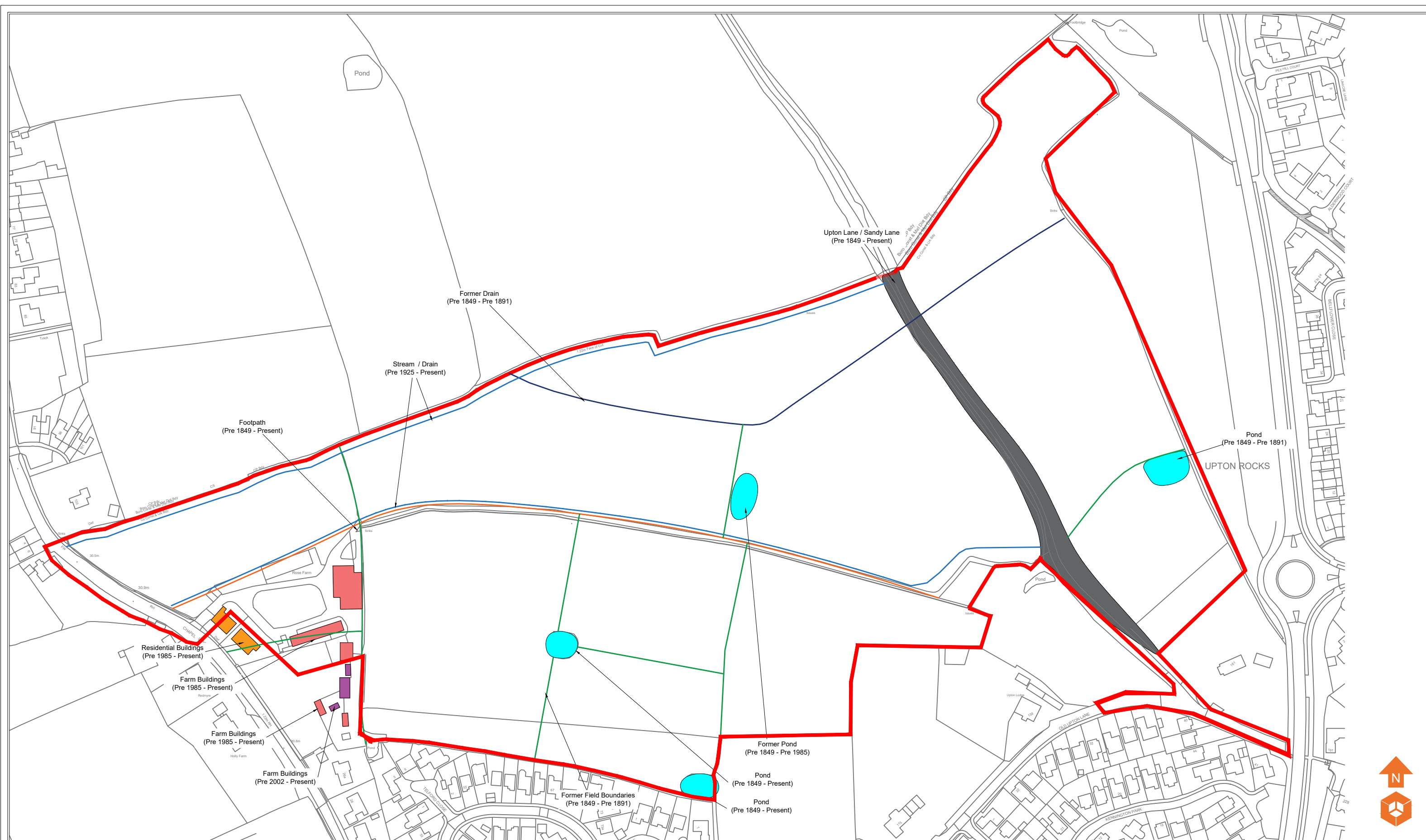
DRAWINGS

DRAWING 13-759-001 – SITE LOCATION PLAN





Notes:					Client: TWNW		Job No: 13-759		Date: 25.09.2020		 Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk										
							Drawing No: 002		Scale: NTS												
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Phase	Issue	Date	Drawn	Checked																	



Historical Features

	Farm Buildings (Pre 1985 - Present)		Former Drain (Pre 1849 - 1891)
	Farm Buildings (Pre 2002 - Present)		
	Residential Buildings (Pre 1985 - Present)		
	Field Boundaries (Pre 1849 - 1891)		
	Former Ponds (Pre 1849 - Present)		
	Upton Lane / Sandy Lane (Pre 1985 - Present)		
	Stream / Drain (Pre 1925 - Present)		
	Footpath (Pre 1849 - Present)		
	Former Field Boundaries (Pre 1849 - 1891)		

Notes:				

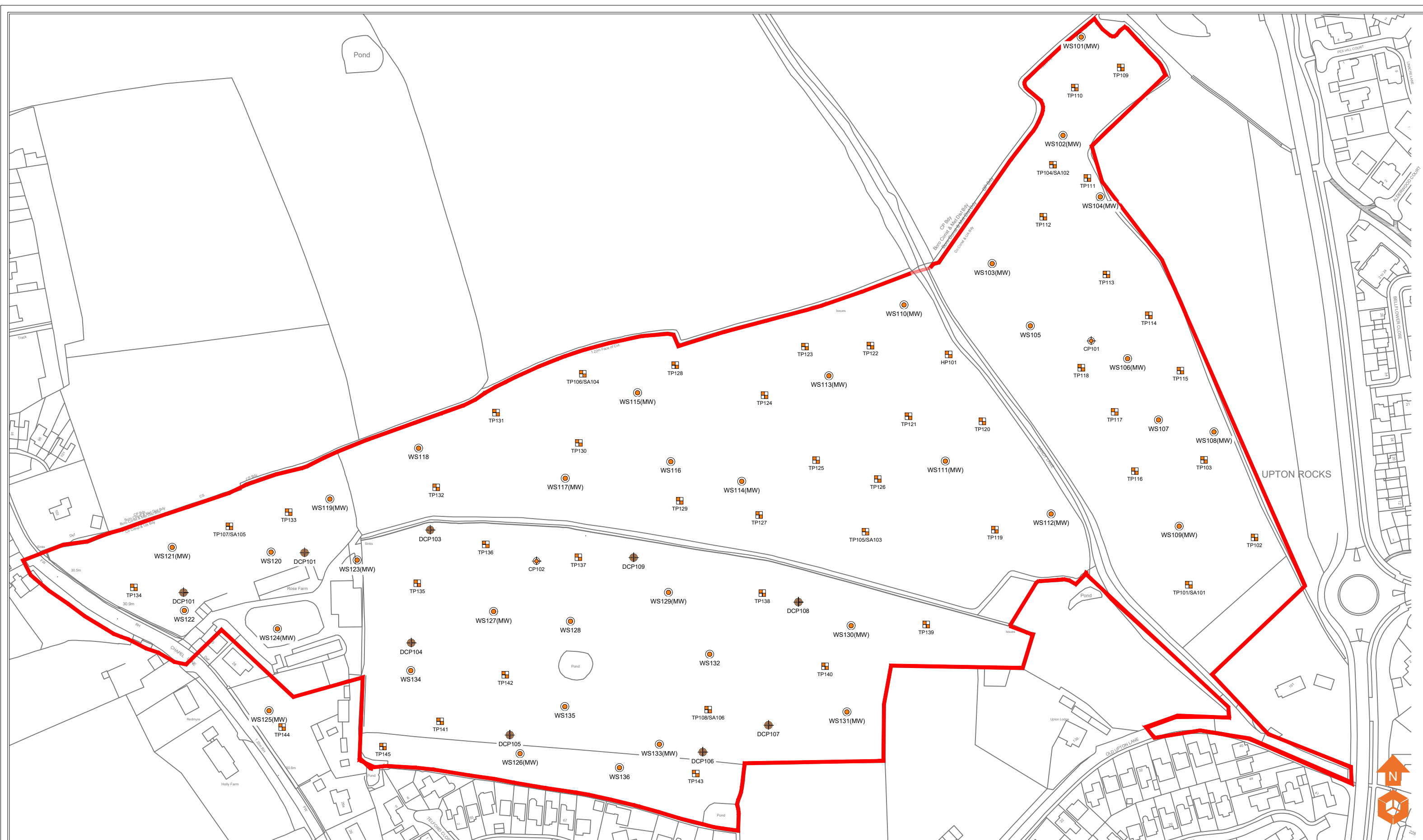
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Phase	Issue	Date	Drawn	Checked

<i>Client:</i>	TWNW
<i>Job Title:</i>	Chapel Lane

Job No:	Date:
13-759	25.09.2020
Drawing No:	Scale:
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Drawing Title:	
Historical Features Plan	

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Location Symbols

	Approximate Window Sample Probehole Location
	Approximate Window Sample Probehole Location with Install
	Approximate Trial Pit Location
	Approximate Soakaway Test Location
	Approximate Cable Percussive Borehole Location
	Approximate Dynamic Cone Penetrometer Test Location
	Approximate Hand Dug Pit Location

Notes:

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P1	REVA	25.09.2020	HM	VW
Phase	Issue	Date	Drawn	Checked

Client:

TWNW

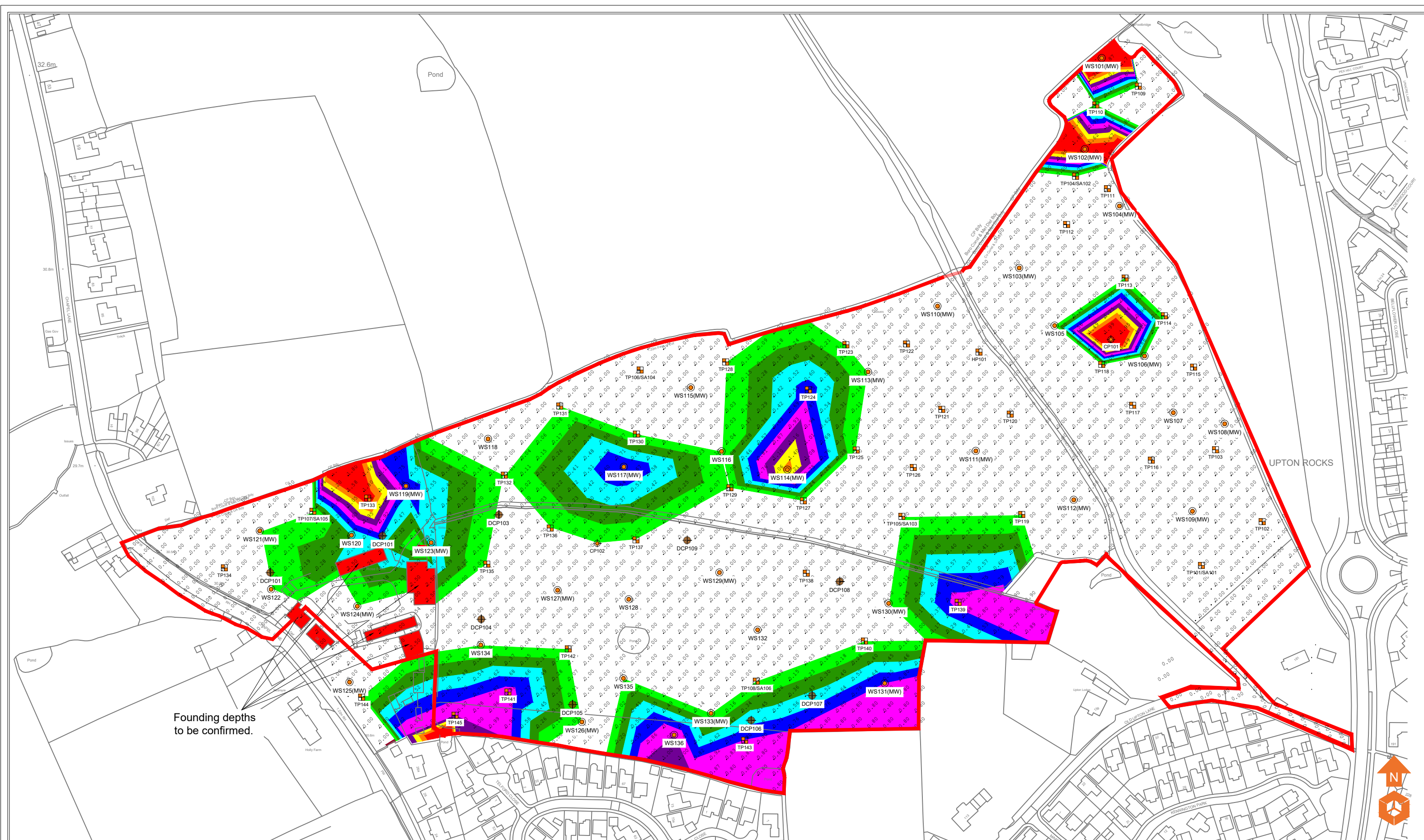
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Chapel Lane

Job No:	13-759	Date:	03.11.2020
Drawing No:	005	Scale:	NTS
Drawing Title:		Exploratory Hole Location Plan	

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Location Symbols		Made Ground Depth (m)	
	Approximate Window Sample Probehole Location		Depth of Made Ground 0.00 - 0.19m
	Approximate Window Sample Probehole Location with Install		Depth of Made Ground 0.20 - 0.39m
	Approximate Trial Pit Location		Depth of Made Ground 0.40 - 0.59m
	Approximate Soakaway Test Location		Depth of Made Ground 0.60 - 0.79m
	Approximate Cable Percussive Borehole Location		Depth of Made Ground 0.80 - 0.99m
	Approximate Hand Dug Pit Location		Depth of Made Ground 1.00 - 1.19m
			Depth of Made Ground 1.20 - 1.39m
			Depth of Made Ground 1.40 - 1.59m
			Depth of Made Ground >1.60m

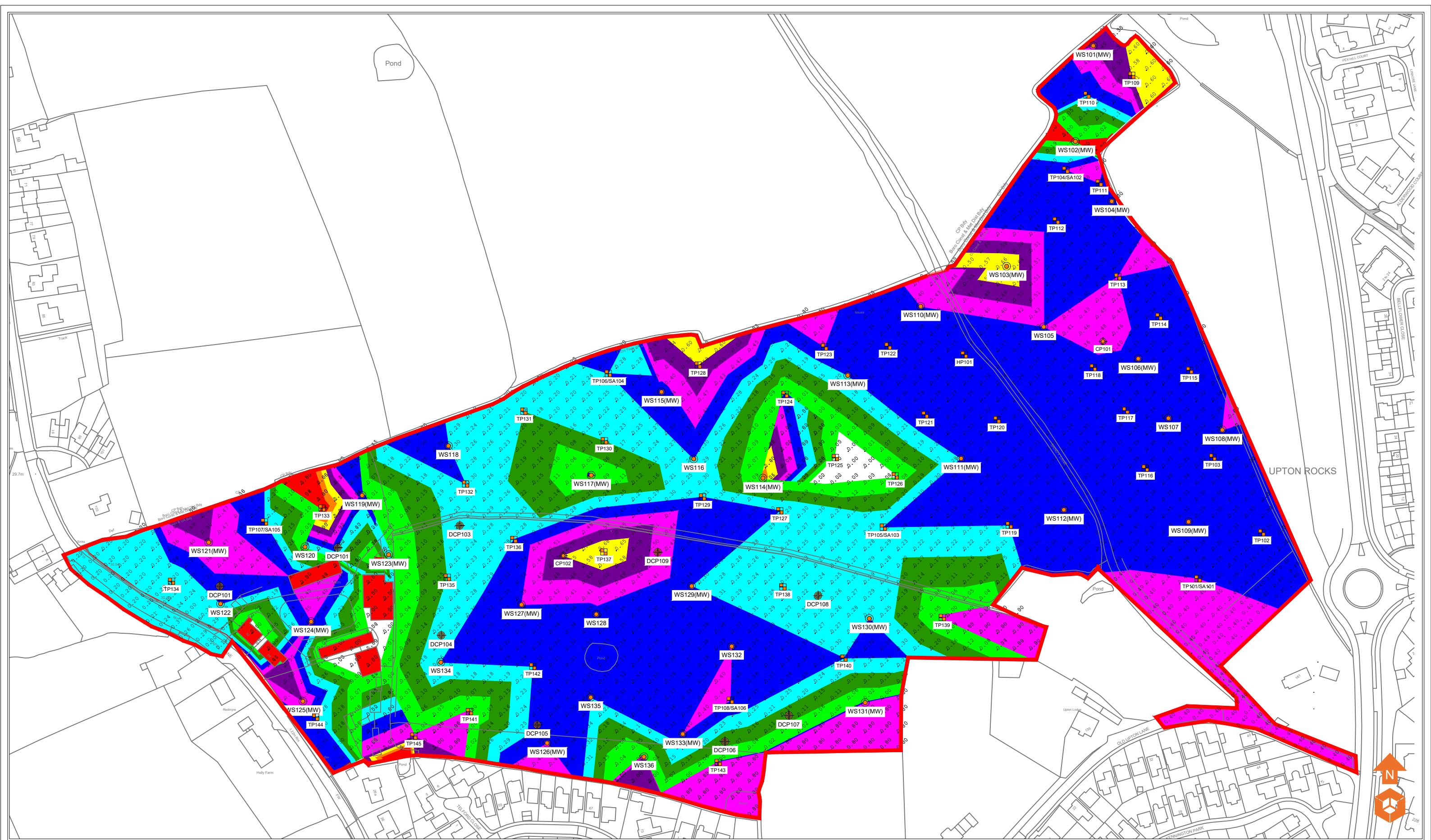
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Client:	
TWNW	
Job Title:	
Chapel Lane	

Job No:	13-759	Date:	15.12.2020
Drawing No:	006	Scale:	NTS
Drawing Title:		Depth of Made Ground Plan	

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Location Symbols

Approximate Window Sample Probehole Location

Approximate Window Sample Probehole Location with Install

Approximate Trial Pit Location

Approximate Soakaway Test Location

Approximate Cable Percussive Borehole Location

Approximate Hand Dug Pit Location

Topsoil Not Identified

Topsoil Depth (m)

Depth of Topsoil 0.00

Depth of Topsoil 0.01 - 0.09m

Depth of Topsoil 0.10 - 0.19m

Depth of Topsoil 0.20 - 0.29m

Depth of Topsoil 0.30 - 0.39m

Depth of Topsoil 0.40 - 0.49m

Depth of Topsoil 0.50 - 0.59m

Depth of Topsoil 0.60 - 0.69m

Depth of Topsoil 0.70 - 0.79m

Depth of Topsoil >0.80m

Notes:				
P1	REVB	15.12.2020	LM	VW
P1	REVA	25.09.2020	HM	VW
Phase	Issue	Date	Drawn	Checked

Client:

TWNW

Job Title:

Chapel Lane

Job No:

13-759

Drawing No:

007

Date:

15.12.2020

Scale:

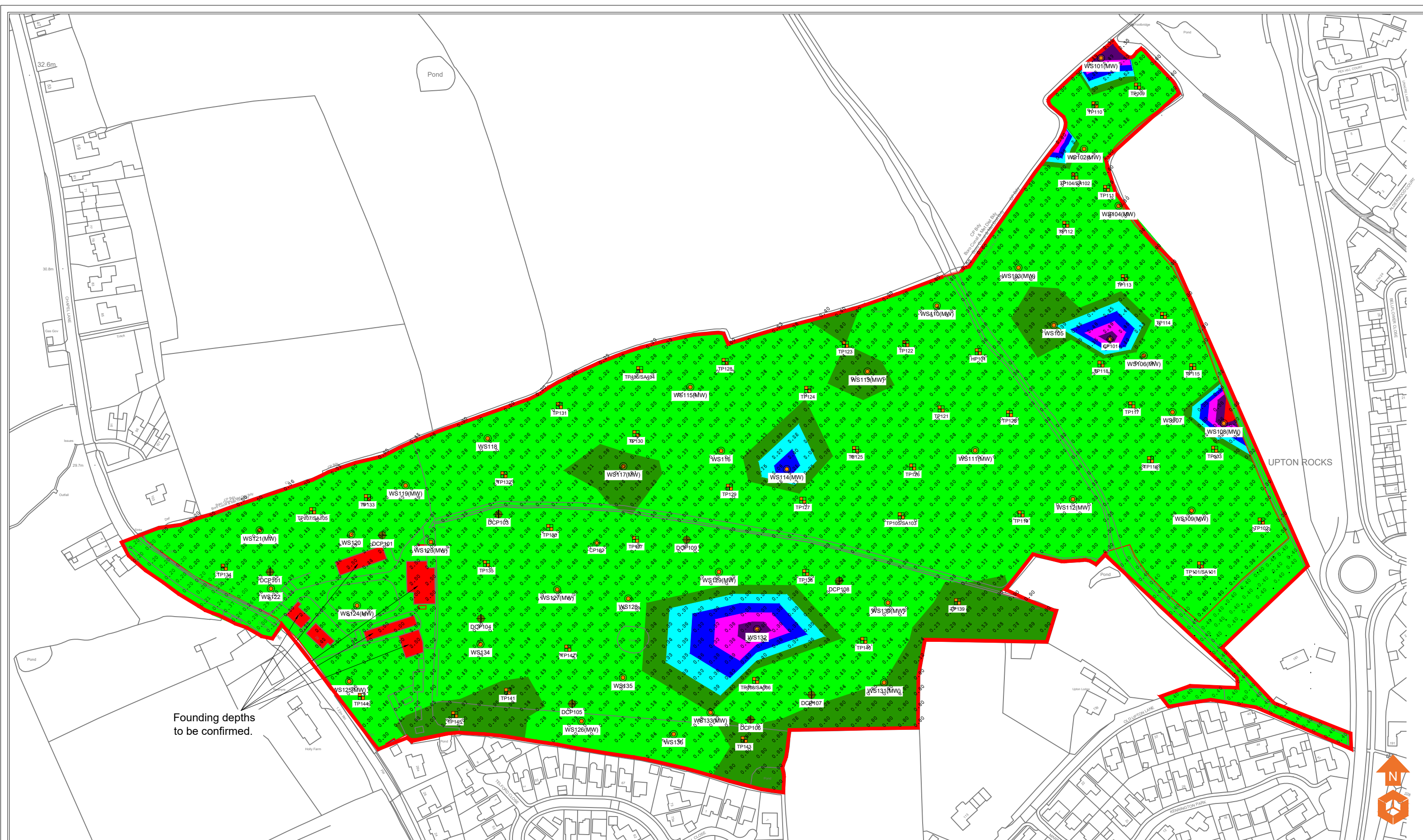
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Depth of Topsoil Plan

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- Location Symbols**
- Approximate Window Sample Probehole Location
 - Approximate Window Sample Probehole Location with Install
 - Approximate Trial Pit Location
 - Approximate Soakaway Test Location
 - Approximate Cable Percussive Borehole Location
 - Approximate Hand Dug Pit Location
- Shallow Spread Footings**
- Depth to Founding Strata 0.00 - 1.24m
 - Depth to Founding Strata 1.25 - 1.49m
- Mass Trench Fill Footings**
- Depth to Founding Strata 1.50 - 1.74m
 - Depth to Founding Strata 1.75 - 1.99m
 - Depth to Founding Strata 2.00 - 2.24m
- Engineered Footings**
- Depth to Founding Strata 2.25 - 2.49m
 - Depth to Founding Strata >2.50m

Notes:				
P1	REVB	15.12.2020	LM	VW
P1	REVA	29.09.2020	HM	VW
Phase	Issue	Date	Drawn	Checked

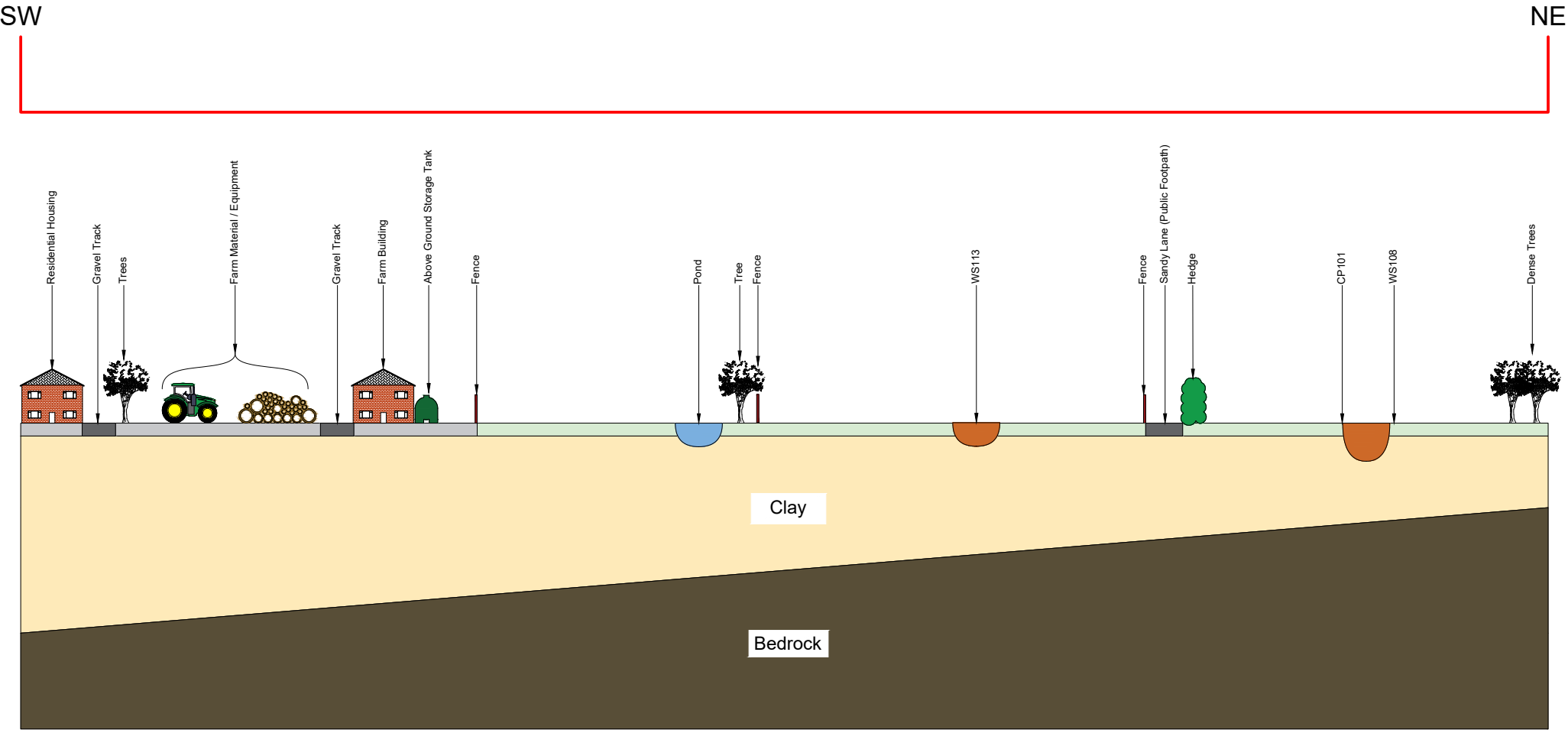
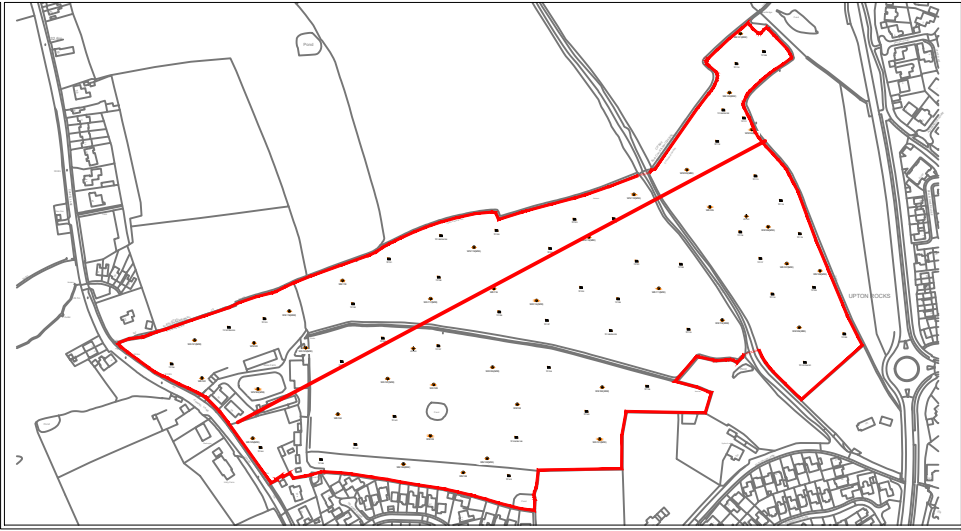
Client:	TWNW
Job Title:	Chapel Lane

Job No:	13-759
Drawing No:	008
Date:	15.12.2020
Scale:	NTS
Drawing Title:	Depth To Founding Strata Plan

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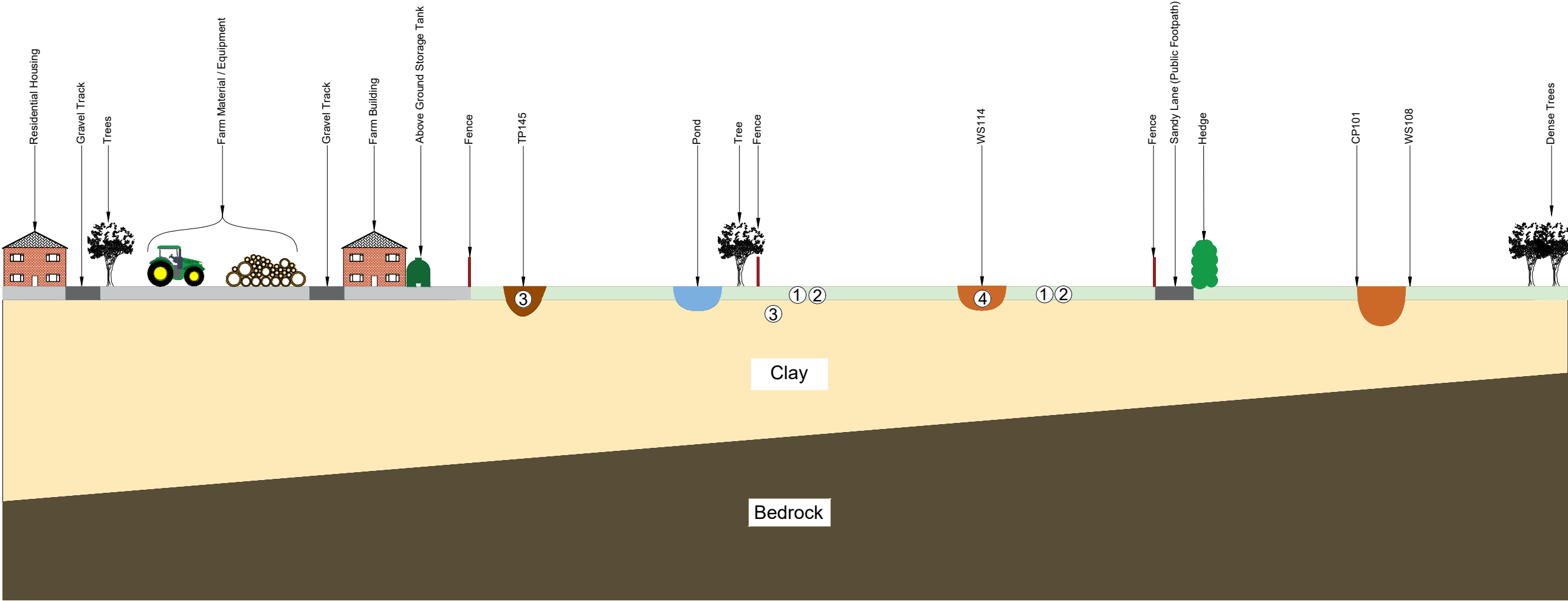
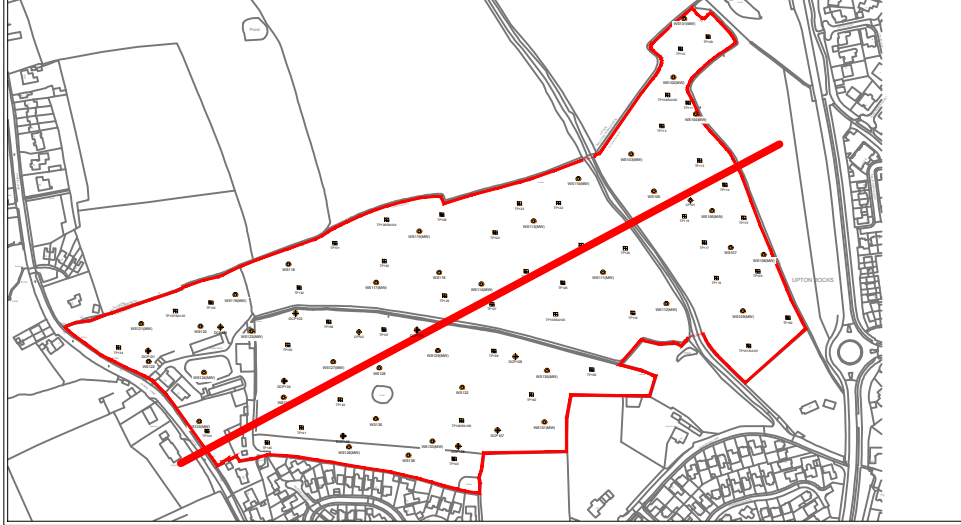
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ID	SOURCE	EXPOSURE	POTENTIAL PATHWAY
HUMAN HEALTH			
1	Heavy Metals, heavy end Hydrocarbons & Non Volatile Polycyclic Aromatic Hydrocarbon (PAH)	Dermal Contact and Ingestion	Construction Workers &
		Consumption of Home-grown Produce	Residential End Users
2	Semi Volatile Polycyclic Aromatic, and petroleum and diesel range Hydrocarbon Compounds, Chlorinated Hydrocarbons	Volatilisation / Accumulation, Vapour Inhalation	Construction Workers &
			Residential End Users
3	Asbestos Containing Materials (ACM)	Fibre / Dust Inhalation	Construction Workers, Residential End Users & Third Party Property
4	Hazardous Ground Gases	Inhalation	Construction Workers
		Accumulation	Residential End Users
5	PCB's	Dermal Contact and Ingestion	Construction Workers &
		Consumption of Home-grown Produce	Residential End Users
CONTROLLED WATERS			
6	Water Soluble Mobile Contaminants	Vertical Migration	Secondary A Aquifer
7	Water Soluble Mobile Contaminants	Lateral Migration	Surface Water Courses
BUILDING & INFRASTRUCTURE			
8	pH & Sulphate	Corrosion of Concrete	Foundations / Concrete
9	VOC, TPH's Phenols, pH	Chemical Corrosion	Potable Water Supply

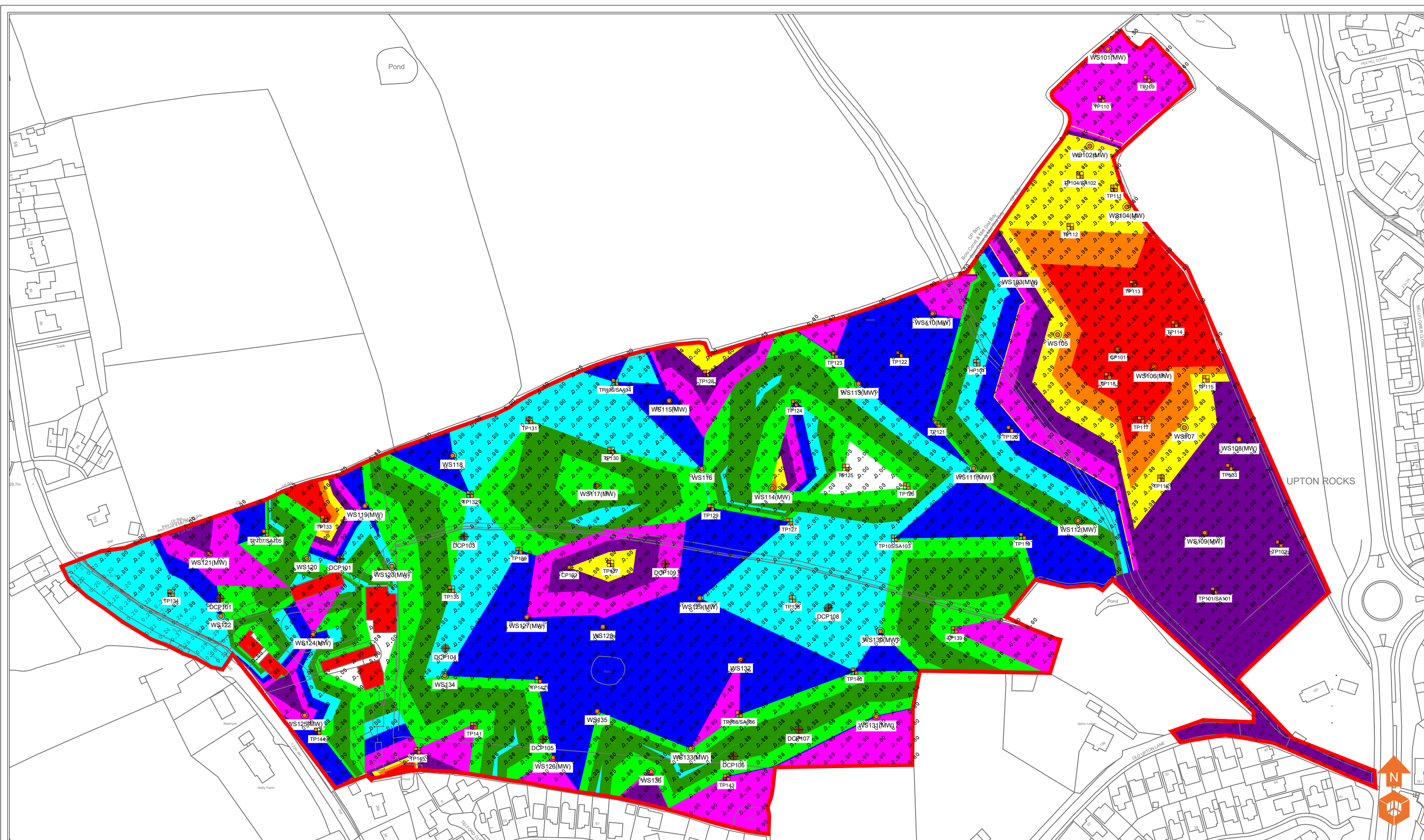


Geological Features Bedrock Clay Topsoil Made Ground Gravel Track / Roads Pond Soft Clay	Notes:					Client:	Job No:		Date:		e3p Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk			
							13-759		29.09.2020					
						Job Title:	Drawing No:		Scale:					
							P1 REVA 29.09.2020 HM VW Phase Issue Date Drawn Checked							010
							Chapel Lane		Conceptual Site Model			The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.		

No.	Potentially-Contaminative-Activity	Contaminants	Migration/Exposure-Pathway(s)	Receptor(s)
PL1 PL2	Topsoil,-farming-activity	Heavy-Metals-(chromium-VI-and-Lead)	Dermal-Contact Dermal-Contact-and-Ingestion	Future-Site-Users-and-Off-site-Receptors
PL3	Made-Ground-and-infilled-clay-pits	Asbestos-and/-or-ACM	Inhalation-of-Dust	Flora-and-Future-Site-Users
PL4	Made-Ground,-infilled-pond,-natural-clay-deposits	Methane-and-Carbon-dioxide	Inhalation-of-gas,-Migration-through-permeable-strata-and-preferential-pathways-and-explosion-in-confined-spaces.	Future-site-users,-buildings-and-off-site-receptors



Geological Features Bedrock Clay Topsoil Made Ground Gravel Track / Roads Pond Soft Clay	Notes:					Client:		Job No:		Date:		Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk						
								13-759		03.11.2020								
	P1 P1 Phase					TWNW		Drawing No:		Scale:								
								010		NTS								
								P1 P1 Phase					Chapel Lane		Conceptual Site Model		The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.	



Location Symbols		Bedrock Depth (m)	
	Approximate Window Sample Probehole Location		Depth to Bedrock 0.00 - 0.49m
	Approximate Window Sample Probehole Location with Install		Depth to Bedrock 0.50 - 0.99m
	Approximate Trial Pit Location		Depth to Bedrock 1.00 - 1.49m
	Approximate Soakaway Test Location		Depth to Bedrock 1.50 - 1.99m
	Approximate Cable Percussive Borehole Location		Depth to Bedrock 2.00 - 2.49m
	Approximate Hand Dug Pit Location		Depth to Bedrock 2.50 - 2.99m
			Depth to Bedrock 3.00 - 3.49m
			Depth to Bedrock 3.50 - 3.99m
			Depth to Bedrock > 4.00m

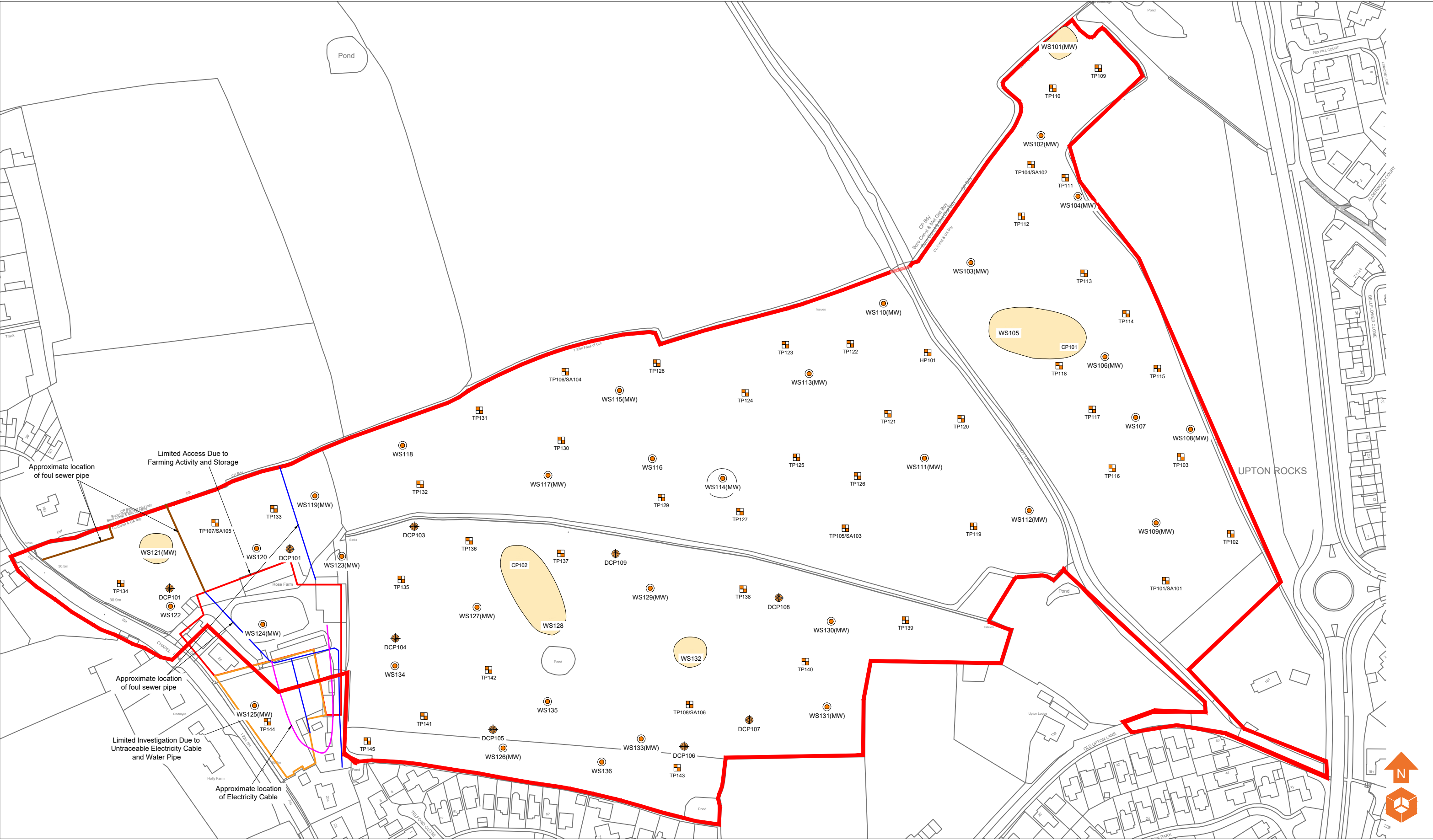
Notes:				
P1	REVB	03.11.2020	LM	VW
P1	REVA	29.09.2020	HM	VW
Phase	Issue	Date	Drawn	Checked

Client:	
TWNW	
Job Title:	
Chapel Lane	

Job No:	13-759
Drawing No:	012
Date:	03.11.2020
Scale:	NTS
Drawing Title:	
Depth to Bedrock Plan	

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Location Symbols  Approximate Window Sample Probehole Location  Approximate Window Sample Probehole Location with Install  Approximate Trial Pit Location  Approximate Soakaway Test Location  Approximate Cable Percussive Borehole Location  Approximate Hand Dug Pit Location		Development Constraints  Limited Investigation Due to Untraceable Electricity Cable and Water Pipe  Limited Access Due to Farming Activity and Storage  Very low to low strength Clays  Approximate location private surface water pipe.  Approximate location of foul sewer pipe  Approximate location of electricity cable		Notes:		Client: TWNW		Job No: 13-759		Date: 15.12.2020		 Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk							
						Drawing No: 015		Scale: NTS											
				P1 P1 Phase		REVB REVA Issue		15.12.2020 29.09.2020 Date		LM HM Drawn		VW VW Checked		Job Title: Chapel Lane		Drawing Title: Development Constraints Plan		The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.	

APPENDIX IV

PHOTOGRAPHS

PLATE 1 UNNAMED BROOK ADJACENT TO NORTHERN BOUNDARY



PLATE 2 FARM BUILDINGS AND EQUIPMENT



PLATE 3 ABOVE GROUND SOTRAGE TANK ADJACENT TO FARM BUILDING



PLATE 4 WATERLOGGED FIELD



PLATE 5 POOR DRAINAGE WITHIN CATTLE GRAZING FIELD (WEST)



PLATE 6 ACCESS TRACK WITH MACHINERY STORAGE IN THE BACKGROUND



PLATE 7

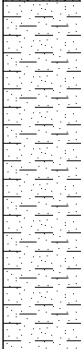
HP101 LOCATING SURFACE WATER PIPE WITHIN CENTRAL FIELD



APPENDIX V

E3P EXPLORATORY HOLE LOGS

Project Name: Chapel Lane	Project No. 13759	Co-ords: 350199.00 - 387739.00 Level:	Date 24/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 1.80		Scale 1:30
Client: Taylor Wimpey North West			Logged V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES		0.40			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	1.00	ES		1.80			Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
							End of Pit at 1.80m	2
								3
								4

Trial Pit Photographs



Trial Pit 101/ Soakaway 101



Trial Pit 101/ Soakaway 101 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 350236.00 - 387771.00 Level:	Date 24/08/2020
Location: Widnes		Dimensions (m): 2.50 Depth 2.10	Scale 1:30
Client: Taylor Wimpey North West			Logged V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	0.80	B					Firm medium strength grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
	1.50	HVP	74	2.10			End of Pit at 2.10m	2
								3
								4

Trial Pit Photographs



Trial Pit 102

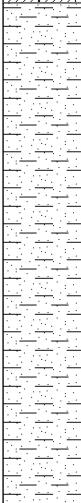


Trial Pit 102 Spoil

Remarks: 1. Complete

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 350212.00 - 387810.00 Level:	Date 24/08/2020
Location: Widnes		Dimensions (m): 2.50 Depth 2.30	Scale 1:30
Client: Taylor Wimpey North West			Logged V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	1.50	ES		2.30			Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1 2
							End of Pit at 2.30m	3 4

Trial Pit Photographs



Trial Pit 103

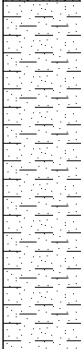


Trial Pit 103 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 350121.00 - 387985.00 Level:	Date 24/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 1.80		Scale 1:30
Client: Taylor Wimpey North West			Logged V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES					Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	0.50	ES		0.40			Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
				1.80			End of Pit at 1.80m	2
								3
								4

Trial Pit Photographs



Trial Pit 104/ Soakaway 102

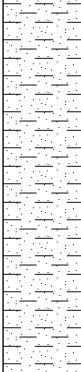


Trial Pit 104/ Soakaway 102 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 350006.00 - 387775.00 Level:	Date 24/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 1.80		Scale 1:30
Client: Taylor Wimpey North West			Logged V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	0.60	ES		1.80			Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
							End of Pit at 1.80m	2
								3
								4

Trial Pit Photographs



Trial Pit 105/ Soakaway 103

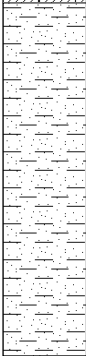


Trial Pit 105/ Soakaway 103 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 349842.00 - 387867.00 Level:	Date 24/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 1.70		Scale 1:30
Client: Taylor Wimpey North West			Logged V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	1.00	ES					Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
	1.50	B		1.70			End of Pit at 1.70m	2
								3
								4

Trial Pit Photographs



Trial Pit 106/ Soakaway 104



Trial Pit 106/ Soakaway 104 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

Project Name: Chapel Lane

Project No.
13759

Co-ords: 349632.00 - 387784.00
Level:

Date
24/08/2020

Location: Widnes

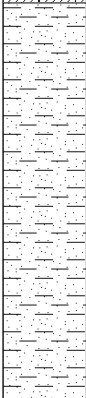
Dimensions (m): 2.50

Scale
1:30

Client: Taylor Wimpey North West

Depth
1.90

Logged
V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	1.80	B		1.90			Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
							End of Pit at 1.90m	2
								3
								4

Trial Pit Photographs



Trial Pit 107/ Soakaway 105

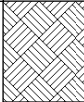


Trial Pit 107/ Soakaway 105 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 349915.00 - 387664.00 Level:	Date 24/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 1.80		Scale 1:30
Client: Taylor Wimpey North West			Logged V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.40			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	0.60	ES (L)					Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
	1.20	B						
				1.80			End of Pit at 1.80m	2
								3
								4

Trial Pit Photographs



Trial Pit 108/ Soakaway 106

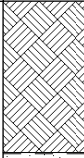


Trial Pit 108/ Soakaway 106 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 350169.00 - 388046.00 Level:	Date 24/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 2.00		Scale 1:30
Client: Taylor Wimpey North West			Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES					Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	0.80	ES		0.60			Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
				2.00			End of Pit at 2.00m	2
								3
								4

Trial Pit Photographs



Trial Pit 109

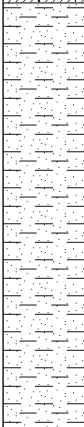


Trial Pit 109 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 350133.00 - 388035.00 Level:	Date 24/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 2.00		Scale 1:30
Client: Taylor Wimpey North West			Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	1.00	HVP	140				Stiff high strength grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone. Becoming firm medium strength at 1.50 m bgl.	1
	1.50	HVP	64					
				2.00			End of Pit at 2.00m	2
								3
								4

Trial Pit Photographs



Trial Pit 110

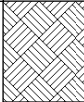


Trial Pit 110 Spoil

Remarks: 1. Complete

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 350145.00 - 387975.00 Level:	Date 24/08/2020
Location: Widnes		Dimensions (m): 2.50 Depth 2.10	Scale 1:30
Client: Taylor Wimpey North West			Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES		0.40			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
				2.10			Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
							End of Pit at 2.10m	2
								3
								4

Trial Pit Photographs



Trial Pit 111



Trial Pit 111 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 350110.00 - 387955.00 Level:	Date 24/08/2020
Location: Widnes		Dimensions (m): 2.50 Depth 1.90	Scale 1:30
Client: Taylor Wimpey North West			Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	1.20	HVP	83	1.90			Stiff high strength grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
							End of Pit at 1.90m	2
								3
								4

Trial Pit Photographs



Trial Pit 112

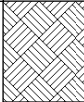
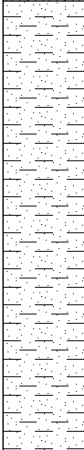


Trial Pit 112 Spoil

Remarks: 1. Complete

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 350148.00 - 387926.00 Level:	Date 24/08/2020
Location: Widnes		Dimensions (m): 2.50 Depth 2.20	Scale 1:30
Client: Taylor Wimpey North West			Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.40			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	1.00	ES		2.20			Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1 2 3 4
							End of Pit at 2.20m	

Trial Pit Photographs



Trial Pit 113

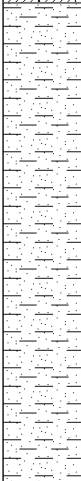


Trial Pit 113 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 350178.00 - 387896.00 Level:	Date 24/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 2.20		Scale 1:30
Client: Taylor Wimpey North West			Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.50	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
							Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1 2 3 4
				2.20			End of Pit at 2.20m	

Trial Pit Photographs



Trial Pit 114



Trial Pit 114 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 350193.00 - 387868.00 Level:	Date 24/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 2.10		Scale 1:30
Client: Taylor Wimpey North West			Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	1.00	HVP	64				Firm medium strength grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
	1.50	HVP	70					
				2.10			End of Pit at 2.10m	2
								3
								4

Trial Pit Photographs



Trial Pit 115

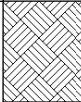
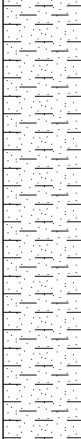


Trial Pit 115 Spoil

Remarks: 1. Complete

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 350164.00 - 387802.00 Level:	Date 24/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 2.20		Scale 1:30
Client: Taylor Wimpey North West			Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.40			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	1.00	HVP	45	2.20			Firm medium strength grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1 2 3 4
							End of Pit at 2.20m	

Trial Pit Photographs



Trial Pit 116

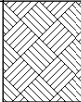
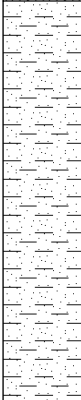


Trial Pit 116 Spoil

Remarks: 1. Complete

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 350146.00 - 387841.00 Level:	Date 24/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 2.00		Scale 1:30
Client: Taylor Wimpey North West			Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.50	ES		0.40			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	1.20	HVP	64				Firm medium strength grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
				2.00			End of Pit at 2.00m	2
								3
								4

Trial Pit Photographs



Trial Pit 117



Trial Pit 117 Spoil

Remarks: 1. Complete

Stability: Stable

Project Name: Chapel Lane

Project No.
13759

Co-ords: 350132.00 - 387869.00
Level:

Date
24/08/2020

Location: Widnes

Dimensions (m): 2.50

Scale
1:30

Client: Taylor Wimpey North West

Depth
2.10

0.60

Logged
J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
				2.10			Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1 2 3 4
							End of Pit at 2.10m	

Trial Pit Photographs



Trial pit 118

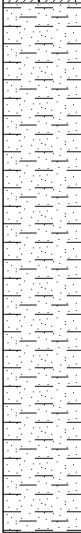


Trial Pit 118 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 350080.00 - 387773.00 Level:	Date 24/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 2.40		Scale 1:30
Client: Taylor Wimpey North West			Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	0.50	ES					Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
				2.40			End of Pit at 2.40m	2
								3
								4

Trial Pit Photographs



Trial Pit 119



Trial Pit 119 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

Project Name: Chapel Lane

Project No.
13759

Co-ords: 350081.00 - 387831.00
Level:

Date
25/08/2020

Location: Widnes

Dimensions (m): 2.50

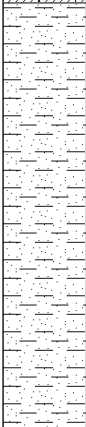
Scale
1:30

Client: Taylor Wimpey North West

Depth
2.00

0.60

Logged
J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
				2.00			Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
							End of Pit at 2.00m	2
								3
								4

Trial Pit Photographs



Trial Pit 120

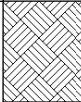


Trial Pit 120 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 350030.00 - 387844.00 Level:	Date 25/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 2.40		Scale 1:30
Client: Taylor Wimpey North West			Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.60	ES		0.40			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
							Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
				2.40			End of Pit at 2.40m	2
								3
								4

Trial Pit Photographs



Trial Pit 121

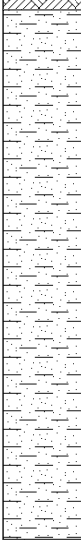


Trial Pit 121 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 349999.00 - 387888.00 Level:	Date 25/08/2020
Location: Widnes		Dimensions (m): 2.50 Depth 2.40	Scale 1:30
Client: Taylor Wimpey North West			Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	1.20	HVP	83	2.40			Stiff high strength grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1 2 3 4
							End of Pit at 2.40m	

Trial Pit Photographs



Trial Pit 122



Trial Pit 122 Spoil

Remarks: 1. Complete

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 349957.00 - 387884.00 Level:	Date 25/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 2.20		Scale 1:30
Client: Taylor Wimpey North West			Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES					Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	0.50	B		0.40			Firm light brown slightly gravelly very sandy CLAY. Gravel is fine to medium sub-angular of mudstone and sandstone.	
				0.80			Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
				2.20			End of Pit at 2.20m	2
								3
								4

Trial Pit Photographs



Trial Pit 123



Trial Pit 123 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 349941.00 - 387847.00 Level:	Date 25/08/2020
Location: Widnes		Dimensions (m): 2.50 Depth 2.30	Scale 1:30
Client: Taylor Wimpey North West			Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES					MADE GROUND: Dark brown slightly gravelly sandy clay (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	0.50	ES		0.50			MADE GROUND: Black sandy gravel. Gravel is fine sub-angular of mudstone, asphalt and concrete. (Red ceramic land drain pipe encountered at 0.55 m bgl)	
	1.00	ES		0.70			Firm medium strength grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
	1.50	HVP	64					
	2.00	HVP	70					2
				2.30			End of Pit at 2.30m	3
								4

Trial Pit Photographs



Trial Pit 124

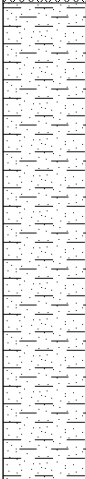


Trial Pit 124 Spoil

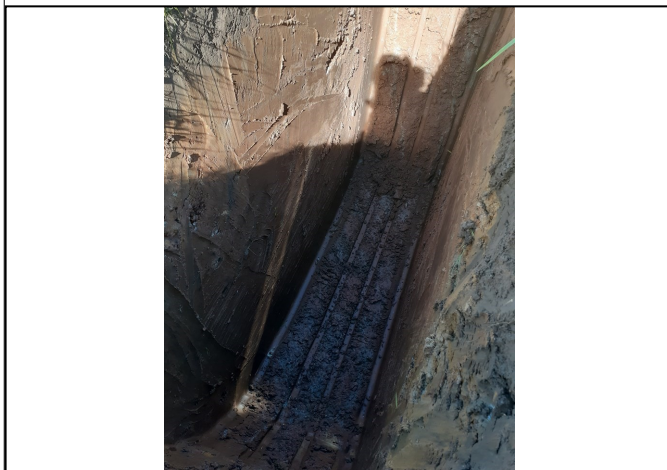
Remarks: 1. Complete

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 349976.00 - 387819.00 Level:	Date 25/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 2.20		Scale 1:30
Client: Taylor Wimpey North West			Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.30			Dark brown slightly gravelly sandy clay (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	1.20	HVP	108				Stiff medium strength grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
	1.60	HVP	83					2
				2.20			End of Pit at 2.20m	3
								4

Trial Pit Photographs



Trial Pit 125

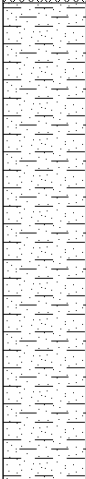


Trial Pit 125 Spoil

Remarks: 1. Complete

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 350017.00 - 387800.00 Level:	Date 25/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 2.20		Scale 1:30
Client: Taylor Wimpey North West			Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.30			Dark brown slightly gravelly sandy clay (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	1.00	HVP	95				Stiff high strength grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
	1.50	HVP	83					
	1.80	HVP	76					2
				2.20			End of Pit at 2.20m	3
								4

Trial Pit Photographs



Trial Pit 126

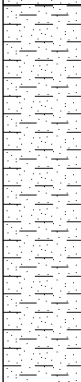


Trial Pit 126 Spoil

Remarks: 1. Complete

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 349952.00 - 387780.00 Level:	Date 25/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 2.10		Scale 1:30
Client: Taylor Wimpey North West			Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
				0.60			Firm brown slightly gravelly very sandy CLAY. Gravel is fine to medium sub-angular of mudstone and sandstone.	
	0.80	ES					Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
				2.10			End of Pit at 2.10m	2
								3
								4

Trial Pit Photographs



Trial Pit 127



Trial Pit 127 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 349886.00 - 387885.00 Level:	Date 25/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 2.20		Scale 1:30
Client: Taylor Wimpey North West			Logged J. Oliver

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES					Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
				0.60 0.70			Light brown slightly gravelly very sandy CLAY. Gravel is fine to medium sub-angular of mudstone and sandstone.	
	0.90	ES					Firm medium strength brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone. Becoming stiff high strength 1.50 m bgl.	1
	1.20	HVP	70					
	1.50	HVP	76					
				2.20			End of Pit at 2.20m	2
								3
								4

Trial Pit Photographs



Trial Pit 128



Trial Pit 128 Spoil

Remarks: 1. Complete

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 349900.00 - 387792.00 Level:	Date 26/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 2.30		Scale 1:30
Client: Taylor Wimpey North West			Logged V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	0.40 0.40	ES HVP	105	0.50			Stiff high strength light brown slightly gravelly very sandy CLAY. Gravel is fine to medium sub-angular of mudstone and sandstone. Stiff high strength grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
	2.00	HVP	101	2.30			End of Pit at 2.30m	2
								3
								4

Trial Pit Photographs



Trial Pit 129

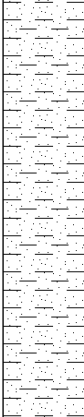


Trial Pit 129 Spoil

Remarks: 1. Complete

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 349835.00 - 387823.00 Level:	Date 26/08/2020
Location: Widnes		Dimensions (m): 2.50	Scale 1:30
Client: Taylor Wimpey North West		Depth 2.20	Logged V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.20			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	0.40	ES		0.50			Light brown slightly gravelly very sandy CLAY. Gravel is fine to medium sub-angular of mudstone and sandstone.	
				2.20			Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1 2 3 4
							End of Pit at 2.20m	

Trial Pit Photographs



Trial Pit 130

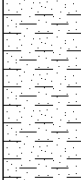
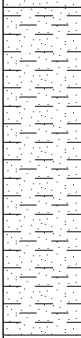


Trial Pit 130 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 349788.00 - 387839.00 Level:	Date 26/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 2.30		Scale 1:30
Client: Taylor Wimpey North West			Logged V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.20			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
				1.00			Firm grey mottled brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	1
	2.00	ES		2.30			Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	2
							End of Pit at 2.30m	3
								4

Trial Pit Photographs



Trial Pit 131

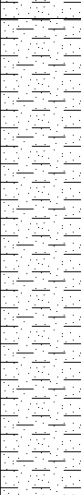


Trial Pit 131 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

				Trial Pit Log			TrialPit No TP132 Sheet 1 of 1	
Project Name: Chapel Lane				Project No. 13759		Co-ords: 349751.00 - 387799.00 Level:		Date 26/08/2020
Location: Widnes						Dimensions (m): 2.50 0.60		Scale 1:30
Client: Taylor Wimpey North West						Depth 2.50		Logged V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
	Depth	Type	Results							
 0.40	0.50	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	1		
							0.60			Firm grey mottled brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.
							2.50			Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.
							End of Pit at 2.50m	3		
								4		

Trial Pit Photographs



Trial Pit 132



Trial Pit 132 Spoil

Remarks: 1. Complete. 2. Hand shear vane could not be obtained due to brittle CLAY. 3. Steady water seepage at 0.40 m bgl.

Stability: Unstable side walls from ground level to 2.50m bgl.



Project Name: Chapel Lane	Project No. 13759	Co-ords: 349663.00 - 387795.00 Level:	Date 26/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 2.40		Scale 1:30
Client: Taylor Wimpey North West			Logged V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.05	ES		0.10			MADE GROUND: Dark brown slightly gravelly sandy clay (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of brick, mudstone and sandstone.	
				0.40			MADE GROUND: Soft grey mottled brown slightly gravelly sandy clay. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	
	1.00	ES					MADE GROUND: Grey mottled brown slightly gravelly slightly silty sandy clay. Gravel is fine to coarse sub-angular to sub-rounded of timber, mudstone, coal and sandstone.	1
	2.00	HVP	64	1.80			Firm medium strength grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	2
				2.40			End of Pit at 2.40m	3
								4

Trial Pit Photographs



Trial Pit 133

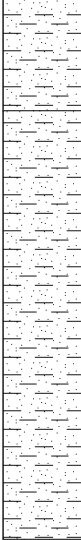


Trial Pit 133 Spoil

Remarks: 1. Complete .

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 349586.00 - 387749.00 Level:	Date 26/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 2.40		Scale 1:30
Client: Taylor Wimpey North West			Logged V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.20			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	1.00	ES		0.70			Firm grey mottled brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	1
				2.40			End of Pit at 2.40m	2 3 4

Trial Pit Photographs



Trial Pit 134



Trial Pit 134 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 349744.00 - 387749.00 Level:	Date 26/08/2020
Location: Widnes		Dimensions (m): 2.50 Depth 1.70	Scale 1:30
Client: Taylor Wimpey North West			Logged V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.20			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
	0.30	ES		0.40			Firm grey mottled brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	
				1.70			Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
							End of Pit at 1.70m	2
								3
								4

Trial Pit Photographs



Trial Pit 135



Trial Pit 135 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 349770.00 - 387770.00 Level:	Date 26/08/2020
Location: Widnes		Dimensions (m): 2.50 Depth 2.00	Scale 1:30
Client: Taylor Wimpey North West			Logged V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
				0.50			Firm brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	
							Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
				2.00			End of Pit at 2.00m	2
								3
								4

Trial Pit Photographs



Trial Pit 136

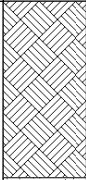
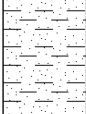
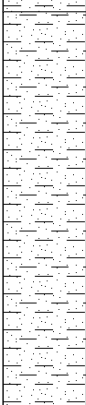


Trial Pit 136 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 349835.00 - 387764.00 Level:	Date 26/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 2.80		Scale 1:30
Client: Taylor Wimpey North West			Logged V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES					Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
				0.70			Firm grey mottled brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	1
	1.10 1.10	B ES		1.20			Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	2
				2.80			End of Pit at 2.80m	3
								4

Trial Pit Photographs



Trial Pit 137



Trial Pit 137 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 349951.00 - 387741.00 Level:	Date 26/08/2020
Location: Widnes		Dimensions (m): 2.50 Depth 2.00	Scale 1:30
Client: Taylor Wimpey North West			Logged V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.20			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
				0.40			Firm grey mottled brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	
							Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
				2.00			End of Pit at 2.00m	2
								3
								4

Trial Pit Photographs



Trial Pit 138



Trial Pit 138 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 350040.00 - 387722.00 Level:	Date 26/08/2020
Location: Widnes		Dimensions (m): 2.50 Depth 0.90	Scale 1:30
Client: Taylor Wimpey North West			Logged V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
 0.90	0.40	ES		0.30			MADE GROUND: Dark brown slightly gravelly sandy clay (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of brick, mudstone and sandstone.
				0.75			MADE GROUND: Grey mottled brown slightly gravelly sandy clay. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.
				0.90			MADE GROUND: Black slightly clayey sandy gravel. Gravel is fine to medium angular to sub-angular of mudstone. (Orange ceramic land drain encountered at 0.90m bgl)
							End of Pit at 0.90m

Trial Pit Photographs



Trial Pit 139



Trial Pit 139 Spoil

Remarks: 1. Incomplete. 2. Terminated due to land drain water inflow at 0.90 m bgl.

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 349970.00 - 387699.00 Level:	Date 26/08/2020
Location: Widnes		Dimensions (m): 2.50 Depth 2.00	Scale 1:30
Client: Taylor Wimpey North West			Logged V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.30 0.40			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
							Firm grey mottled brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
				2.00			End of Pit at 2.00m	2
								3
								4

Trial Pit Photographs



Trial Pit 140



Trial Pit 140 Spoil

Remarks: 1. Complete 2. Hand shear vane could not be obtained due to brittle CLAY.

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 349764.00 - 387669.00 Level:	Date 26/08/2020
Location: Widnes		Dimensions (m): 2.50 Depth 0.90	Scale 1:30
Client: Taylor Wimpey North West			Logged V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
 0.90	0.10	ES					MADE GROUND: Dark brown slightly gravelly sandy clay (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of brick, mudstone and sandstone.
	0.50	ES		0.30			MADE GROUND: Grey mottled brown slightly gravelly sandy clay. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.
				0.80			MADE GROUND: Black slightly clayey sandy gravel. Gravel is fine to medium angular to sub-angular of mudstone. (Orange ceramic land drain encountered at 0.90m bgl)
				0.90			End of Pit at 0.90m

Trial Pit Photographs



Trial Pit 141

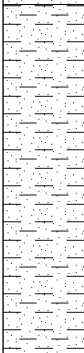


Trial Pit 141 Spoil

Remarks: 1. Incomplete. 2. Terminated due to land drain water inflow at 0.90 m bgl.

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 349797.00 - 387694.00 Level:	Date 26/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 2.00		Scale 1:30
Client: Taylor Wimpey North West			Logged V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
				0.60			Firm grey mottled brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	
	1.00	ES					Stiff high strength grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	1
	1.20	HVP	103					
				2.00			End of Pit at 2.00m	2
								3
								4

Trial Pit Photographs



Trial Pit 142



Trial Pit 142 Spoil

Remarks: 1. Complete

Stability: Stable

Project Name: Chapel Lane	Project No. 13759	Co-ords: 349913.00 - 387631.00 Level:	Date 26/08/2020
Location: Widnes	Dimensions (m): 2.50 Depth 0.80		Scale 1:30
Client: Taylor Wimpey North West			Logged V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
 0.80	0.20	ES		0.30			MADE GROUND: Dark brown slightly gravelly sandy clay (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of brick, mudstone and sandstone.	
				0.70			MADE GROUND: Grey mottled brown slightly gravelly sandy clay. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	
				0.80			MADE GROUND: Black slightly clayey sandy gravel. Gravel is fine to medium angular to sub-angular of mudstone. (Orange ceramic land drain encountered at 0.90m bgl)	
							End of Pit at 0.80m	

Trial Pit Photographs



Trial Pit 143



Trial Pit 143 Spoil

Remarks: 1. Incomplete. 2. Terminated due to land drain water inflow at 0.80 m bgl.

Stability: Stable

Project Name: Chapel Lane

Project No.
13759

Co-ords: 349674.00 - 387667.00
Level:

Date
26/08/2020

Location: Widnes

Dimensions (m): 2.50

Scale
1:30

Client: Taylor Wimpey North West

Depth
2.00

Logged
V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.90	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	1
				0.50		                          	Firm grey mottled brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Stiff grey mottled brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Cobbles are sub-rounded to rounded of mudstone and sandstone.	
				2.00			End of Pit at 2.00m	

Trial Pit Photographs



Trial Pit 144



Trial Pit 144 Spoil

Remarks: 1. Complete.

Stability:	Stable
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Project Name: Chapel Lane

Project No.
13759

Co-ords: 349733.00 - 387656.00
Level:

Date
26/08/2020

Location: Widnes

Dimensions (m): 2.50

Scale
1:30

Client: Taylor Wimpey North West

Depth
1.00

Logged
V. Wilkinson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.80 0.90	ES B		0.30			MADE GROUND: Dark brown slightly gravelly sandy clay (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of brick, mudstone and sandstone. MADE GROUND: Brown gravelly fine to medium sand. Gravel is fine to coarse, angular to sub-angular of mudstone.
				1.00			End of Pit at 1.00m

Trial Pit Photographs



Trial Pit 145



Trial Pit 145 Spoil

Remarks: 1. Incomplete. 2.Terminated at 1.00 m bgl due to gravel indicative of service below.

Stability: Stable

Borehole Log

Borehole No.

WS101

Sheet 1 of 1

Project Name: Chapel Lane

Project No.
13759

Co-ords: 350151E - 388063N

Hole Type
WS

Location: Widnes

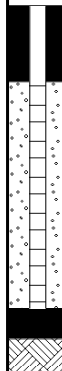
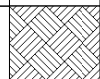
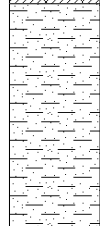
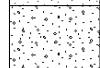
Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 25/08/2020

Logged By
J. Sheridan

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.60	ES		0.50			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
		1.00 1.00	D SPT	N=4 (2,2/1,1,1,1)				Soft low strength grey mottled brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	1
		2.00 2.00	D SPT	N=50 (3,2/4,4,12,30)	2.00			Dense reddish brown gravelly fine to medium SAND. Gravel is fine to coarse sub-angular to sub-rounded of sandstone. (Weathered bedrock).	2
					2.45			End of Borehole at 2.45m	
									3
									4
									5
									6
									7
									8
									9
									10

Remarks

1. Complete. 2. Refused at 2.45 on weathered bedrock. 3. Monitoring well installed (Response zone between 0.50 m and 2.00 m bgl)

Borehole Log

Borehole No.

WS102

Sheet 1 of 1

Project Name: Chapel Lane

Project No.
13759

Co-ords: 350128E - 388006N

Hole Type
WS

Location: Widnes

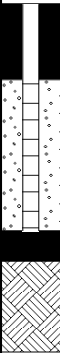
Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 25/08/2020

Logged By
V. Wilkinson

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.95	ES		0.90			MADE GROUND: Dark brown slightly gravelly sandy clay (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of brick, mudstone and sandstone.	
		1.00	SPT	N=11 (1,1/2,2,3,4)	1.10			MADE GROUND: Black slightly clayey sandy gravel. Gravel is fine to medium angular to sub-angular of mudstone. (Orange ceramic land drain encountered 1.00m bgl)	1
		2.00	D		1.80			MADE GROUND: Grey mottled brown slightly gravelly sandy clay. Gravel is fine to coarse sub-angular to sub-rounded of brick, mudstone, coal and sandstone.	2
		2.00	SPT	50 (2,12/50 for 155mm)	2.30			Very stiff very high strength grey mottled brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	
								End of Borehole at 2.30m	
									3
									4
									5
									6
									7
									8
									9
									10

Remarks

1. Complete 2. Refused on 2.30 m bgl on very stiff CLAY. 3. Monitoring well installed (response zone between 0.50 and 1.50 m bgl).

Project Name: Chapel Lane

Project No.
13759

Co-ords: 350086E - 387943N

Hole Type
WS

Location: Widnes

Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 25/08/2020

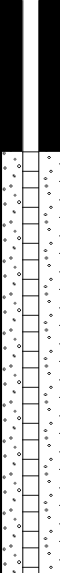
Logged By
V. Wilkinson

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	ES					Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
		1.00	D		0.70				
		1.00	SPT	N=7 (1,1/2,1,2,2)				Firm low strength grey mottled brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Becoming very stiff high strength at 2.00m bgl.	1
		2.00	D						
		2.00	SPT	N=20 (3,3/4,5,5,6)					2
		2.20	ES						
		3.00	D						
		3.00	SPT	N=28 (3,4/6,7,7,8)					3
		4.00	SPT	N=29 (4,6/7,6,8,8)					4
		4.60	SPT	50 (25 for 10mm/50 for 0mm)	4.61			End of Borehole at 4.61m	5
									6
									7
									8
									9
									10

Remarks

1. Complete. 2. Refused at 4.61 m bgl on very stiff CLAY. 3. Water strike at 2.00 m bgl. 4. Monitoring well installed (response zone between 1.00 m and 4.00 m bgl).

				Borehole Log				Borehole No. WS104 Sheet 1 of 1	
Project Name: Chapel Lane				Project No. 13759		Co-ords: 350153E - 387965N		Hole Type WS	
Location: Widnes				Level:		Scale 1:50			
Client: Taylor Wimpey North West				Dates: 25/08/2020		Logged By V. Wilkinson			

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	ES		0.30 0.40		Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone. Light brown fine to medium SAND. Stiff medium strength grey mottled brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Becoming very stiff very high strength at 3.00 m bgl.	1	
		1.00	SPT	N=9 (2,2/2,2,2,3)					
		1.20	D						
		1.50	U						
		2.00	SPT	N=15 (3,2/4,3,4,4)					
		3.00	SPT	N=24 (25 for 115mm/9,2,3,10)	3.40				
	3.80	SPT	50 (25 for 10mm/50 for 0mm)	3.80		Dense reddish brown gravelly fine to medium SAND. Gravel is fine to coarse sub-angular to sub-rounded of sandstone. (Weathered bedrock). End of Borehole at 3.80m	4		
								5	
								6	
								7	
								8	
								9	
								10	

Remarks

1. Complete. 2. Refused at 3.80 m bgl on weathered SANDSTONE bedrock. 3. Monitoring well installed (response zone between 1.00m and 3.80m bgl).



Borehole Log

Borehole No.

WS105

Sheet 1 of 1

Project Name: Chapel Lane

Project No.
13759

Co-ords: 350099E - 387903N

Hole Type
WS

Location: Widnes

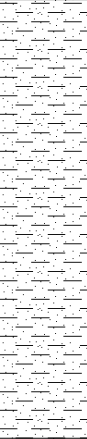
Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 25/08/2020

Logged By
J. Sheridan

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
	 2.20	0.20	ES		0.40		Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	1	
		0.50	ES						
		1.00 1.00	D SPT	N=7 (1,2/2,1,2,2)	3.30			Firm low strength grey mottled brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. No recovery between 2.20 m and 2.40 m bgl. Becoming very stiff very high strength at 2.00 m bgl.	2
		2.00 2.00	D SPT	N=40 (3,5/7,6,14,13)					
		3.00 3.00	D SPT	50 (14,11/50 for 170mm)					
		End of Borehole at 3.30m							
							3		
								4	
								5	
								6	
								7	
								8	
								9	
								10	

Remarks

1. Complete. 2. Refused at 3.30 m bgl on very stiff CLAY. 3. Water strike at 2.20 m bgl.

Borehole Log

Borehole No.

WS106

Sheet 1 of 1

Project Name: Chapel Lane

Project No.
13759

Co-ords: 350164E - 387868N

Hole Type
WS

Location: Widnes

Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 25/08/2020

Logged By
V. Wilkinson

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
		1.00	D		1.00			Firm brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	1
		1.00	SPT	N=9 (1,2/2,2,2,3)					
		2.00	D					Stiff medium strength brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Becoming very stiff high strength at 2.00 m bgl. Becoming very stiff very high strength at 3.00 m bgl.	2
		2.00	SPT	N=28 (2,4/5,5,9,9)					
		3.00	D						3
		3.00	SPT	N=37 (5,6/7,8,10,12)					
		4.00	ES		4.40				4
		4.00	SPT	50 (7,9/50 for 283mm)					
								End of Borehole at 4.40m	5
									6
									7
									8
									9
									10

Remarks

1. Complete. 2. Refused at 4.00 m bgl on very stiff CLAY. 3. Monitoring well installed (response zone between 1.00 m and 4.00 m bgl).

Borehole Log

Borehole No.

WS107

Sheet 1 of 1

Project Name: Chapel Lane

Project No.
13759

Co-ords: 350179E - 387825N

Hole Type
WS

Location: Widnes

Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 25/08/2020

Logged By
V. Wilkinson

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
		1.00	D					Firm brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	
		1.00	SPT	N=8 (1,2/2,1,2,3)	1.00				1
		2.00	D					Stiff medium strength brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Becoming very stiff high strength at 3.00 m bgl. Becoming very stiff very high strength at 4.00 m bgl.	2
		2.00	SPT	N=12 (2,2/2,2,4,4)					
		3.00	D						3
		3.00	SPT	N=21 (4,4/4,5,5,7)					
		4.00	SPT	N=50 (6,6/12,12,13,13)					4
					4.45			End of Borehole at 4.45m	5
									6
									7
									8
									9
									10

Remarks

1. Complete. 2. Refused at 4.45 m bgl on very stiff CLAY.

Project Name: Chapel Lane

Project No.
13759

Co-ords: 350222E - 387824N

Hole Type
WS

Location: Widnes

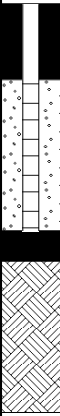
Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 25/08/2020

Logged By
V. Wilkinson

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES					Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
		0.50	U		0.40			Soft brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	
		1.00	SPT	N=0 (1,0/0,0,0,0)	1.10			Very soft extremely low strength brown very sandy CLAY with organic matter.	1
		1.50						Very stiff high strength brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	
		2.00 2.00	D SPT	N=33 (4,5/5,10,9,9)				Dense reddish brown gravelly fine to medium SAND. Gravel is fine to coarse sub-angular to sub-rounded of sandstone. (Weathered bedrock)	2
		2.70	SPT	50 (25 for 20mm/50 for 10mm)	2.50 2.70			End of Borehole at 2.70m	3
									4
									5
									6
									7
									8
									9
									10

Remarks

1. Complete. 2. Refused at 2.70 m bgl on weathered bedrock. 3. Water strike at 1.00 m bgl. 4. Monitoring well installed (Response zone between 0.50 m and 1.50 m bgl).

Borehole Log

Borehole No.

WS109

Sheet 1 of 1

Project Name: Chapel Lane

Project No.
13759

Co-ords: 350193E - 387774N

Hole Type
WS

Location: Widnes

Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 25/08/2020

Logged By
J. Sheridan

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
		1.00	D					Stiff medium strength brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Becoming very stiff high strength at 2.00 m bgl. Becoming very stiff very high strength at 4.00 m bgl.	1
		1.00	SPT	N=9 (1,1/2,2,2,3)					
		2.00	D						2
		2.00	SPT	N=25 (2,4/5,6,7,7)					
		2.50	ES						
		3.00	D						3
		3.00	SPT	N=23 (3,3/5,5,6,7)					
		4.00	SPT	50 (7,9/50 for 285mm)	4.40				4
								End of Borehole at 4.40m	5
									6
									7
									8
									9
									10

Remarks

1.Complete. 2. Refused at 4.40 m bgl on very stiff CLAY. 3. Monitoring well installed (response zone between 0.50 m and 2.50 m bgl).

Borehole Log

Borehole No.

WS110

Sheet 1 of 1

Project Name: Chapel Lane

Project No.
13759

Co-ords: 350028E - 387907N

Hole Type
WS

Location: Widnes

Level:

Scale
1:50

Client: Taylor Wimpey North West

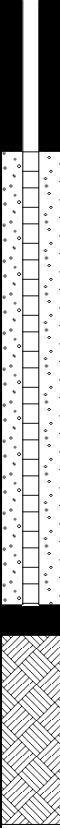
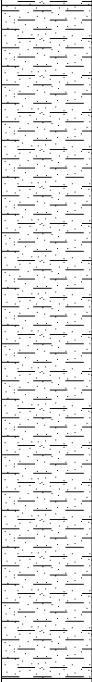
Dates: 25/08/2020

Logged By
J. Sheridan

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	ES		0.40			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	1
		1.00 1.00	D SPT	N=9 (1,1/2,2,2,3)				Stiff medium strength brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Becoming very stiff high strength at 2.00 m bgl. Becoming very stiff very high strength at 5.00 m bgl.	
		2.00 2.00	D SPT	N=17 (3,4/3,4,5,5)					
		3.00 3.00	D SPT	N=24 (4,4/5,6,6,7)					
		4.00 4.00	D SPT	N=24 (5,5/6,5,6,7)					
		5.00 5.00	D SPT	N=37 (6,6/8,10,8,11)	5.45				5
								End of Borehole at 5.45m	6
									7
									8
									9
									10

Remarks

1. Complete.

				Borehole Log				Borehole No. WS111 Sheet 1 of 1	
Project Name: Chapel Lane				Project No. 13759		Co-ords: 350054E - 387809N		Hole Type WS	
Location: Widnes				Level:		Scale 1:50			
Client: Taylor Wimpey North West				Dates: 25/08/2020		Logged By V. Wilkinson			
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.30			Dark brown slightly gravelly sandy clay (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
		0.60	ES					Firm brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	1
		1.00	D		1.00			Stiff medium strength brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Becoming very stiff high strength at 3.00 m bgl. Becoming very stiff very high strength at 4.00 m bgl. Becoming very stiff high strength at 5.00 m bgl.	
		1.00	SPT	N=9 (1,2/2,2,2,3)					2
		2.00	D						
		2.00	SPT	N=15 (2,2/3,3,4,5)					3
		2.50	U						4
	3.00	D							
	3.00	SPT	N=23 (5,4/5,5,6,7)			5			
		4.00	SPT	N=36 (4,5/7,9,10,10)				6	
		5.00	SPT	N=26 (4,5/5,6,7,8)				7	
					5.45			8	
							End of Borehole at 5.45m	9	
								10	
Remarks 1. Complete. 2. Monitoring well installed (response zone between 1.00 m and 4.00 m bgl).									

Borehole Log

Borehole No.

WS112

Sheet 1 of 1

Project Name: Chapel Lane

Project No.
13759

Co-ords: 350119E - 387773N

Hole Type
WS

Location: Widnes

Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 25/08/2020

Logged By
V. Wilkinson

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
		1.00	D		1.00			Firm brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	1
		1.00	SPT	N=11 (1,2/2,3,3,3)					
		2.00	D					Stiff high strength brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Very stiff high strength at 2.00 m bgl. Becoming very stiff very high strength at 5.00 m bgl.	2
		2.00	SPT	N=18 (2,2/4,4,5,5)					
		3.00	D						3
		3.00	SPT	N=27 (5,5/5,6,7,9)					
		4.00	D						4
		4.00	SPT	N=33 (6,6/7,8,9,9)					
		5.00	D		5.45				5
		5.00	SPT	N=37 (6,6/8,9,10,10)					
								End of Borehole at 5.45m	6
									7
									8
									9
									10

Remarks

1. Complete. 2. Monitoring well installed (response zone between 1.00 m and 4.00 m bgl).

Project Name: Chapel Lane

Project No.
13759

Co-ords: 349973E - 387863N

Hole Type
WS

Location: Widnes

Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 25/08/2020

Logged By
V. Wilkinson

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30 0.40 0.60	ES					Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
		1.00 1.00	D SPT	N=9 (1,2/2,2,3,2)	1.00			Firm brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	1
		2.00 2.00	D SPT	N=16 (2,3/3,4,4,5)				Soft dark brown slightly gravelly sandy CLAY (Relict topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
								Firm brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	2
		3.00 3.00	D SPT	N=25 (3,3/5,6,6,8)				Stiff medium strength brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Becoming very stiff high strength at 3.00 m bgl.	3
		4.00 4.00	D SPT	N=19 (3,3/4,4,5,6)					4
		5.00	SPT	N=24 (3,4/5,5,7,7)					5
					5.45			End of Borehole at 5.45m	6
									7
									8
									9
									10

Remarks

1. Complete. 2. Monitoring well installed (response zone between 1.00 m and 5.00 m bgl).

Project Name: Chapel Lane

Project No.
13759

Co-ords: 349942E - 387798N

Hole Type
WS

Location: Widnes

Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 25/08/2020

Logged By
V. Wilkinson

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES		0.30			MADE GROUND: Dark brown slightly gravelly sandy clay (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
		0.30	ES					MADE GROUND: Grey mottled brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	1
		1.00	SPT	N=4 (1,1/2,1,0,1)	1.20			MADE GROUND: Black slightly gravelly very clayey fine to medium SAND. Gravel is fine to coarse angular to sub-angular of brick.	
					1.50			Firm low strength black slightly silty sandy CLAY. Becoming stiff medium strength at 4.00 m bgl.	2
		2.00	SPT	N=5 (1,4/2,1,1,1)					
		3.00	SPT	N=9 (2,1/2,2,2,3)					3
		4.00	SPT	N=17 (2,3/4,4,4,5)					4
					4.50			Stiff medium strength brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	5
		5.00	SPT	N=12 (2,3/2,3,3,4)					
					5.45			End of Borehole at 5.45m	6
									7
									8
									9
									10

Remarks

1. Complete. 2. Monitoring well installed (response zone between 1.00 m and 4.00 m bgl).

Project Name: Chapel Lane

Project No.
13759

Co-ords: 349876E - 387852N

Hole Type
WS

Location: Widnes

Level:

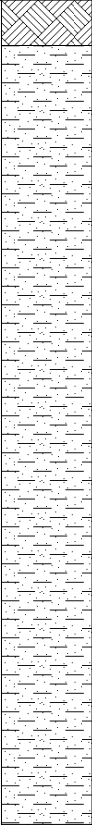
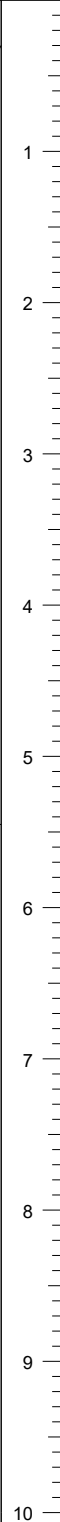
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Client: Taylor Wimpey North West

Dates: 25/08/2020

Logged By
J. Oliver

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES	N=13 (3,3/3,4,3,3)	0.35			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	1
		1.00	ES						
		1.00	SPT						
		1.50	U	N=15 (3,3/3,4,4,4)					
		2.00	D						
		2.00	SPT						
		3.00	D						
		3.00	SPT	N=20 (2,3/5,4,5,6)					
		4.00	D						
		4.00	SPT	N=24 (4,3/5,5,7,7)					
5.45									
							End of Borehole at 5.45m		
									6
									7
									8
									9
									10

				Borehole Log				Borehole No. WS116 Sheet 1 of 1	
Project Name: Chapel Lane				Project No. 13759		Co-ords: 349894E - 387816N		Hole Type WS	
Location: Widnes						Level:		Scale 1:50	
Client: Taylor Wimpey North West						Dates: 25/08/2020		Logged By V. Wilkinson	
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone. Stiff medium strength brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Becoming very stiff high strength at 2.00 m bgl. Becoming very stiff very high strength at 5.00 m bgl.	
		1.00	D						
		1.00	SPT	N=13 (2,3/3,4,3,3)					
		2.00	D						
		2.00	SPT	N=18 (3,3/4,3,5,6)					
		3.00	D						
		3.00	SPT	N=19 (4,3/4,5,5,5)					
		4.00	SPT	N=23 (4,3/6,5,6,6)					
		5.00	SPT	N=37 (6,8/8,9,9,11)					
					5.45			End of Borehole at 5.45m	
Remarks 1. Complete.									

Borehole Log

Borehole No.

WS117

Sheet 1 of 1

Project Name: Chapel Lane

Project No.
13759

Co-ords: 349826E - 387802N

Hole Type
WS

Location: Widnes

Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 25/08/2020

Logged By
V. Wilkinson

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	ES					MADE GROUND: Dark brown slightly gravelly sandy clay (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
		1.00	SPT	N=16 (3,2/3,4,4,5)	0.70 0.80 1.00			MADE GROUND: Black slightly clayey sandy gravel. Gravel is fine sub-angular of mudstone. (orange ceramic land drain encountered at 0.75 m bgl) Firm brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Very stiff high strength brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Becoming stiff medium strength at 2.00 m bgl. Becoming very stiff high strength at 3.00 m bgl.	1
		2.00	SPT	N=14 (3,3/4,4,3,3)					2
		3.00	SPT	N=20 (3,4/4,5,4,7)					3
		4.00	SPT	N=20 (3,4/5,5,4,6)					4
		5.00	SPT	N=24 (3,4/5,6,6,7)					5
					5.45			End of Borehole at 5.45m	6
									7
									8
									9
									10

Remarks

1. Complete. 2. Monitoring well installed (response zone between 1.00 m and 5.00 m bgl).

Borehole Log

Borehole No.

WS118

Sheet 1 of 1

Project Name: Chapel Lane

Project No.
13759

Co-ords: 349747E - 387828N

Hole Type
WS

Location: Widnes

Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 26/08/2020

Logged By
J. Sheridan

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
		0.70	ES					Firm brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	
		1.00	D		1.00				1
		1.00	SPT	N=15 (2,2/3,4,4,4)					
		2.00	D					Stiff Very stiff high strength reddish brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	2
		2.00	SPT	N=32 (6,6/8,8,8,8)					
		3.00	D						3
		3.00	SPT	N=20 (3,3/5,5,5,5)	3.50				
		4.00	D					Stiff medium strength reddish brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Becoming very stiff high strength at 5.00 m bgl.	4
		4.00	SPT	N=17 (2,3/3,4,5,5)					
		5.00	D						5
		5.00	SPT	N=24 (5,5/6,6,6,6)	5.45				
								End of Borehole at 5.45m	6
									7
									8
									9
									10

Remarks

1. Complete.

Borehole Log

Borehole No.

WS119

Sheet 1 of 1

Project Name: Chapel Lane

Project No.
13759

Co-ords: 349696E - 387795N

Hole Type
WS

Location: Widnes

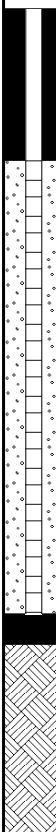
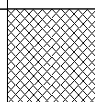
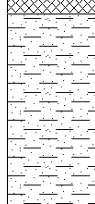
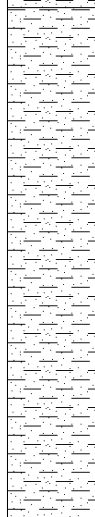
Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 26/08/2020

Logged By
J. Sheridan

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.40	ES	N=11 (1,1/2,2,3,4)	0.70			MADE GROUND: Dark brown slightly gravelly sandy clay (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of brick, concrete, mudstone and sandstone.	1	
		1.00 1.00	ES SPT					Stiff medium strength brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.		
		2.00 2.00	ES SPT	N=19 (3,4/3,4,6,6)	2.00			Very stiff high strength reddish brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	2	
		3.00 3.00	ES SPT	N=23 (2,3/4,5,7,7)	3					
		4.00	SPT	N=23 (3,3/5,5,6,7)						4
		5.00	SPT	N=24 (6,6/6,6,6,6)						
				5.45			End of Borehole at 5.45m	6		
								7		
								8		
								9		
								10		

Remarks

1. Complete. 2. Monitoring well installed (response zone between 1.00 m and 4.00 m bgl).

Borehole Log

Borehole No.

WS120

Sheet 1 of 1

Project Name: Chapel Lane

Project No.
13759

Co-ords: 349664E - 387769N

Hole Type
WS

Location: Widnes

Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 26/08/2020

Logged By
J. Sheridan

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
		Depth (m)	Type	Results							
		0.30	ES	N=13 (2,2/2,4,3,4)	0.40			MADE GROUND: Dark brown slightly gravelly sandy clay (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of charcoal, mudstone and sandstone.	1		
		0.50	ES								
		1.00	D		N=28 (3,5/5,7,7,9)		0.70		Firm brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.		
		1.00	SPT								
		2.00	D		N=21 (4,4/4,5,6,6)			Stiff medium strength reddish brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Becoming very stiff very high strength at 2.00 m bgl. Becoming stiff medium strength at 4.00 m bgl.	2		
		2.00	SPT								
		3.00	D		N=15 (3,3/3,4,4,4)				3		
		3.00	SPT								
		4.00	D		N=15 (3,3/3,3,4,5)				4		
		4.00	SPT								
		5.00	D		5.45				5		
		5.00	SPT								
		End of Borehole at 5.45m							6		
									7		
									8		
									9		
									10		

Remarks

1. Complete.

Borehole Log

Borehole No.

WS121

Sheet 1 of 1

Project Name: Chapel Lane

Project No.
13759

Co-ords: 349591E - 387769N

Hole Type
WS

Location: Widnes

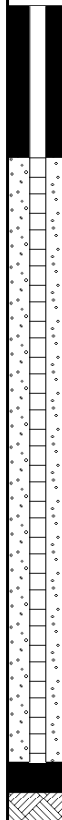
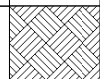
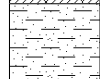
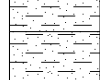
Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 26/08/2020

Logged By
V. Wilkinson

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES		0.50			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
		1.00	D					Firm low strength brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	1
		1.00	SPT	N=7 (1,1/1,1,2,3)	1.20				
		1.50	U						
		2.00	D					Very stiff high strength brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. SAND band encountered between 3.00 m and 3.20 m bgl.	2
		2.00	SPT	N=31 (5,6/7,7,7,10)					
		3.00	D						3
		3.00	SPT	N=22 (3,3/4,5,6,7)					
		4.00	ES						4
		4.00	SPT	N=22 (3,3/4,5,6,7)					
		5.00	SPT	N=23 (4,4/4,6,6,7)					5
					5.45			End of Borehole at 5.45m	6
									7
									8
									9
									10

Remarks

1. Complete. 2. Monitoring well installed (response zone between 1.00 m and 5.00 m bgl).

Borehole Log

Borehole No.

WS122

Sheet 1 of 1

Project Name: Chapel Lane

Project No.
13759

Co-ords: 349613E - 387737N

Hole Type
WS

Location: Widnes

Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 26/08/2020

Logged By
V. Wilkinson

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
		1.00	D		0.50			Firm brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	
		1.00	SPT	N=13 (3,4/3,3,3,4)				Stiff medium strength brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. SAND band encountered between 3.80 m and 4.20 m bgl. Becoming very stiff high strength at 2.00 m bgl. Becoming stiff medium strength at 5.00 m bgl.	1
		2.00	D						2
		2.00	SPT	N=24 (5,4/5,5,7,7)					
		3.00	D						3
		3.00	SPT	N=24 (5,4/5,5,7,7)					
		3.90	ES						4
		4.00	D						
		4.00	SPT	N=27 (5,5/5,7,7,8)					
		5.00	SPT	N=16 (4,4/4,4,4,4)					5
					5.45			End of Borehole at 5.45m	6
									7
									8
									9
									10

Remarks

1. Complete. 2. Water strike at 3.80 m bgl.

Borehole Log

Borehole No.

WS123

Sheet 1 of 1

Project Name: Chapel Lane

Project No.
13759

Co-ords: 349704E - 387762N

Hole Type
WS

Location: Widnes

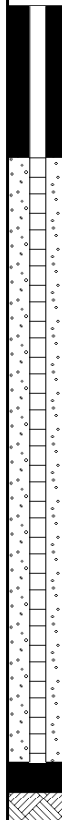
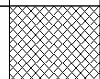
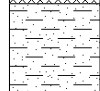
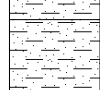
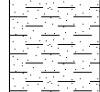
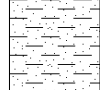
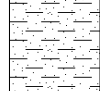
Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 26/08/2020

Logged By
J. Sheridan

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES		0.50			MADE GROUND: Dark brown slightly gravelly sandy clay (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of brick, concrete, mudstone and sandstone.	1
		1.00 1.00	D SPT	N=14 (2,1/2,3,4,5)	1.20			Stiff grey brown mottled slightly gravelly sandy CLAY with occasional layers of grey medium sand. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	
		2.00 2.00	D SPT	N=29 (4,5/7,7,7,8)				Stiff medium strength reddish brown mottled slightly gravelly sandy CLAY with occasional layers of grey medium sand. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Becoming very stiff high strength at 2.00 m bgl.	2
		3.00 3.00	D SPT	N=23 (3,4/5,5,6,7)					3
		4.00 4.00	D SPT	N=15 (3,3/3,4,4,4)	4.00				4
		5.00 5.00	D SPT	N=27 (5,6/5,6,6,10)	5.45			Stiff medium strength reddish brown mottled slightly gravelly sandy CLAY with occasional layers of grey medium sand. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Becoming very stiff high strength at 5.00 m bgl.	5
								End of Borehole at 5.45m	6
									7
									8
									9
									10

Remarks

1. Complete. 2. Monitoring well installed (response zone between 1.00 m and 5.00 m bgl).

Project Name: Chapel Lane

Project No.
13759

Co-ords: 349662E - 387727N

Hole Type
WS

Location: Widnes

Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 26/08/2020

Logged By
J. Sheridan

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES		0.40			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
		1.00	D		1.00			Stiff brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	1
		1.00	SPT	N=9 (1,1/1,2,3,3)					
		2.00	D					Stiff medium strength reddish brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Becoming very stiff high strength at 2.00 m bgl. Becoming stiff medium strength at 3.00 m bgl. Becoming very stiff very high strength at 4.00 m bgl.	2
		2.00	SPT	N=20 (2,3/5,5,5,5)					
		3.00	D						3
		3.00	SPT	N=15 (3,3/4,3,4,4)					
		4.00	D						4
		4.00	SPT	N=19 (4,3/4,5,4,6)					
		4.50	U						
		5.00	D						5
		5.00	SPT	N=22 (3,5/5,4,6,7)					
					5.45			End of Borehole at 5.45m	6
									7
									8
									9
									10

Remarks

1. Complete. 2. Monitoring well installed (response zone between 1.00 m and 5.00 m bgl).

Project Name: Chapel Lane

Project No.
13759

Co-ords: 349660E - 387680N

Hole Type
WS

Location: Widnes

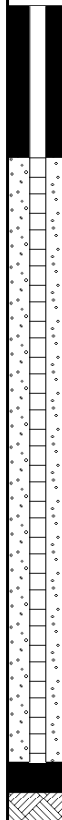
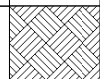
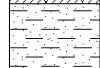
Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 26/08/2020

Logged By
J. Sheridan

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES		0.50			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
		1.00	D		1.00			Firm brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	1
		1.00	SPT	N=8 (2,1/2,2,2,2)				Stiff medium strength reddish brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Becoming very stiff high strength at 4.00 m bgl.	
		2.00	D						2
		2.00	SPT	N=16 (3,3/3,4,4,5)					
		2.50	U						
		3.00	D						3
		3.00	SPT	N=14 (2,3/3,4,4,3)					
		4.00	D						4
		4.00	SPT	N=19 (3,3/4,3,6,6)					
		5.00	D						5
		5.00	SPT	N=20 (3,4/4,4,5,7)					
					5.45			End of Borehole at 5.45m	6
									7
									8
									9
									10

Remarks

1. Complete. 2. Monitoring well installed (response zone between 1.00 m and 5.00 m bgl).

Borehole Log

Borehole No.

WS126

Sheet 1 of 1

Project Name: Chapel Lane

Project No.
13759

Co-ords: 349801E - 387649N

Hole Type
WS

Location: Widnes

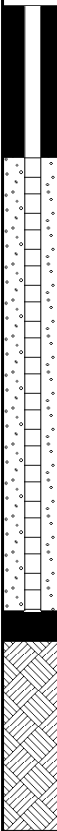
Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 26/08/2020

Logged By
J. Sheridan

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	ES		0.40			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
		1.00	D		0.70			Firm brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	
		1.00	SPT	N=11 (2,3/3,3,2,3)				Stiff medium strength reddish brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Becoming very stiff high strength at 2.00 m bgl. Becoming stiff medium strength at 3.00 m bgl. Becoming Very stiff high strength at 5.00 m bgl.	1
		1.50	U						
		2.00	D						2
		2.00	SPT	N=17 (3,3/4,4,4,5)					
		3.00	D						3
		3.00	SPT	N=15 (2,3/3,4,4,4)					
		4.00	D						4
		4.00	SPT	N=15 (3,4/4,3,3,5)					
		5.00	D		5.45				5
		5.00	SPT	N=20 (3,4/5,4,5,6)					
								End of Borehole at 5.45m	6
									7
									8
									9
									10

Remarks

1. Complete. 2. Water strike at 4.00 m bgl. 3. Monitoring well installed (response zone between 1.00 m and 4.00 m bgl).

Project Name: Chapel Lane

Project No.
13759

Co-ords: 349822E - 387731N

Hole Type
WS

Location: Widnes

Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 26/08/2020

Logged By
J. Sheridan

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.35			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
					0.60			Firm brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	
		1.00	D					Stiff low strength reddish brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Brown fine to medium SAND pockets encountered at 1.00 m and 2.60 m bgl. Becoming stiff medium strength at 2.00 m bgl. Becoming very stiff very high strength at 3.00 m bgl. Becoming stiff medium strength at 5.00 m bgl.	1
		1.00	SPT	N=6 (2,1/1,2,1,2)					
		2.00	D						2
		2.00	SPT	N=13 (3,4/4,3,3,3)					
		3.00	D						3
		3.00	SPT	N=20 (4,4/5,5,5,5)					
		4.00	D						4
		4.00	SPT	N=22 (3,3/5,6,5,6)					
		5.00	D						5
		5.00	SPT	N=17 (4,5/4,4,5,4)					
					5.45			End of Borehole at 5.45m	6
									7
									8
									9
									10

Remarks

1. Complete. 2. Monitoring well installed (response zone between 1.00 m and 5.00 m bgl).

Borehole Log

Borehole No.

WS129

Sheet 1 of 1

Project Name: Chapel Lane

Project No.
13759

Co-ords: 349882E - 387748N

Hole Type
WS

Location: Widnes

Level:

Scale
1:50

Client: Taylor Wimpey North West

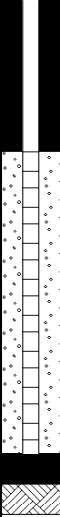
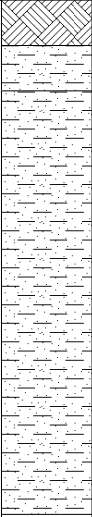
Dates: 26/08/2020

Logged By
J. Sheridan

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	ES		0.30 0.40			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone. Greyish brown fine to medium SAND.	
		1.00 1.00	D SPT	N=10 (3,3/3,2,3,2)				Stiff medium strength reddish brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Becoming very stiff high strength at 3.00 m bgl.	1
		2.00 2.00	D SPT	N=14 (3,4/3,3,4,4)					2
		3.00 3.00	D SPT	N=19 (4,5/5,4,5,5)					3
		3.50	U						
		4.00 4.00	D SPT	N=24 (6,7/6,6,6,6)					4
		5.00 5.00	D SPT	N=25 (7,6/7,6,6,6)					5
					5.45			End of Borehole at 5.45m	6
									7
									8
									9
									10

Remarks

1. Complete. 2. Monitoring well installed (response zone between 1.00 m and 5.00 m bgl).

				Borehole Log				Borehole No. WS130 Sheet 1 of 1	
Project Name: Chapel Lane				Project No. 13759		Co-ords: 350002E - 387723N		Hole Type WS	
Location: Widnes						Level:		Scale 1:50	
Client: Taylor Wimpey North West						Dates: 26/08/2020		Logged By J. Sheridan	
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone. Stiff brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Stiff medium strength reddish brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Becoming very stiff very high strength at 3.00 m bgl.	
					0.60				
	1.00	ES							
	1.00	SPT	N=12 (4,3/3,3,3,3)						
	2.00	ES							
	2.00	SPT	N=16 (3,4/4,4,4,4)						
	3.00	ES							
	3.00	SPT	50 (8,10/50 for 275mm)						
					3.40				
End of Borehole at 3.40m									
Remarks 1. Complete. 2. Refused at 3.40 m bgl on very stiff CLAY. 3. Monitoring well installed (response zone between 1.00 m and 3.00 m bgl).									

Borehole Log

Borehole No.

WS131

Sheet 1 of 1

Project Name: Chapel Lane

Project No.
13759

Co-ords: 349993E - 387664N

Hole Type
WS

Location: Widnes

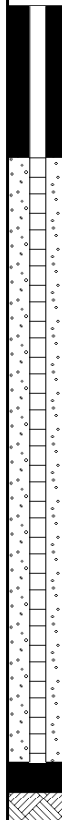
Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 26/08/2020

Logged By
J. Sheridan

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30			0.30			MADE GROUND: Dark brown slightly gravelly sandy clay (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
		0.60	ES		0.70			MADE GROUND: Brown mottled grey slightly gravelly sandy clay. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	
		1.00	D		0.80			MADE GROUND: Black slightly clayey sandy gravel. Gravel is fine sub-angular of mudstone. (Orange ceramic land drain encountered at 0.75 m bgl)	1
		1.00	SPT	N=12 (2,3/3,2,3,4)				Stiff medium strength reddish brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Becoming very stiff high strength at 3.00 m bgl. Becoming stiff medium strength at 4.00 m bgl.	
		2.00	D						2
		2.00	SPT	N=11 (4,3/3,3,2,3)					
		3.00	D						3
		3.00	ES						
		3.00	SPT	N=30 (6,7/7,7,8,8)					
		4.00	D						4
		4.00	SPT	N=17 (4,5/5,4,4,4)					
		5.00	D						5
		5.00	SPT	N=14 (3,4/4,3,4,3)					
					5.45			End of Borehole at 5.45m	6
									7
									8
									9
									10

Remarks

1. Complete. 2. Water strike at 3.50 m bgl. 3. Monitoring well installed (response zone between 1.00 m and 5.00 m bgl).

Project Name: Chapel Lane

Project No.
13759

Co-ords: 349903E - 387707N

Hole Type
WS

Location: Widnes

Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 26/08/2020

Logged By
J. Sheridan

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.40			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
		1.00	D SPT	N=7 (2,1/1,1,2,3)	1.00			Stiff brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	1
		2.00	D SPT	N=24 (3,4/5,5,7,7)				Firm low strength reddish brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Becoming very stiff high strength at 2.00 m bgl. Becoming stiff medium strength at 4.00 m bgl. Becoming very stiff very high strength at 5.00 m bgl.	2
		3.00	D SPT	N=24 (7,6/6,6,6,6)					3
		4.00	SPT	N=16 (4,3/4,4,4,4)					4
		5.00	SPT	N=19 (4,5/5,4,5,5)					5
					5.45			End of Borehole at 5.45m	6
									7
									8
									9
									10

Remarks

1. Complete. 2. Monitoring well installed (response zone between 1.00 m and 5.00 m bgl).

Borehole Log

Borehole No.

WS133

Sheet 1 of 1

Project Name: Chapel Lane

Project No.
13759

Co-ords: 349882E - 387656N

Hole Type
WS

Location: Widnes

Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 26/08/2020

Logged By
J. Sheridan

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES		0.40			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
					0.80			Stiff brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.	
		1.00	D					Stiff medium strength reddish brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Becoming very stiff high strength at 2.00 m bgl. Becoming stiff medium strength at 4.00 m bgl. Becoming very stiff high strength at 5.00 m bgl.	1
		1.00	SPT	N=10 (2,1/2,2,3,3)					
		2.00	D						2
		2.00	SPT	N=20 (5,6/5,4,6,5)					
		2.50	ES						
		3.00	D						3
		3.00	SPT	N=20 (4,5/5,5,5,5)					
		4.00	D						4
		4.00	SPT	N=15 (3,4/3,4,4,4)					
		5.00	D						5
		5.00	SPT	N=19 (5,4/5,5,5,4)					
					5.45			End of Borehole at 5.45m	6
									7
									8
									9
									10

Remarks

1. Complete.

Borehole Log

Borehole No.

WS134

Sheet 1 of 1

Project Name: Chapel Lane

Project No.
13759

Co-ords: 349737E - 387703N

Hole Type
WS

Location: Widnes

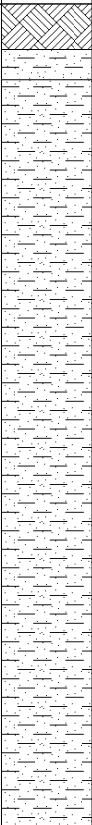
Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 26/08/2020

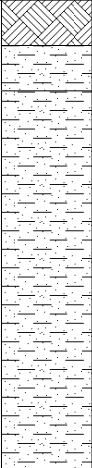
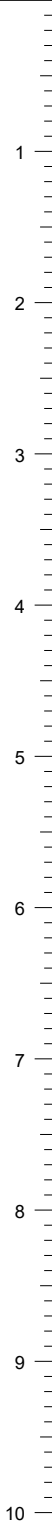
Logged By
J. Sheridan

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES		0.30			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone. Stiff brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Stiff medium strength reddish brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Becoming very stiff high strength at 3.00 m bgl.	1
		0.50	U		0.50				
		1.00	D						
		1.00	SPT	N=11 (2,1/3,2,2,4)					
		2.00	D						
		2.00	SPT	N=13 (2,3/3,4,3,3)					
		3.00	D						
		3.00	SPT	N=20 (3,4/4,5,5,6)					
		4.00	D						
		4.00	SPT	N=19 (3,4/4,5,5,5)					
		5.00	D						
		5.00	SPT	N=20 (3,4/4,5,5,6)					
					5.45			End of Borehole at 5.45m	6
									7
									8
									9
									10

Remarks

1. Complete.

				Borehole Log				Borehole No. WS135 Sheet 1 of 1	
Project Name: Chapel Lane				Project No. 13759		Co-ords: 349835E - 387680N		Hole Type WS	
Location: Widnes				Level:		Scale 1:50			
Client: Taylor Wimpey North West				Dates: 26/08/2020		Logged By J. Sheridan			

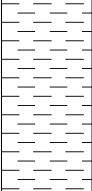
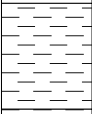
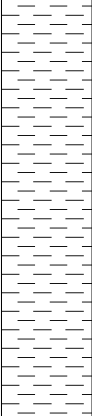
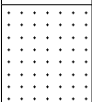
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.30		 Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone. Stiff brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Stiff medium strength reddish brown slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone. Becoming very stiff very high strength at 3.00 m bgl.		
					0.60				
		1.00	D	N=9 (1,2/2,2,2,3)					
		1.00	ES						
		1.00	SPT						
		1.50	U						
		2.00	D	N=11 (2,2/3,2,3,3)					
		2.00	SPT						
		3.00	D	50 (25 for 10mm/50 for 5mm)	3.10				
		3.00	SPT						
End of Borehole at 3.10m									

Remarks
 1. Complete. 2. Refused at 3.10 m bgl on dense SAND.



				Borehole Log				Borehole No. WS136 Sheet 1 of 1		
Project Name: Chapel Lane				Project No. 13759		Co-ords: 349862E - 387638N		Hole Type WS		
Location: Widnes						Level:		Scale 1:50		
Client: Taylor Wimpey North West						Dates: 26/08/2020		Logged By J. Sheridan		
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
					0.40			MADE GROUND: Dark brown slightly gravelly sandy clay (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	1	
					0.50					MADE GROUND: Brown mottled grey slightly gravelly sandy clay. Gravel is fine to coarse sub-angular to sub-rounded of mudstone, coal and sandstone.
		0.90	ES		1.00					MADE GROUND: Black sandy gravel. Gravel is fine sub-angular of mudstone. (Land drain encountered at 1.00 m bgl)
		1.00	D	N=11 (2,2/2,3,3,3)				Medium dense yellowish grey slightly clayey fine to medium SAND.		
		2.00	D	N=14 (2,3/4,4,3,3)	1.90			Medium dense brown very clayey fine to medium SAND. Becoming dense at 3.00 m bgl.	2	
		2.00	SPT							
		3.00	D	50 (3,10/50 for 230mm)	3.40				3	
		3.00	SPT							
End of Borehole at 3.40m									4	
									5	
									6	
									7	
									8	
									9	
									10	
Remarks 1. Complete. 2. Refused at 3.40 m bgl on very stiff CLAY.										

					Borehole Log			Borehole No. CP101 Sheet 1 of 1	
Project Name: Chapel Lane					Project No. 13759		Co-ords: 350156E - 387897N		Hole Type CP
Location: Widnes					Level:		Scale 1:50		
Client: Taylor Wimpey North West					Dates: 24/08/2020		Logged By PM Sampling		

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.50		 Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.		
							 Soft low strength brown mottled grey CLAY.	1	
	1.20	B	N=4 (1,0/1,1,0,2)						
	1.20	D							
	1.20	SPT							
	1.80	B		1.80			 Very stiff very high strength brown boulder CLAY.	2	
	2.00	U							
				2.50			 Very stiff very high strength brown boulder CLAY.	3	
	3.00	D	N=35 (2,4/6,9,10,10)						
	3.00	SPT							
4.00	U						4		
5.00	D	50 (8 for 0mm/50 for 10mm)						5	
5.00	SPT								
5.30	D	50 (25 for 0mm/50 for 10mm)		5.30		 Dense SANDSTONE.			
5.50	D								
5.50	SPT								
				5.95			End of Borehole at 5.95m	6	
								7	
								8	
								9	
								10	

Remarks
 1. Complete. 2. Refused at 5.95 m bgl on SANDSTONE bedrock.



Borehole Log

Borehole No.

CP102

Sheet 1 of 2

Project Name: Chapel Lane

Project No.
13759

Co-ords: 349802E - 387765N

Hole Type
CP

Location: Widnes

Level:

Scale
1:50

Client: Taylor Wimpey North West

Dates: 25/08/2020

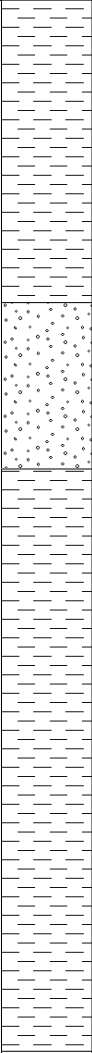
Logged By
PM Sampling

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.60			Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to medium angular to sub-rounded of mudstone and sandstone.	
								Firm low strength brown mottled grey CLAY.	1
		1.20 1.20 1.20	B D SPT	N=6 (1,1/1,2,1,2)					
		2.00	U		2.00			Very stiff very high strength brown boulder CLAY.	2
		3.00 3.00	D SPT	N=38 (1,5/7,10,10,11)					3
		4.00	U		4.00			Stiff medium strength CLAY. Becoming very stiff high strength at 7.50 m bgl. Becoming stiff medium strength at 10.50 m bgl. Becoming very stiff high strength at 13.50 m bgl. Becoming very stiff very high strength at 15.00 m bgl.	4
		5.00 5.00	D SPT	N=17 (2,2/4,4,4,5)					5
		6.00	U						6
		6.50	B						7
		7.50 7.50	D SPT	N=22 (2,4/5,5,6,6)					8
		9.00	U						9
									10

Remarks

1. Complete. 2. Refused at 16.95 m bgl on very stiff CLAY. 3. Water strikes encountered at 11.80 m bgl and 12.00 m bgl.

				Borehole Log				Borehole No. CP102 Sheet 2 of 2	
Project Name: Chapel Lane				Project No. 13759		Co-ords: 349802E - 387765N		Hole Type CP	
Location: Widnes				Level:		Scale 1:50			
Client: Taylor Wimpey North West				Dates: 25/08/2020		Logged By PM Sampling			

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
	 12.00	10.50 10.50	D SPT	N=16 (1,3/3,4,4,5)	12.00 13.10 16.95		Stiff medium strength CLAY. Becoming very stiff high strength at 7.50 m bgl. Becoming stiff medium strength at 10.50 m bgl. Becoming very stiff high strength at 13.50 m bgl. Becoming very stiff very high strength at 15.00 m bgl.	11	
		12.00	U				Sparse GRAVEL with SAND bands.	12	
		13.50 13.50	D SPT	N=30 (3,4/5,7,8,10)			Very stiff high strength brown boulder CLAY. Becoming very stiff very high strength at 15.00 m bgl.	13	
		15.00 15.00	D SPT	50 (4,4/50 for 255mm)				14	
		16.50 16.50	D SPT	50 (3,6/50 for 150mm)				15	
		End of Borehole at 16.95m							17
Remarks 1. Complete. 2. Refused at 16.95 m bgl on very stiff CLAY. 3. Water strikes encountered at 11.80 m bgl and 12.00 m bgl.									



APPENDIX VI

CHEMICAL TESTING

RESULTS



Veronique Wilkinson

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e: vwilkinson@e3p.co.uk

Analytical Report Number : 20-27331

Project / Site name:	Chapel Lane	Samples received on:	26/08/2020
Your job number:	13-759	Samples instructed on/ Analysis started on:	26/08/2020
Your order number:	13759 VW G	Analysis completed by:	03/09/2020
Report Issue Number:	1	Report issued on:	03/09/2020
Samples Analysed:	13 soil samples		

Signed: *A. Czerwińska*

Agnieszka Czerwińska
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.



Analytical Report Number: 20-27331

Project / Site name: Chapel Lane

Your Order No: 13759 VW G

Lab Sample Number	1606969	1606970	1606971	1606972
Sample Reference	TP103	TP109	TP112	TP119
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.10	0.10	0.20	0.10
Date Sampled	24/08/2020	24/08/2020	24/08/2020	24/08/2020
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status	

Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	17	6.4	16	14
Total mass of sample received	kg	0.001	NONE	0.5	0.5	0.5	0.5

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected
------------------	------	-----	-----------	--------------	--------------	--------------	--------------

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	-	-	-	-
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1
Total Sulphate as SO ₄	mg/kg	50	MCERTS	-	-	-	-
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	-	-	-
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	-	-	-
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	-	-
Sulphide	mg/kg	1	MCERTS	-	-	-	-
Total Sulphur	mg/kg	50	MCERTS	-	-	-	-
Total Organic Carbon (TOC)	%	0.1	MCERTS	-	-	-	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	-	-	-	-
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.42	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.37	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.24	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.21	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	< 0.80	1.24	< 0.80
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	14	3.5	15	17
Barium (aqua regia extractable)	mg/kg	1	MCERTS	210	44	210	230
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.75	0.28	1	0.89
Boron (water soluble)	mg/kg	0.2	MCERTS	0.3	0.2	0.6	0.4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.5	< 0.2	0.5	0.5
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	67	11	57	72
Lead (aqua regia extractable)	mg/kg	1	MCERTS	70	75	53	68



Analytical Report Number: 20-27331

Project / Site name: Chapel Lane

Your Order No: 13759 VW G

Lab Sample Number				1606969	1606970	1606971	1606972
Sample Reference				TP103	TP109	TP112	TP119
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.10	0.20	0.10
Date Sampled				24/08/2020	24/08/2020	24/08/2020	24/08/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	20	9	26	24
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	25	9.3	30	28
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	120	21	120	140

Petroleum Hydrocarbons

TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C21 - C35)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C35 - C40)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10
TPH Total C5 - C40	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number: 20-27331

Project / Site name: Chapel Lane

Your Order No: 13759 VW G

Lab Sample Number	1606973	1606974	1606975	1606976
Sample Reference	TP122	TP124	TP125	WS101
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.10	0.10	0.10	0.60
Date Sampled	25/08/2020	25/08/2020	25/08/2020	25/08/2020
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status	

Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	14	18	22	21
Total mass of sample received	kg	0.001	NONE	0.5	0.5	0.5	0.5

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected
------------------	------	-----	-----------	--------------	--------------	--------------	--------------

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.3	-	-	-
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1
Total Sulphate as SO ₄	mg/kg	50	MCERTS	350	-	-	-
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	13	-	-	-
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.0066	-	-	-
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	6.6	-	-	-
Sulphide	mg/kg	1	MCERTS	< 1.0	-	-	-
Total Sulphur	mg/kg	50	MCERTS	280	-	-	-
Total Organic Carbon (TOC)	%	0.1	MCERTS	-	-	-	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	-	-	-
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.27	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.32	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.33	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	< 0.80	0.92	< 0.80
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	13	16	16	6.5
Barium (aqua regia extractable)	mg/kg	1	MCERTS	-	230	190	70
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	-	0.82	0.75	0.87
Boron (water soluble)	mg/kg	0.2	MCERTS	-	0.3	< 0.2	0.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.4	0.6	0.5	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	7	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	30	-	-	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	60	60	54	21
Lead (aqua regia extractable)	mg/kg	1	MCERTS	52	57	52	16



Analytical Report Number: 20-27331

Project / Site name: Chapel Lane

Your Order No: 13759 VW G

Lab Sample Number				1606973	1606974	1606975	1606976
Sample Reference				TP122	TP124	TP125	WS101
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.10	0.10	0.60
Date Sampled				25/08/2020	25/08/2020	25/08/2020	25/08/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.4	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	22	21	21	30
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	-	31	31	43
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	120	130	120	60

Petroleum Hydrocarbons

TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C21 - C35)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C35 - C40)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10
TPH Total C5 - C40	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number: 20-27331

Project / Site name: Chapel Lane

Your Order No: 13759 VW G

Lab Sample Number	1606977	1606978	1606979	1606980
Sample Reference	WS102	WS106	WS113	WS116
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.95	4.00	0.50	0.10
Date Sampled	25/08/2020	25/08/2020	25/08/2020	25/08/2020
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status	

Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	21	10	16	16
Total mass of sample received	kg	0.001	NONE	0.5	0.5	0.5	0.5

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected
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General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.8	-	7.6	-
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1
Total Sulphate as SO ₄	mg/kg	50	MCERTS	470	-	200	-
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	28	-	20	-
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.014	-	0.01	-
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	14.2	-	10	-
Sulphide	mg/kg	1	MCERTS	3.3	-	< 1.0	-
Total Sulphur	mg/kg	50	MCERTS	340	-	180	-
Total Organic Carbon (TOC)	%	0.1	MCERTS	1.7	-	1.6	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	< 0.80	< 0.80	< 0.80
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	3.2	16	8.8	16
Barium (aqua regia extractable)	mg/kg	1	MCERTS	-	210	-	210
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	-	0.72	-	0.71
Boron (water soluble)	mg/kg	0.2	MCERTS	-	< 0.2	-	0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	0.5	0.7	0.5
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	29	-	16	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	7.6	59	34	58
Lead (aqua regia extractable)	mg/kg	1	MCERTS	7.3	54	110	53



Analytical Report Number: 20-27331

Project / Site name: Chapel Lane

Your Order No: 13759 VW G

Lab Sample Number				1606977	1606978	1606979	1606980
Sample Reference				WS102	WS106	WS113	WS116
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.95	4.00	0.50	0.10
Date Sampled				25/08/2020	25/08/2020	25/08/2020	25/08/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	14	21	13	20
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	-	28	-	28
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	17	140	140	140

Petroleum Hydrocarbons

TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C21 - C35)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C35 - C40)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10
TPH Total C5 - C40	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 20-27331

Project / Site name: Chapel Lane

Your Order No: 13759 VW G

Lab Sample Number				1606981
Sample Reference				WS117
Sample Number				None Supplied
Depth (m)				0.30
Date Sampled				25/08/2020
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status	

Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	N/A	NONE	14
Total mass of sample received	kg	0.001	NONE	0.5

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected
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General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.2
Total Cyanide	mg/kg	1	MCERTS	< 1
Total Sulphate as SO ₄	mg/kg	50	MCERTS	430
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	27
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.014
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	13.7
Sulphide	mg/kg	1	MCERTS	5.5
Total Sulphur	mg/kg	50	MCERTS	270
Total Organic Carbon (TOC)	%	0.1	MCERTS	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	19
Barium (aqua regia extractable)	mg/kg	1	MCERTS	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	-
Boron (water soluble)	mg/kg	0.2	MCERTS	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.6
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	28
Copper (aqua regia extractable)	mg/kg	1	MCERTS	66
Lead (aqua regia extractable)	mg/kg	1	MCERTS	62

Analytical Report Number: 20-27331

Project / Site name: Chapel Lane

Your Order No: 13759 VW G

Lab Sample Number				1606981
Sample Reference				WS117
Sample Number				None Supplied
Depth (m)				0.30
Date Sampled				25/08/2020
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status	
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	22
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	140

Petroleum Hydrocarbons

TPH (C5 - C6)	mg/kg	1	NONE	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	< 1.0
TPH (C21 - C35)	mg/kg	1	MCERTS	< 1.0
TPH (C35 - C40)	mg/kg	10	MCERTS	< 10
TPH Total C5 - C40	mg/kg	10	MCERTS	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number : 20-27331

Project / Site name: Chapel Lane

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1606969	TP103	None Supplied	0.1	Brown loam and clay with gravel and vegetation.
1606970	TP109	None Supplied	0.1	Brown loam with gravel and vegetation.
1606971	TP112	None Supplied	0.2	Brown loam and clay with gravel and vegetation.
1606972	TP119	None Supplied	0.1	Brown loam and clay with gravel and vegetation.
1606973	TP122	None Supplied	0.1	Brown loam and clay with gravel and vegetation.
1606974	TP124	None Supplied	0.1	Brown loam and clay with gravel and vegetation.
1606975	TP125	None Supplied	0.1	Brown loam and clay with gravel and vegetation.
1606976	WS101	None Supplied	0.6	Brown clay with gravel.
1606977	WS102	None Supplied	0.95	Brown clay and loam with gravel.
1606978	WS106	None Supplied	4	Brown clay and loam.
1606979	WS113	None Supplied	0.5	Brown loam and clay with gravel and vegetation.
1606980	WS116	None Supplied	0.1	Brown loam and clay with gravel and vegetation.
1606981	WS117	None Supplied	0.3	Brown loam and clay with gravel and vegetation.



Analytical Report Number : 20-27331

Project / Site name: Chapel Lane

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS



Analytical Report Number : 20-27331
Project / Site name: Chapel Lane

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
 For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
 Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.



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Analytical Report Number : 20-27710

Project / Site name:	Chapel Lane	Samples received on:	27/08/2020
Your job number:	13-759	Samples instructed on/ Analysis started on:	27/08/2020
Your order number:	13759 VW G	Analysis completed by:	07/09/2020
Report Issue Number:	1	Report issued on:	07/09/2020
Samples Analysed:	2 leachate samples - 15 soil samples		

Signed: *A. Czerwińska*

Agnieszka Czerwińska
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.



Analytical Report Number: 20-27710
Project / Site name: Chapel Lane



Your Order No: 13759 VW G

Lab Sample Number				1608881	1608882
Sample Reference				TP140	WS120
Sample Number				None Supplied	None Supplied
Depth (m)				0.10	0.50
Date Sampled				26/08/2020	26/08/2020
Time Taken				None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status		

General Inorganics

pH	pH Units	N/A	ISO 17025	6.5	7.2
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	< 1.0	< 1.0

Total Phenols

Total Phenols (monohydric)	µg/l	1	ISO 17025	4	4.6
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Speciated PAHs

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01	< 0.01

Total PAH

Total EPA-16 PAHs	µg/l	0.2	NONE	< 0.2	< 0.2
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Heavy Metals / Metalloids

Arsenic (dissolved)	µg/l	1.1	ISO 17025	3.7	2.9
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	U/S*
Chromium (dissolved)	µg/l	0.4	ISO 17025	4	3
Copper (dissolved)	µg/l	0.7	ISO 17025	35	8.2
Lead (dissolved)	µg/l	1	ISO 17025	6.2	2
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5
Nickel (dissolved)	µg/l	0.3	ISO 17025	3	0.6
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0
Zinc (dissolved)	µg/l	0.4	ISO 17025	23	2.9

Monoaromatics & Oxygenates

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	10	NONE	< 10	< 10

Petroleum Hydrocarbons

TPH1 (C10 - C40)	µg/l	10	NONE	< 10	< 10
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Your Order No: 13759 VW G

Lab Sample Number				1608881	1608882
Sample Reference				TP140	WS120
Sample Number				None Supplied	None Supplied
Depth (m)				0.10	0.50
Date Sampled				26/08/2020	26/08/2020
Time Taken				None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status		
TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample

*U/S due to high variances between chromium (hexavalent) and chromium (dissolved) caused by method differences.

Analytical Report Number: 20-27710

Project / Site name: Chapel Lane

Your Order No: 13759 VW G

Lab Sample Number				1608866	1608867	1608868	1608869
Sample Reference				TP129	TP131	TP133	TP134
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.10	1.00	0.10
Date Sampled				26/08/2020	26/08/2020	26/08/2020	26/08/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)				Units	Limit of detection	Accreditation Status	

Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	15	20	17	13
Total mass of sample received	kg	0.001	NONE	0.5	0.5	0.5	0.5

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	-

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	-	-	-	7
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1
Total Sulphate as SO4	mg/kg	50	MCERTS	-	-	-	350
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	-	-	30
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	-	-	0.015
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	-	15.2
Sulphide	mg/kg	1	MCERTS	-	-	-	29
Total Sulphur	mg/kg	50	MCERTS	-	-	-	220
Total Organic Carbon (TOC)	%	0.1	MCERTS	0.7	-	1.7	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	-	-	-	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	< 0.80	< 0.80	< 0.80
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	8.8	12	4.7	19
Barium (aqua regia extractable)	mg/kg	1	MCERTS	81	170	58	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.63	0.71	0.48	-
Boron (water soluble)	mg/kg	0.2	MCERTS	< 0.2	0.4	< 0.2	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	0.4	< 0.2	0.5
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0

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Project / Site name: Chapel Lane

Your Order No: 13759 VW G

Lab Sample Number				1608866	1608867	1608868	1608869
Sample Reference				TP129	TP131	TP133	TP134
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.10	1.00	0.10
Date Sampled				26/08/2020	26/08/2020	26/08/2020	26/08/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	27
Copper (aqua regia extractable)	mg/kg	1	MCERTS	15	44	12	76
Lead (aqua regia extractable)	mg/kg	1	MCERTS	15	150	14	99
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	0.4
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	21	22	16	23
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	39	31	23	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	40	95	26	150

Petroleum Hydrocarbons

TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C21 - C35)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C35 - C40)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10
TPH Total C5 - C40	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number: 20-27710

Project / Site name: Chapel Lane

Your Order No: 13759 VW G

Lab Sample Number				1608870	1608871	1608872	1608873
Sample Reference				TP135	TP138	TP139	TP141
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.10	0.40	0.50
Date Sampled				26/08/2020	26/08/2020	26/08/2020	26/08/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)				Units	Limit of detection	Accreditation Status	

Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	12	19	14	12
Total mass of sample received	kg	0.001	NONE	0.5	0.5	0.5	0.5

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	-

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	-	-	6.9	-
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1
Total Sulphate as SO4	mg/kg	50	MCERTS	-	-	190	-
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	-	27	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	-	0.013	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	13.3	-
Sulphide	mg/kg	1	MCERTS	-	-	5	-
Total Sulphur	mg/kg	50	MCERTS	-	-	120	-
Total Organic Carbon (TOC)	%	0.1	MCERTS	0.4	-	-	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	-	-	< 1.0	-
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	0.29	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.44	< 0.05	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05	0.46	< 0.05	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.29	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	0.27	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	1.75	< 0.80	< 0.80
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	3.9	13	8.9	6.8
Barium (aqua regia extractable)	mg/kg	1	MCERTS	71	180	-	110
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.44	0.67	-	1.1
Boron (water soluble)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	-	0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	0.4	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0



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Lab Sample Number				1608870	1608871	1608872	1608873
Sample Reference				TP135	TP138	TP139	TP141
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.10	0.40	0.50
Date Sampled				26/08/2020	26/08/2020	26/08/2020	26/08/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	41	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	8.6	53	17	22
Lead (aqua regia extractable)	mg/kg	1	MCERTS	7.2	300	20	8.8
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.4	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	14	19	23	44
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	22	25	-	38
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	22	89	34	49

Petroleum Hydrocarbons

TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C21 - C35)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C35 - C40)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10
TPH Total C5 - C40	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number: 20-27710

Project / Site name: Chapel Lane

Your Order No: 13759 VW G

Lab Sample Number				1608874	1608875	1608876	1608877
Sample Reference				TP144	TP145	WS121	WS124
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.90	0.80	4.00	0.20
Date Sampled				26/08/2020	26/08/2020	26/08/2020	26/08/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)				Units	Limit of detection	Accreditation Status	

Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	16	8	11	23
Total mass of sample received	kg	0.001	NONE	1	0.5	0.5	0.5

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	Chrysotile	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	< 0.001	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	< 0.001	-	-

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	-	7.5	-	7.4
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1
Total Sulphate as SO4	mg/kg	50	MCERTS	-	350	-	670
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	34	-	63
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	0.017	-	0.031
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	16.8	-	31.4
Sulphide	mg/kg	1	MCERTS	-	12	-	2.3
Total Sulphur	mg/kg	50	MCERTS	-	2400	-	490
Total Organic Carbon (TOC)	%	0.1	MCERTS	0.6	-	0.6	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	-	< 1.0	-	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.16
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.44
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.43
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.39
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.31
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.44
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.22
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.24

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	< 0.80	< 0.80	2.63
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	9.4	12	5.2	26
Barium (aqua regia extractable)	mg/kg	1	MCERTS	82	-	110	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.78	-	0.65	-
Boron (water soluble)	mg/kg	0.2	MCERTS	< 0.2	-	0.2	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	0.3	< 0.2	0.6
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0



Analytical Report Number: 20-27710

Project / Site name: Chapel Lane

Your Order No: 13759 VW G

Lab Sample Number				1608874	1608875	1608876	1608877
Sample Reference				TP144	TP145	WS121	WS124
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.90	0.80	4.00	0.20
Date Sampled				26/08/2020	26/08/2020	26/08/2020	26/08/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	27	-	32
Copper (aqua regia extractable)	mg/kg	1	MCERTS	21	58	19	92
Lead (aqua regia extractable)	mg/kg	1	MCERTS	16	96	9.2	100
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.3	< 0.3	0.5
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	21	21	29	26
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	36	-	23	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	46	100	40	180

Petroleum Hydrocarbons

TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C21 - C35)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C35 - C40)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10
TPH Total C5 - C40	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 20-27710

Project / Site name: Chapel Lane

Your Order No: 13759 VW G

Lab Sample Number	1608878	1608879	1608880
Sample Reference	WS125	WS126	WS133
Sample Number	None Supplied	None Supplied	None Supplied
Depth (m)	0.20	0.10	2.50
Date Sampled	26/08/2020	26/08/2020	26/08/2020
Time Taken	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status

Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	17	19	17
Total mass of sample received	kg	0.001	NONE	0.5	0.5	0.5

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	-	-	-
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1
Total Sulphate as SO4	mg/kg	50	MCERTS	-	-	-
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	-
Sulphide	mg/kg	1	MCERTS	-	-	-
Total Sulphur	mg/kg	50	MCERTS	-	-	-
Total Organic Carbon (TOC)	%	0.1	MCERTS	-	-	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	-	-	-
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.25	< 0.05	0.23
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.64	< 0.05	0.36
Pyrene	mg/kg	0.05	MCERTS	0.62	< 0.05	0.31
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.34	< 0.05	0.2
Chrysene	mg/kg	0.05	MCERTS	0.37	< 0.05	0.16
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	2.22	< 0.80	1.26
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	22	20	16
Barium (aqua regia extractable)	mg/kg	1	MCERTS	240	240	220
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.2	0.97	0.84
Boron (water soluble)	mg/kg	0.2	MCERTS	< 0.2	0.3	< 0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.6	0.6	0.5
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0



Analytical Report Number: 20-27710

Project / Site name: Chapel Lane

Your Order No: 13759 VW G

Lab Sample Number				1608878	1608879	1608880
Sample Reference				WS125	WS126	WS133
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.10	2.50
Date Sampled				26/08/2020	26/08/2020	26/08/2020
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status			
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	120	86	67
Lead (aqua regia extractable)	mg/kg	1	MCERTS	130	88	82
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.4	0.5	0.4
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	27	22	22
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	33	28	27
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	220	140	120

Petroleum Hydrocarbons

TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
TPH (C21 - C35)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
TPH (C35 - C40)	mg/kg	10	MCERTS	< 10	< 10	< 10
TPH Total C5 - C40	mg/kg	10	MCERTS	< 10	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number: 20-27710
Project / Site name: Chapel Lane
Your Order No: 13759 VW G

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006-PL based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
1608875	TP145	0.80	74	Loose Fibres	Chrysotile	< 0.001	< 0.001

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Analytical Report Number : 20-27710

Project / Site name: Chapel Lane

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1608866	TP129	None Supplied	0.4	Brown clay and loam with gravel.
1608867	TP131	None Supplied	0.1	Brown clay and loam with gravel.
1608868	TP133	None Supplied	1	Brown clay and loam with gravel.
1608869	TP134	None Supplied	0.1	Brown loam and clay with gravel and vegetation.
1608870	TP135	None Supplied	0.3	Brown clay and sand with gravel.
1608871	TP138	None Supplied	0.1	Brown loam and clay with gravel.
1608872	TP139	None Supplied	0.4	Brown clay and loam with gravel.
1608873	TP141	None Supplied	0.5	Brown loam and clay with gravel.
1608874	TP144	None Supplied	0.9	Brown loam and clay with gravel.
1608875	TP145	None Supplied	0.8	Brown loam and clay with gravel.
1608876	WS121	None Supplied	4	Brown clay.
1608877	WS124	None Supplied	0.2	Brown loam and clay with gravel.
1608878	WS125	None Supplied	0.2	Brown loam and clay with gravel.
1608879	WS126	None Supplied	0.1	Brown loam and clay with gravel.
1608880	WS133	None Supplied	2.5	Brown loam and clay with gravel.



Analytical Report Number : 20-27710

Project / Site name: Chapel Lane

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
BS EN 12457-1 (2:1) Leachate Prep	2:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-1.	L043-PL	W	NONE
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in leachate - LOW LEVEL 1 ug/l	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in leachate	Determination of PAH compounds in leachate by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L102B-PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
pH at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In house method.	L005-PL	W	ISO 17025
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS



Analytical Report Number : 20-27710

Project / Site name: Chapel Lane

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
TPH1 (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	NONE
TPHCWG (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX and MTBE in leachates (Monoaromatics)	Determination of BTEX and MTBE in leachates by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
Total cyanide in leachate - 1µg/l	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.



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Analytical Report Number : 20-29068

Project / Site name:	Chaple Lane	Samples received on:	09/09/2020
Your job number:	13.375	Samples instructed on/ Analysis started on:	09/09/2020
Your order number:		Analysis completed by:	16/09/2020
Report Issue Number:	1	Report issued on:	16/09/2020
Samples Analysed:	4 water samples		

Signed:

Joanna Wawrzeczko
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.



Analytical Report Number: 20-29068
Project / Site name: Chaple Lane

Lab Sample Number				1615707	1615708	1615709	1615710
Sample Reference				WS114	WS103	WS131	WS127
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)				Units	Limit of detection	Accreditation Status	

General Inorganics

pH	pH Units	N/A	ISO 17025	7.4	6.7	7.5	7.4
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	13	< 1.0	< 1.0	< 1.0
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	16.2	13.9	3.57	2.06

Total Phenols

Total Phenols (monohydric)	µg/l	1	ISO 17025	4	2.3	3.4	2.9
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Heavy Metals / Metalloids

Calcium (dissolved)	mg/l	0.012	ISO 17025	700	72	130	130
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0

Arsenic (dissolved)	µg/l	0.15	ISO 17025	109	2.11	0.99	0.83
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	0.03	< 0.02	< 0.02
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	1.2	0.4	< 0.2
Copper (dissolved)	µg/l	0.5	ISO 17025	0.9	7.4	5.6	4.5
Lead (dissolved)	µg/l	0.2	ISO 17025	0.5	1.5	1.2	0.7
Manganese (dissolved)	µg/l	0.05	ISO 17025	3400	190	130	97
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	5	3.4	2.4	1.6
Selenium (dissolved)	µg/l	0.6	ISO 17025	2.5	2	1.7	1
Zinc (dissolved)	µg/l	0.5	ISO 17025	5.4	13	14	7

Monoaromatics & Oxygenates

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0



Analytical Report Number: 20-29068

Project / Site name: Chaple Lane

Lab Sample Number				1615707	1615708	1615709	1615710
Sample Reference				WS114	WS103	WS131	WS127
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				

Petroleum Hydrocarbons

TPH1 (C10 - C40)	µg/l	10	NONE	< 10	< 10	< 10	< 10
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TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	< 10	< 10

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	< 10	< 10

VOCs

Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0



Analytical Report Number: 20-29068
Project / Site name: Chaple Lane

Lab Sample Number				1615707	1615708	1615709	1615710
Sample Reference				WS114	WS103	WS131	WS127
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0

SVOCs

Aniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05



Analytical Report Number: 20-29068
Project / Site name: Chaple Lane

Lab Sample Number				1615707	1615708	1615709	1615710
Sample Reference				WS114	WS103	WS131	WS127
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Dibenzofuran	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Azobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Carbazole	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Anthraquinone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number : 20-29068
Project / Site name: Chaple Lane

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Monohydric phenols in water - LOW LEVEL 1 ug/l	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Semi-volatile organic compounds in water	Determination of semi-volatile organic compounds in leachate by extraction in dichloromethane followed by GC-MS.	In-house method based on USEPA 8270	L102B-PL	W	NONE
TPH1 (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Low level total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Sample Deviation Report



Analytical Report Number : 20-29068
Project / Site name: Chaple Lane

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
WS103	None Supplied	W	1615708	a	None Supplied	None Supplied	None Supplied
WS114	None Supplied	W	1615707	a	None Supplied	None Supplied	None Supplied
WS127	None Supplied	W	1615710	a	None Supplied	None Supplied	None Supplied
WS131	None Supplied	W	1615709	a	None Supplied	None Supplied	None Supplied

APPENDIX VII

ORIGIN OF TIER I GENERIC ASSESSMENT CRITERIA

CONSTITUENT	ORIGIN OF RISK ASSESSMENT VALUE
Arsenic	2014 LQM/CIEH S4ULs
Cadmium	2014 LQM/CIEH S4ULs
Chromium	2014 LQM/CIEH S4ULs
Lead	2014 LQM/CIEH S4ULs
Mercury	2014 LQM/CIEH S4ULs – methylmercury
Nickel	2014 LQM/CIEH S4ULs
Selenium	2014 LQM/CIEH S4ULs
Copper	2014 LQM/CIEH S4ULs
Zinc	2014 LQM/CIEH S4ULs
Cyanide – Total	2014 LQM/CIEH S4ULs
Phenols – Total	2014 LQM/CIEH S4ULs
Naphthalene	General assessment criteria (GAC) developed by CIEH/LQM Suitable 4 Use Levels with supporting data from SR3, SR7 and existing Tox report where applicable. 1% SOM.
Acenaphthylene	
Acenaphthene	
Fluorene	
Phenanthrene	
Anthracene	
Fluoranthene	
Pyrene	
Benzo(a)Anthracene	
Chrysene	
Benzo(b/k)Fluoranthene ⁽ⁱⁱⁱ⁾	
Benzo(a)Pyrene	
Indeno(123-cd)Pyrene	
Dibenzo(a,h)Anthracene	
Benzo(ghi)Perylene	
TPH C ₅ -C ₆ (aliphatic)	
TPH C ₆ -C ₈ (aliphatic)	
TPH C ₈ -C ₁₀ (aliphatic)	
TPH C ₁₀ -C ₁₂ (aliphatic)	
TPH C ₁₂ -C ₁₆ (aromatic)	
TPH C ₁₆ -C ₂₁ (aromatic)	
TPH C ₂₁ -C ₃₅ (aromatic)	



APPENDIX VIII DYNAMIC CONE PENETROMETER TEST CERTIFICATES

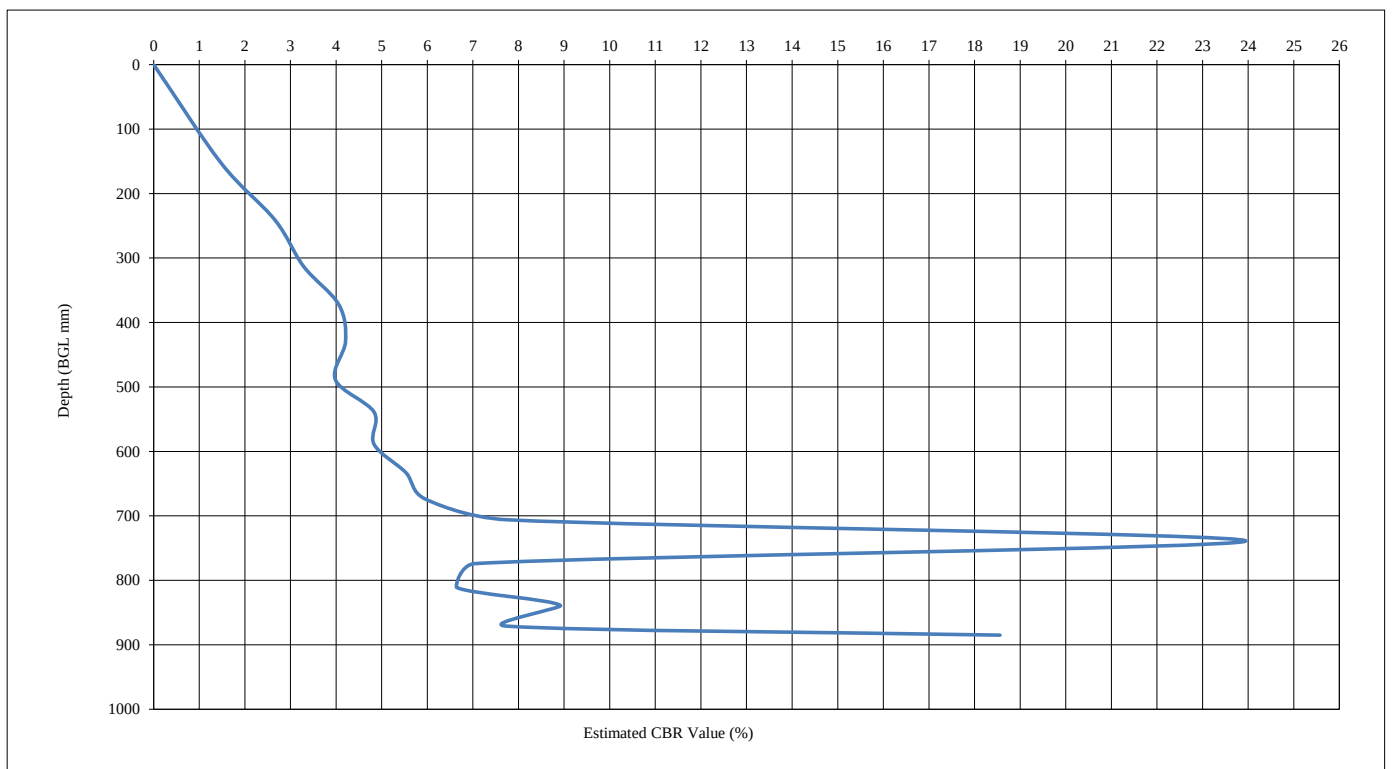


Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

Site Name	Chapel Lane	Test Date:	11/09/2020
Site Ref	13-759	Test Location:	Widnes
Test No.:	DCP101	Easting:	0
Initial Depth (mm BGL):	0	Northing:	0
Final Depth (mm BGL):	885		

Estimated California Bearing Ratio Graph



Start Depth (mm) BGL	Finish Depth (mm) BGL	No. of Blows	Blows Per Layer	DCP mm/Blows	Ave Estimated Layer (CBR %)
0	739	14	14	52.79	4.56
739	839	17	3	33.33	7.42
839	885	19	2	23.00	10.98

Comments

Site Engineer:	Checked By:	Date:	Approved By:	Date:
HM	VW	19/10/2020	JS	19/10/2020



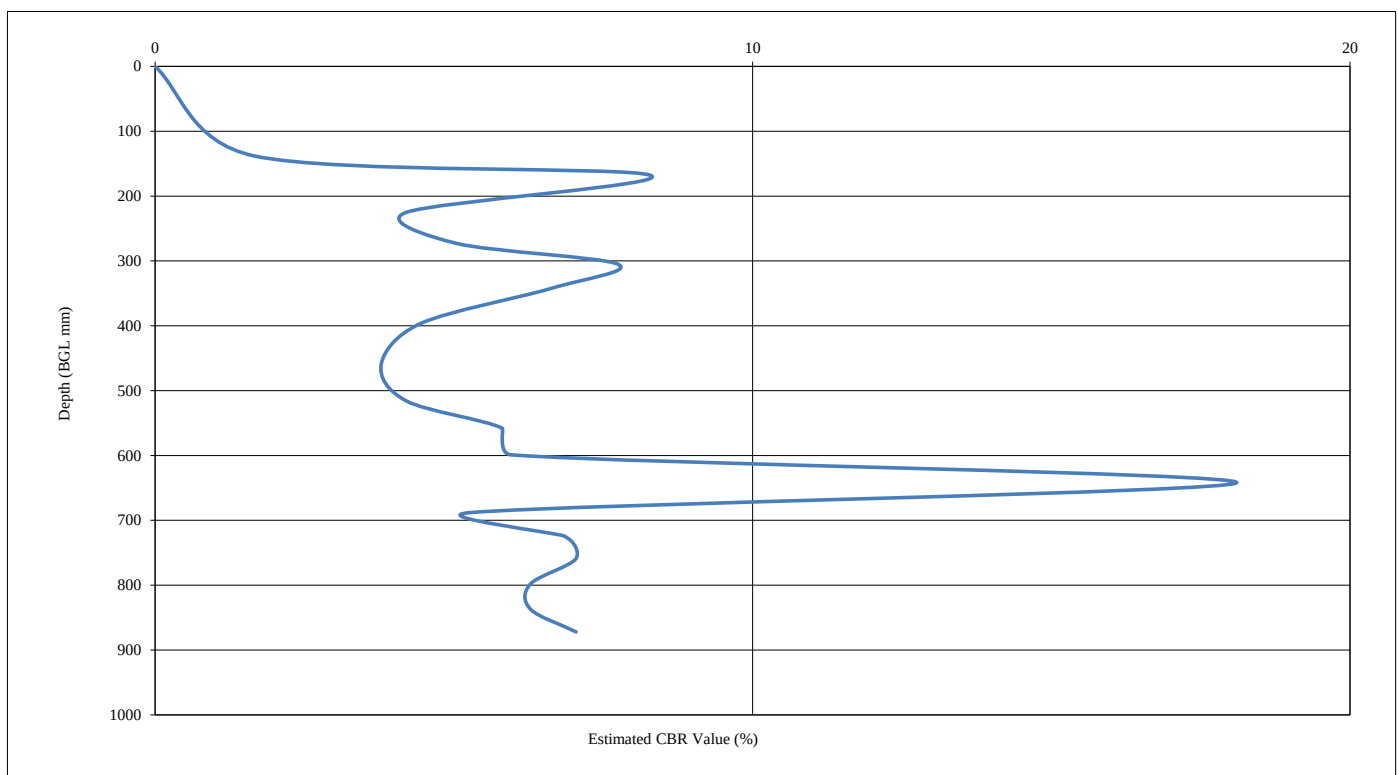
Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

Site Name Chapel Lane
Site Ref 13-759
Test No.: DCP102
Initial Depth (mm BGL): 0
Final Depth (mm BGL): 872

Test Date: 11/09/2020
Test Location: Widnes
Easting: 0
Northing: 0

Estimated California Bearing Ratio Graph



Start Depth (mm) BGL	Finish Depth (mm) BGL	No. of Blows	Blows Per Layer	DCP mm/Blows	Ave Estimated Layer (CBR %)
0	168	2	2	84.00	2.79
168	305	5	3	45.67	5.32
305	642	14	9	37.44	6.56
642	872	20	6	38.33	6.40

Comments

Site Engineer:	Checked By:	Date:	Approved By:	Date:
HM	VW	19/10/2020	JS	19/10/2020

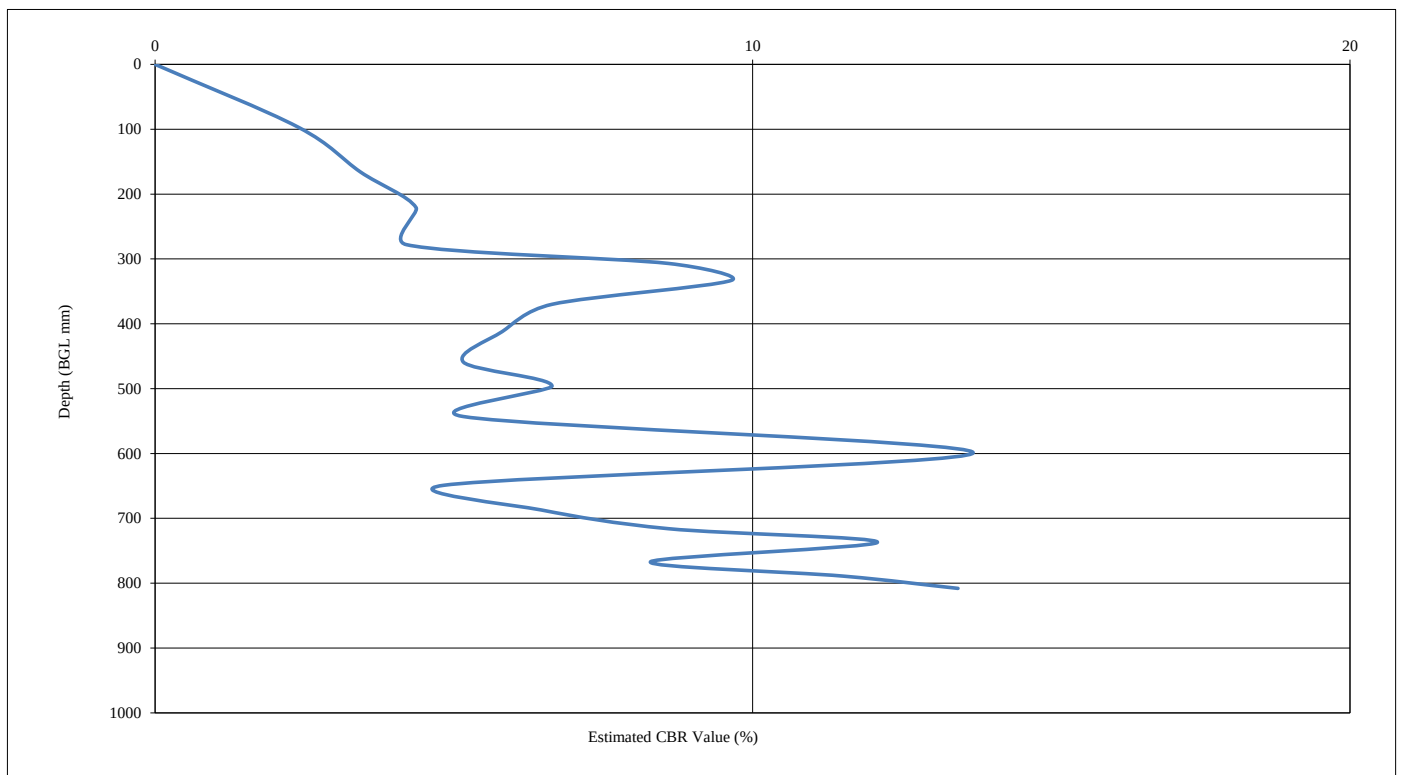


Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

Site Name	Chapel Lane	Test Date:	11/09/2020
Site Ref	13-759	Test Location:	Widnes
Test No.:	DCP103	Easting:	0
Initial Depth (mm BGL):	0	Northing:	0
Final Depth (mm BGL):	808		

Estimated California Bearing Ratio Graph



Start Depth (mm) BGL	Finish Depth (mm) BGL	No. of Blows	Blows Per Layer	DCP mm/Blows	Ave Estimated Layer (CBR %)
0	333	6	6	55.50	4.33
333	599	14	8	33.25	7.44
599	737	18	4	34.50	7.15
737	808	21	3	23.67	10.65

Comments

Site Engineer:	Checked By:	Date:	Approved By:	Date:
HM	VW	19/10/2020	VW	19/10/2020

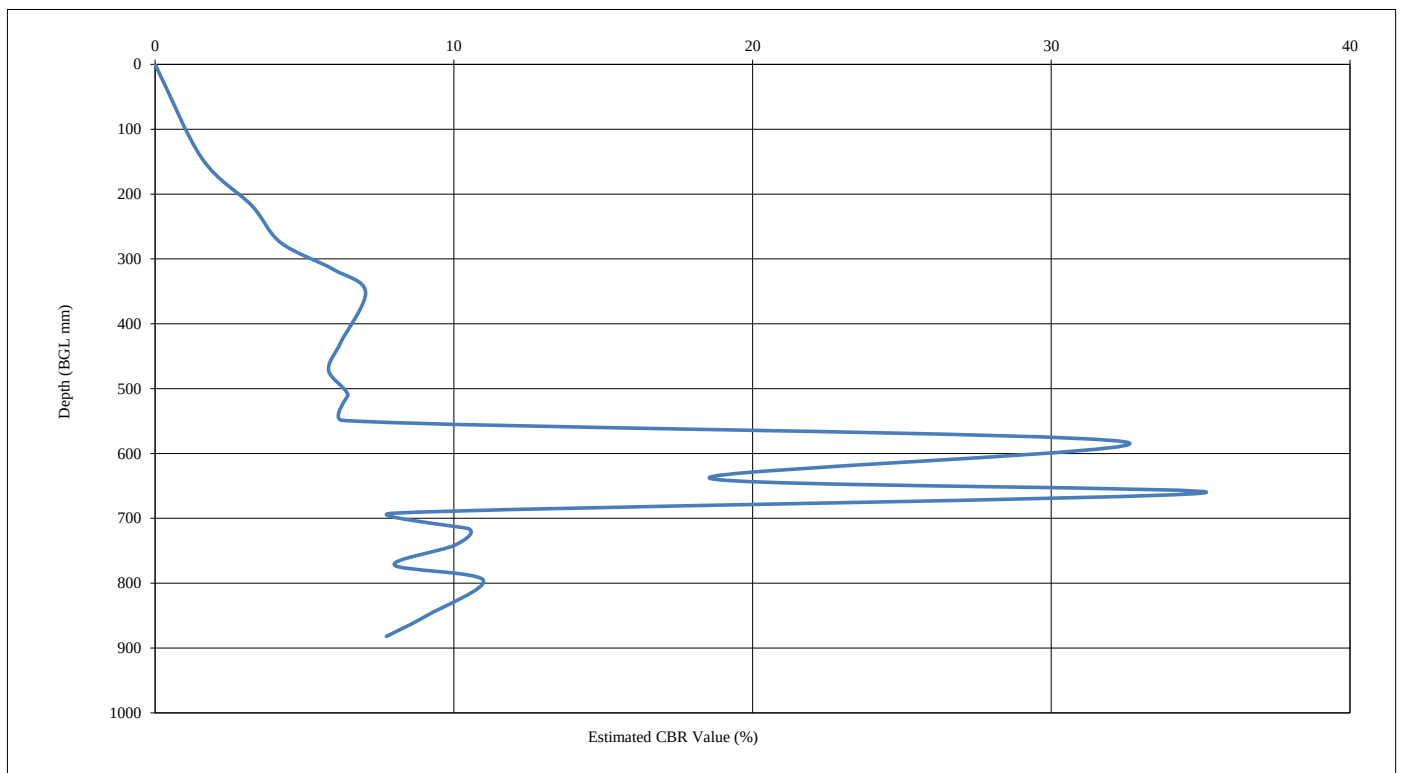


Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

Site Name	Chapel Lane	Test Date:	11/09/2020
Site Ref	13-759	Test Location:	Widnes
Test No.:	DCP104	Easting:	0
Initial Depth (mm BGL):	0	Northing:	0
Final Depth (mm BGL):	882		

Estimated California Bearing Ratio Graph



Start Depth (mm) BGL	Finish Depth (mm) BGL	No. of Blows	Blows Per Layer	DCP mm/Blows	Ave Estimated Layer (CBR %)
0	582	14	14	41.57	5.87
582	661	21	7	11.29	23.31
661	882	29	8	27.63	9.05

Comments

Site Engineer:	Checked By:	Date:	Approved By:	Date:
HM	VW	19/10/2020	JS	19/10/2020

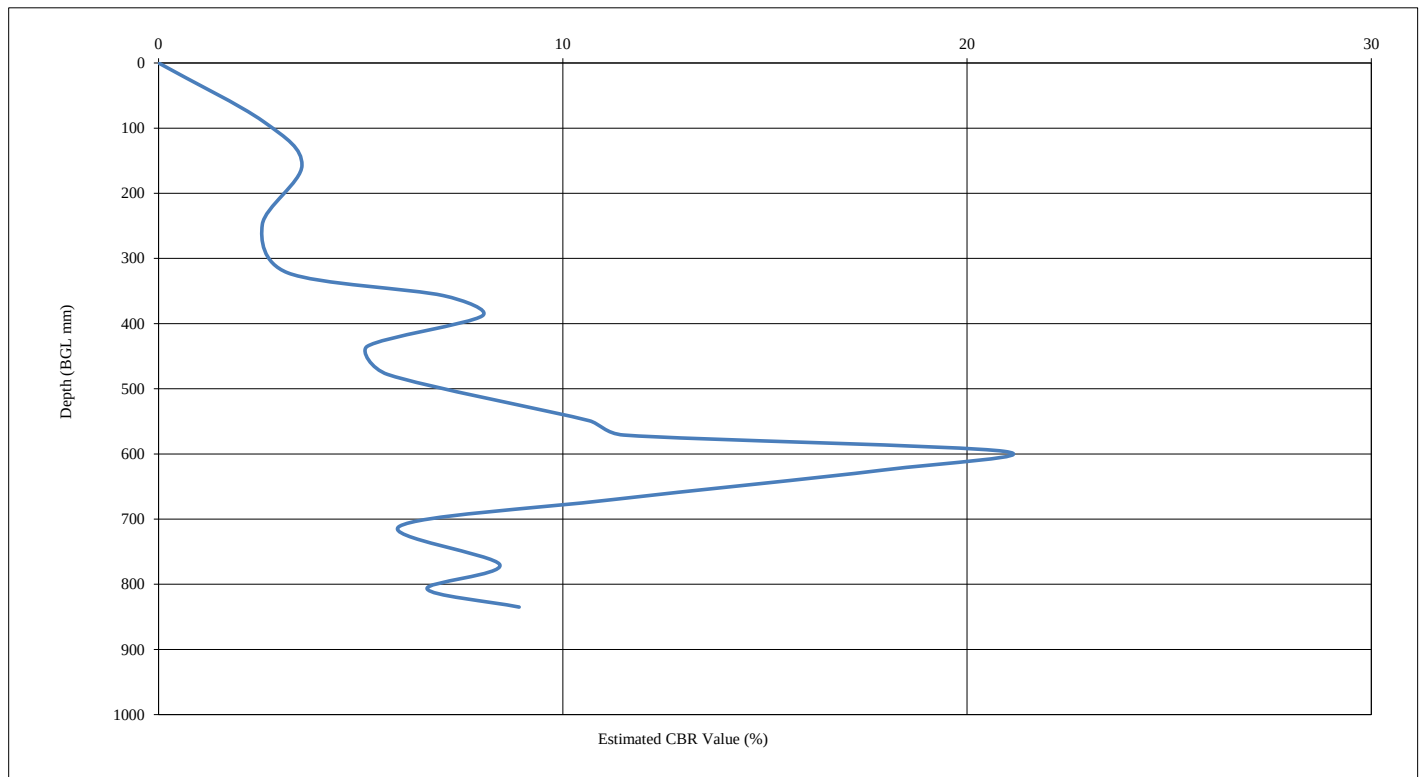


Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

Site Name	Chapel Lane	Test Date:	11/09/2020
Site Ref	13-759	Test Location:	Widnes
Test No.:	DCP105	Easting:	0
Initial Depth (mm BGL):	0	Northing:	0
Final Depth (mm BGL):	835		

Estimated California Bearing Ratio Graph



Start Depth (mm) BGL	Finish Depth (mm) BGL	No. of Blows	Blows Per Layer	DCP mm/Blows	Ave Estimated Layer (CBR %)
0	388	6	6	64.67	3.68
388	625	16	10	23.70	10.64
625	835	23	7	30.00	8.29

Comments

Site Engineer:	Checked By:	Date:	Approved By:	Date:
HM	VW	19/10/2020	JS	19/10/2020

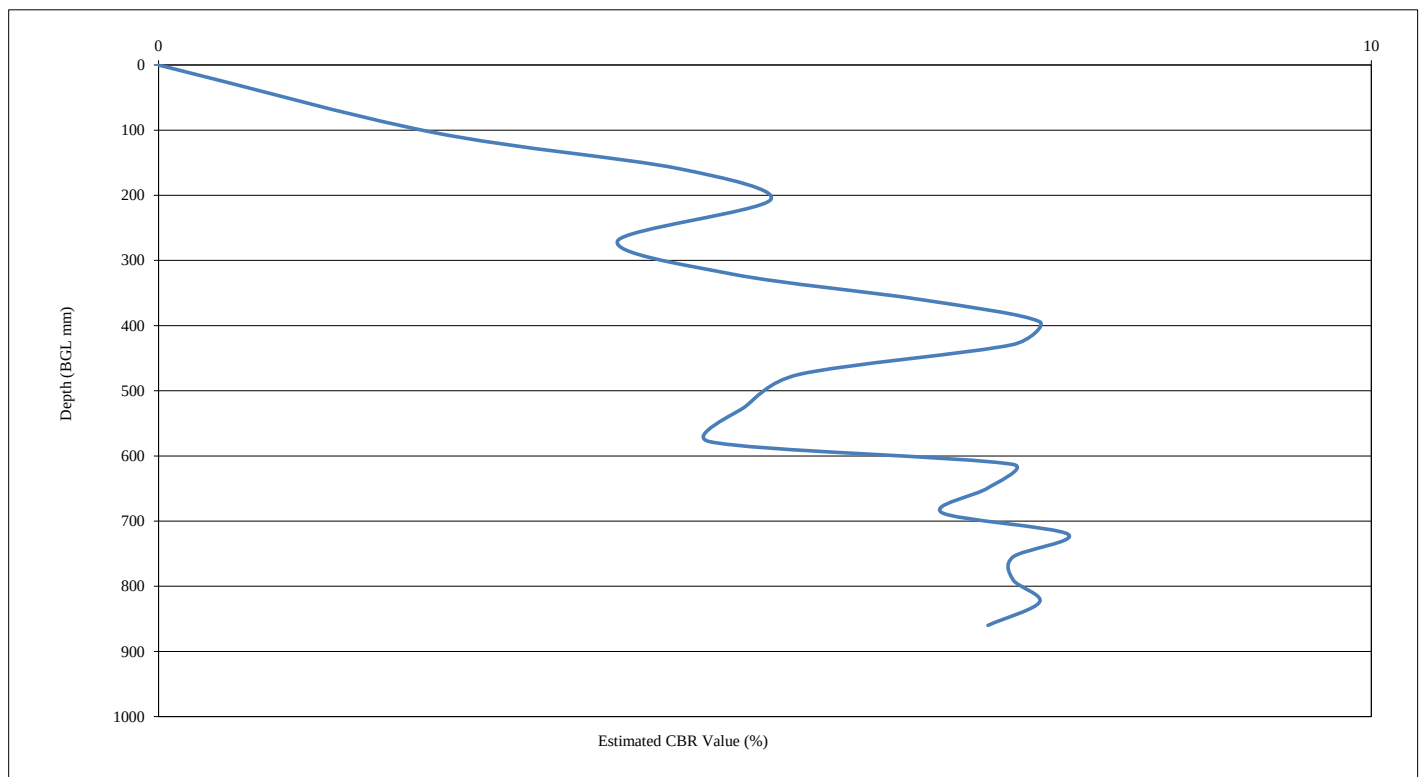


Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

Site Name	Chapel Lane	Test Date:	11/09/2020
Site Ref	13-759	Test Location:	Widnes
Test No.:	DCP106	Easting:	0
Initial Depth (mm BGL):	0	Northing:	0
Final Depth (mm BGL):	860		

Estimated California Bearing Ratio Graph



Start Depth (mm) BGL	Finish Depth (mm) BGL	No. of Blows	Blows Per Layer	DCP mm/Blows	Ave Estimated Layer (CBR %)
0	207	3	3	69.00	3.44
207	394	7	4	46.75	5.19
394	613	12	5	43.80	5.56
613	860	19	7	35.29	6.99

Comments

Site Engineer:	Checked By:	Date:	Approved By:	Date:
HM	VW	19/10/2020	JS	19/10/2020

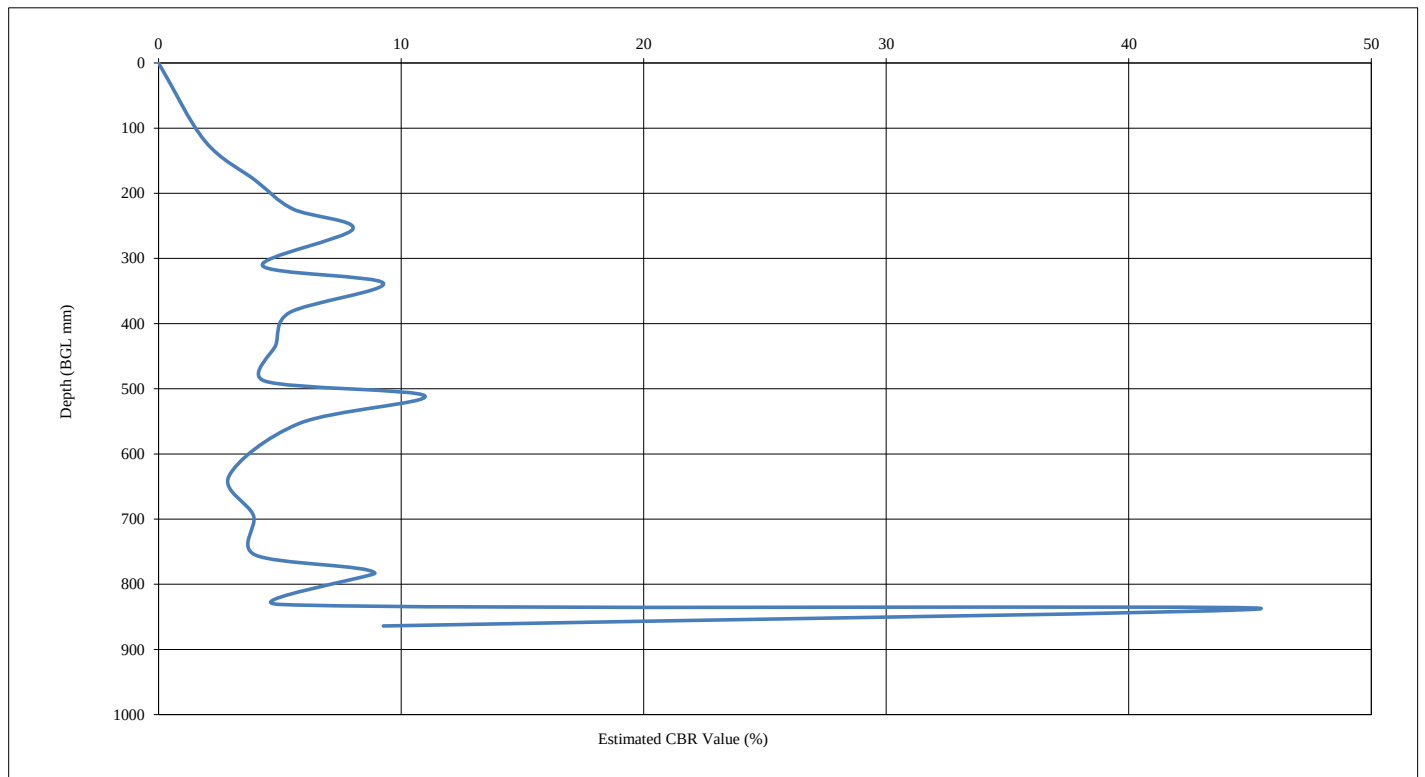


Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

Site Name	Chapel Lane	Test Date:	11/09/2020
Site Ref	13-759	Test Location:	Widnes
Test No.:	DCP107	Easting:	0
Initial Depth (mm BGL):	0	Northing:	0
Final Depth (mm BGL):	864		

Estimated California Bearing Ratio Graph



Start Depth (mm) BGL	Finish Depth (mm) BGL	No. of Blows	Blows Per Layer	DCP mm/Blows	Ave Estimated Layer (CBR %)
0	255	3	3	85.00	2.76
255	511	7	4	64.00	3.72
511	837	12	5	65.20	3.65
837	864	19	7	3.86	72.50

Comments

Site Engineer:	Checked By:	Date:	Approved By:	Date:
HM	VW	19/10/2020	VW	19/10/2020

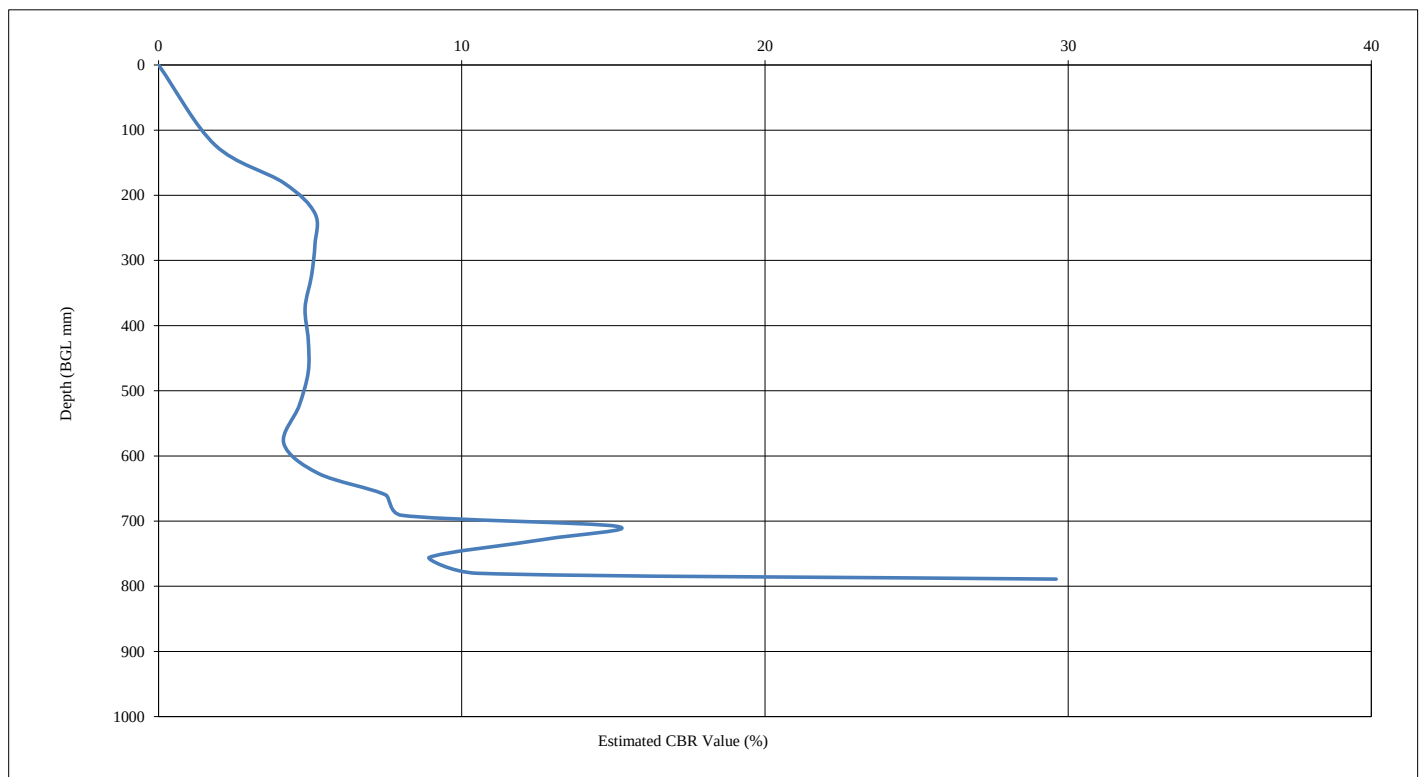


Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

Site Name	Chapel Lane	Test Date:	11/09/2020
Site Ref	13-759	Test Location:	Widnes
Test No.:	DCP108	Easting:	0
Initial Depth (mm BGL):	0	Northing:	0
Final Depth (mm BGL):	789		

Estimated California Bearing Ratio Graph



Start Depth (mm) BGL	Finish Depth (mm) BGL	No. of Blows	Blows Per Layer	DCP mm/Blows	Ave Estimated Layer (CBR %)
0	708	14	14	50.57	4.77
708	789	18	4	20.25	12.56

Comments

Site Engineer:	Checked By:	Date:	Approved By:	Date:
HM	VW	19/10/2020	JS	19/10/2020

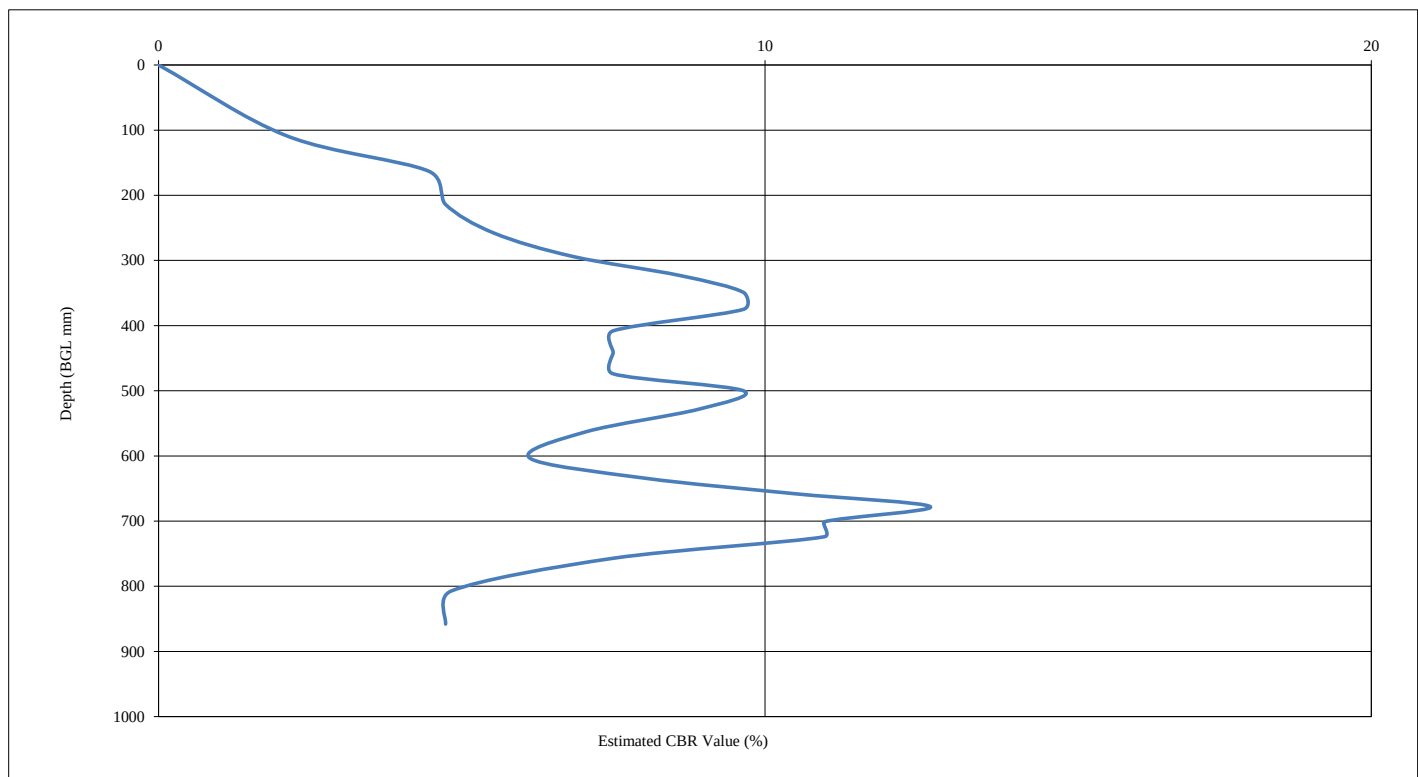


Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

Site Name	Chapel Lane	Test Date:	11/09/2020
Site Ref	13-759	Test Location:	Widnes
Test No.:	DCP109	Easting:	0
Initial Depth (mm BGL):	0	Northing:	0
Final Depth (mm BGL):	858		

Estimated California Bearing Ratio Graph



Start Depth (mm) BGL	Finish Depth (mm) BGL	No. of Blows	Blows Per Layer	DCP mm/Blows	Ave Estimated Layer (CBR %)
0	375	8	8	46.88	5.17
375	500	12	4	31.25	7.94
500	678	18	6	29.67	8.39
678	858	23	5	36.00	6.84

Comments

Site Engineer:	Checked By:	Date:	Approved By:	Date:
HM	VW	19/10/2020	JS	19/10/2020

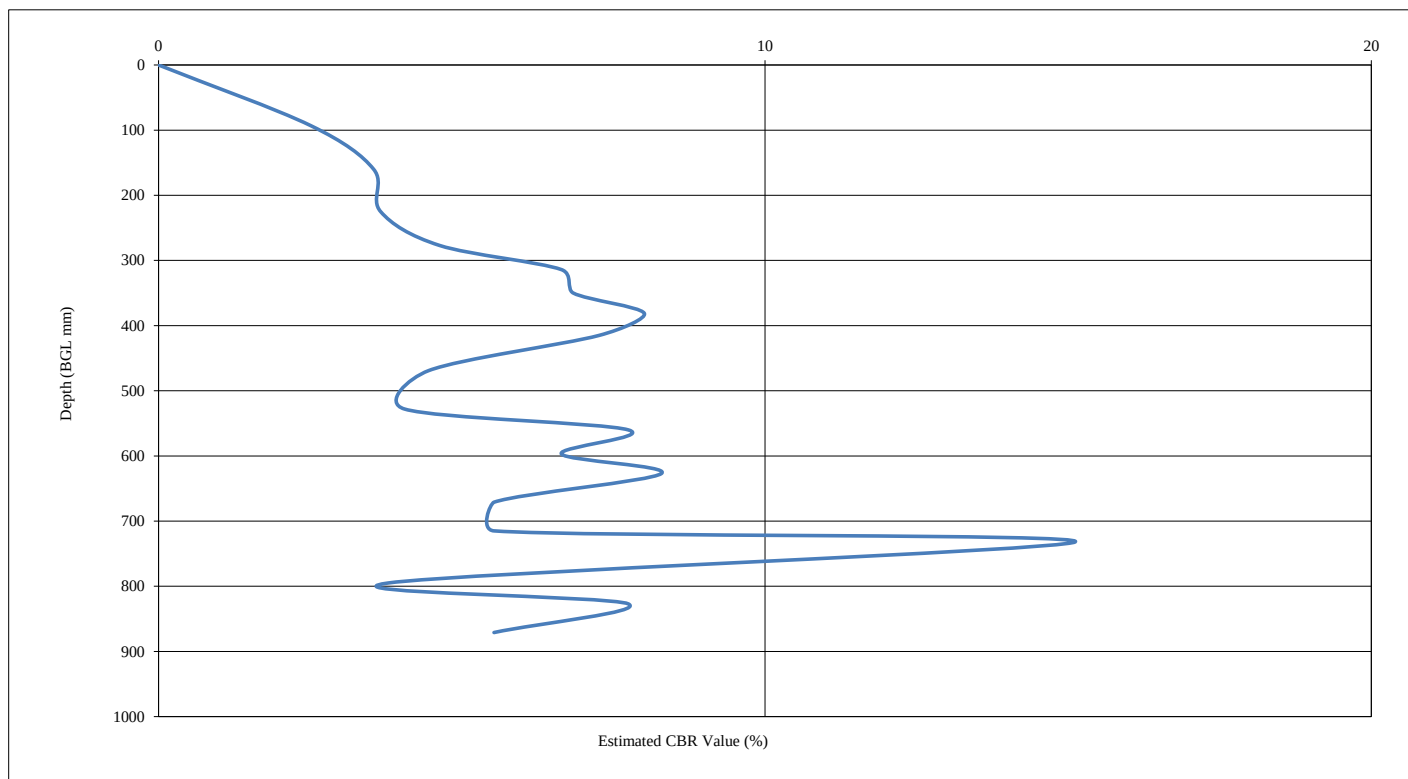


Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

Site Name	Chapel Lane	Test Date:	11/09/2020
Site Ref	13-759	Test Location:	Widnes
Test No.:	DCP110	Easting:	0
Initial Depth (mm BGL):	0	Northing:	0
Final Depth (mm BGL):	871		

Estimated California Bearing Ratio Graph



Start Depth (mm) BGL	Finish Depth (mm) BGL	No. of Blows	Blows Per Layer	DCP mm/Blows	Ave Estimated Layer (CBR %)
0	381	7	7	54.43	4.42
381	627	13	6	41.00	5.96
627	732	16	3	35.00	7.05
7.2	871	19	3	287.93	0.76

Comments

Site Engineer:	Checked By:	Date:	Approved By:	Date:
HM	VW	19/10/2020	JS	19/10/2020

APPENDIX IX SOAKAWAY PERMEABILITY TEST CERTIFICATES

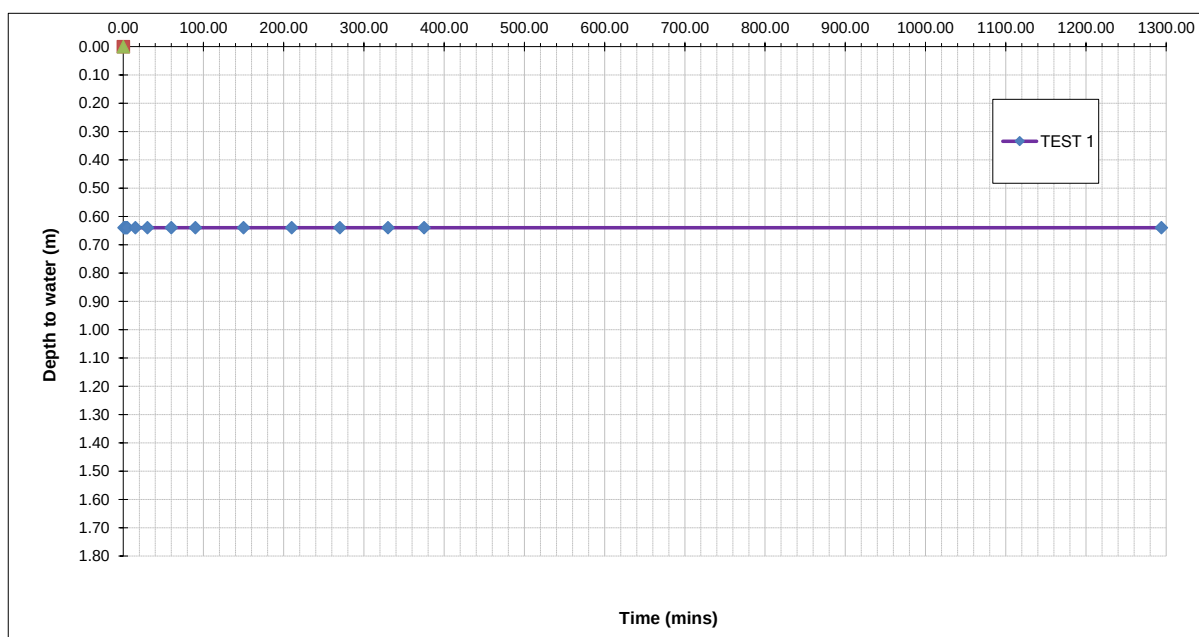


Site: Chapel Lane, Widnes
Job Number: 13-759
Date of Test: 24/08/2020

Trial Pit Number: SA101
Length: 2.20 m
Width: 0.64 m
Depth: 1.80 m
Groundwater Level: N/A

		TEST 1		TEST 2		TEST 3	
		Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
		1.00	0.64	0.00	0.00	0.00	0.00
		2.00	0.64				
		3.00	0.64				
		4.00	0.64				
		5.00	0.64				
		15.00	0.64				
		30.00	0.64				
		60.00	0.64				
		90.00	0.64				
		150.00	0.64				
		210.00	0.64				
		270.00	0.64				
		330.00	0.64				
		375.00	0.64				
		1294.00	0.64				
Effective Storage Depth	m	1.16					
75% Effective Storage Depth	m	0.87					
(i.e. depth below GL)	m	0.93					
25% Effective Storage Depth	m	0.29					
(i.e. depth below GL)	m	1.51					
Effective Storage Depth 75%-25%	m	0.58					
Time to fall to 75% effective depth	mins	N/A					
Time to fall to 25% effective depth	mins	N/A					
V (75%-25%)	m3	0.82					
a (50%)	m2	4.70					
t (75%-25%)	mins	N/A					
SOIL INFILTRATION RATE	m/s	N/A					

DESIGN SOIL INFILTRATION RATE, f	N/A
----------------------------------	-----





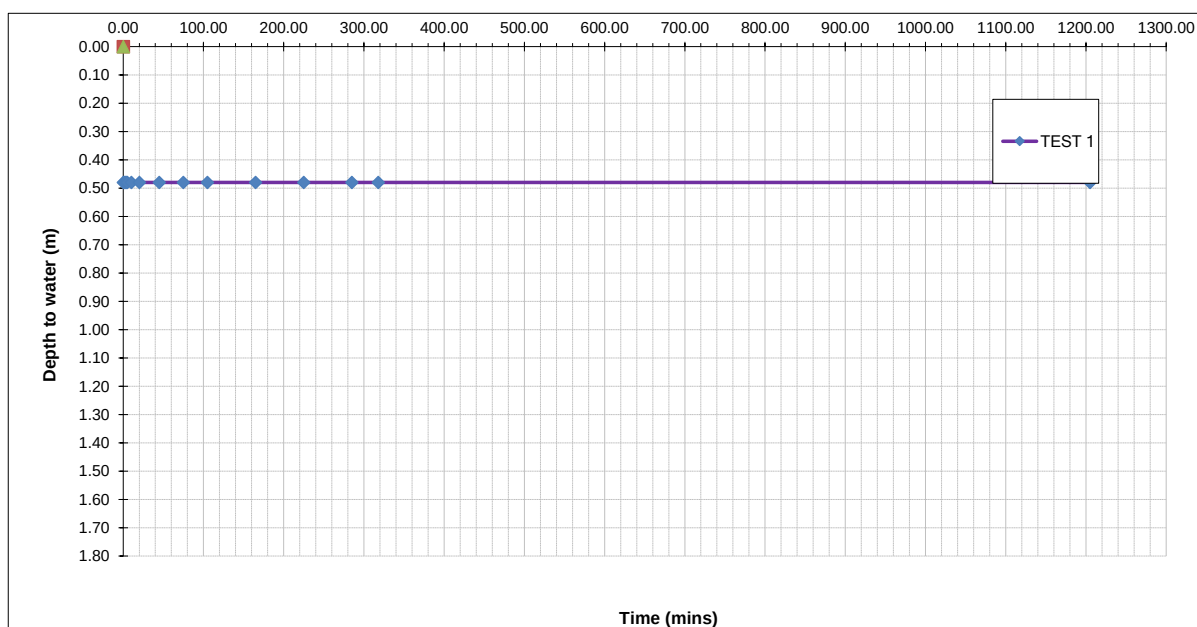
Site: Chapel Lane, Widnes
Job Number: 13-759
Date of Test: 24/08/2020

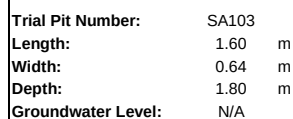
Trial Pit Number: SA102
Length: 1.70 m
Width: 0.64 m
Depth: 1.80 m
Groundwater Level: N/A

		TEST 1		TEST 2		TEST 3	
		Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
		0.00	0.48	0.00	0.00	0.00	0.00
		1.00	0.48				
		2.00	0.48				
		3.00	0.48				
		4.00	0.48				
		5.00	0.48				
		10.00	0.48				
		20.00	0.48				
		45.00	0.48				
		75.00	0.48				
		105.00	0.48				
		165.00	0.48				
		225.00	0.48				
		285.00	0.48				
		318.00	0.48				
		1205.00	0.48				
Effective Storage Depth	m		1.32				
75% Effective Storage Depth	m		0.99				
(i.e. depth below GL)	m		0.81				
25% Effective Storage Depth	m		0.33				
(i.e. depth below GL)	m		1.47				
Effective Storage Depth 75%-25%	m		0.66				
Time to fall to 75% effective depth	mins		N/A				
Time to fall to 25% effective depth	mins		N/A				
V (75%-25%)	m3		0.72				
a (50%)	m2		4.18				
t (75%-25%)	mins		N/A				
SOIL INFILTRATION RATE	m/s		N/A				

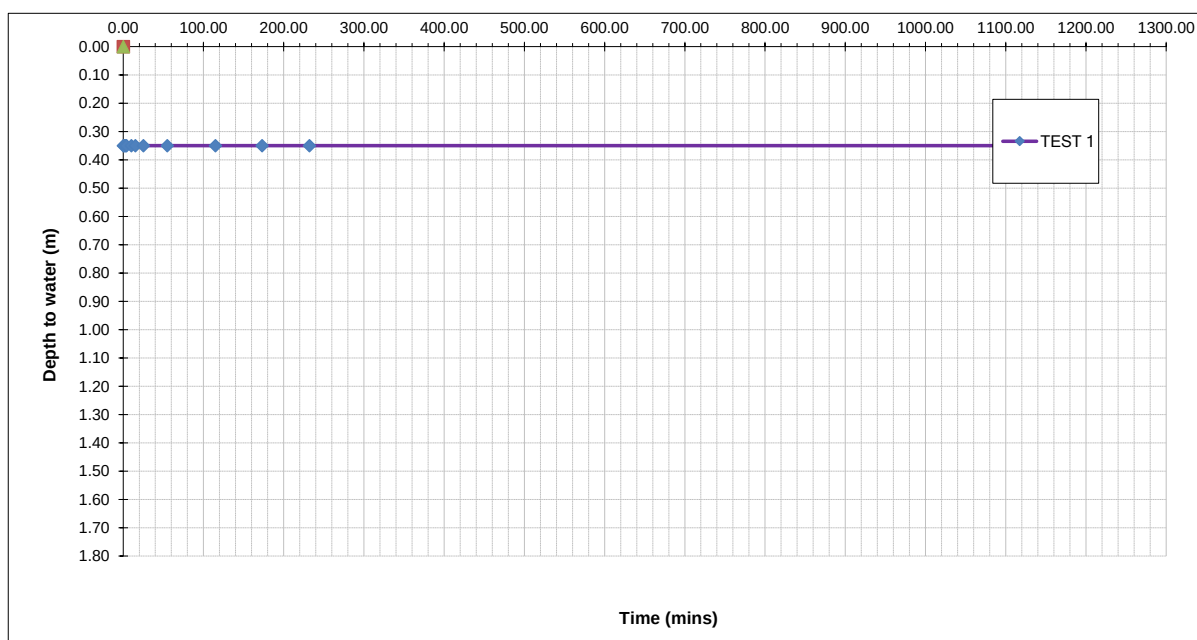
DESIGN SOIL INFILTRATION RATE, f

N/A



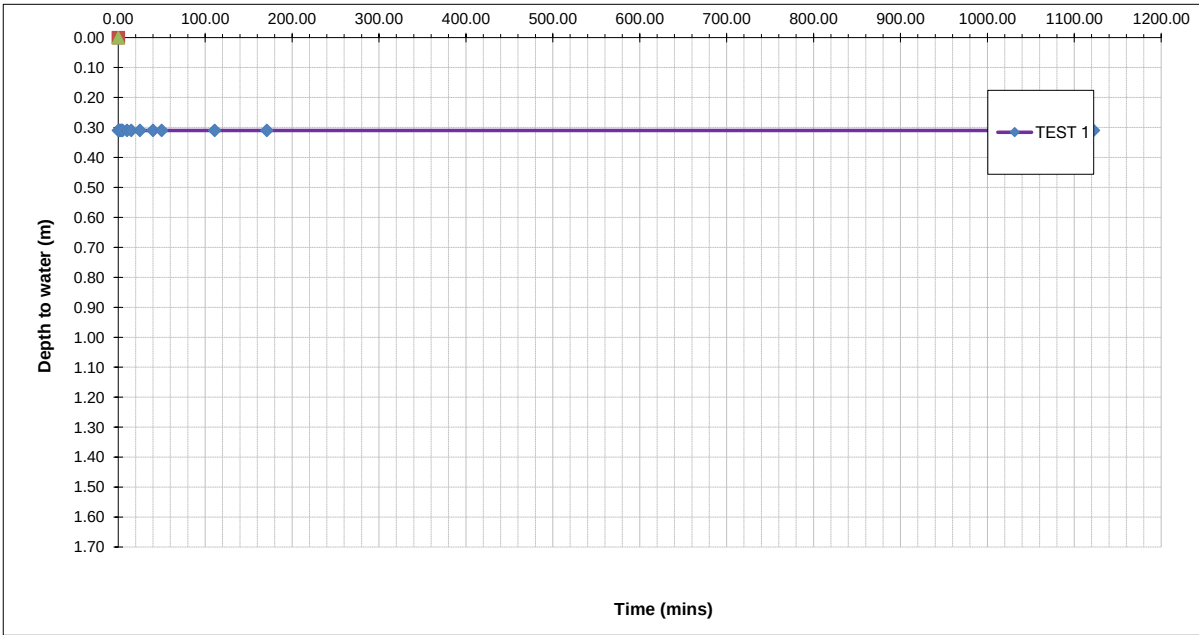


DESIGN SOIL INFILTRATION RATE, f	N/A
----------------------------------	-----



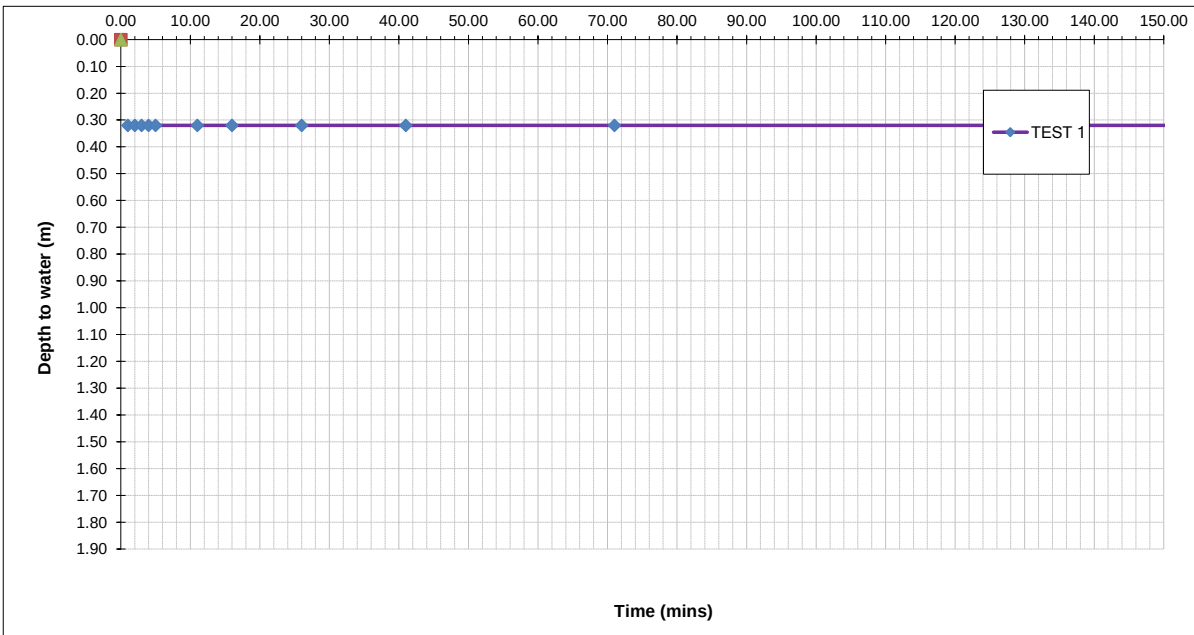
		Site: Chapel Lane, Widnes Job Number: 13-759 Date of Test: 24/08/2020		Trial Pit Number: SA104 Length: 1.70 m Width: 0.67 m Depth: 1.70 m Groundwater Level: N/A		
	TEST 1		TEST 2		TEST 3	
	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
	0.00	0.31	0.00	0.00	0.00	0.00
	1.00	0.31				
	2.00	0.31				
	3.00	0.31				
	4.00	0.31				
	5.00	0.31				
	10.00	0.31				
	15.00	0.31				
	25.00	0.31				
	40.00	0.31				
	50.00	0.31				
	111.00	0.31				
	171.00	0.31				
1122.00	0.31					
Effective Storage Depth	m	1.39				
75% Effective Storage Depth	m	1.04				
(i.e. depth below GL)	m	0.66				
25% Effective Storage Depth	m	0.35				
(i.e. depth below GL)	m	1.35				
Effective Storage Depth 75%-25%	m	0.70				
Time to fall to 75% effective depth	mins	N/A				
Time to fall to 25% effective depth	mins	N/A				
V (75%-25%)	m3	0.79				
a (50%)	m2	4.43				
t (75%-25%)	mins	N/A				
SOIL INFILTRATION RATE	m/s	N/A				

DESIGN SOIL INFILTRATION RATE, f	N/A
----------------------------------	-----



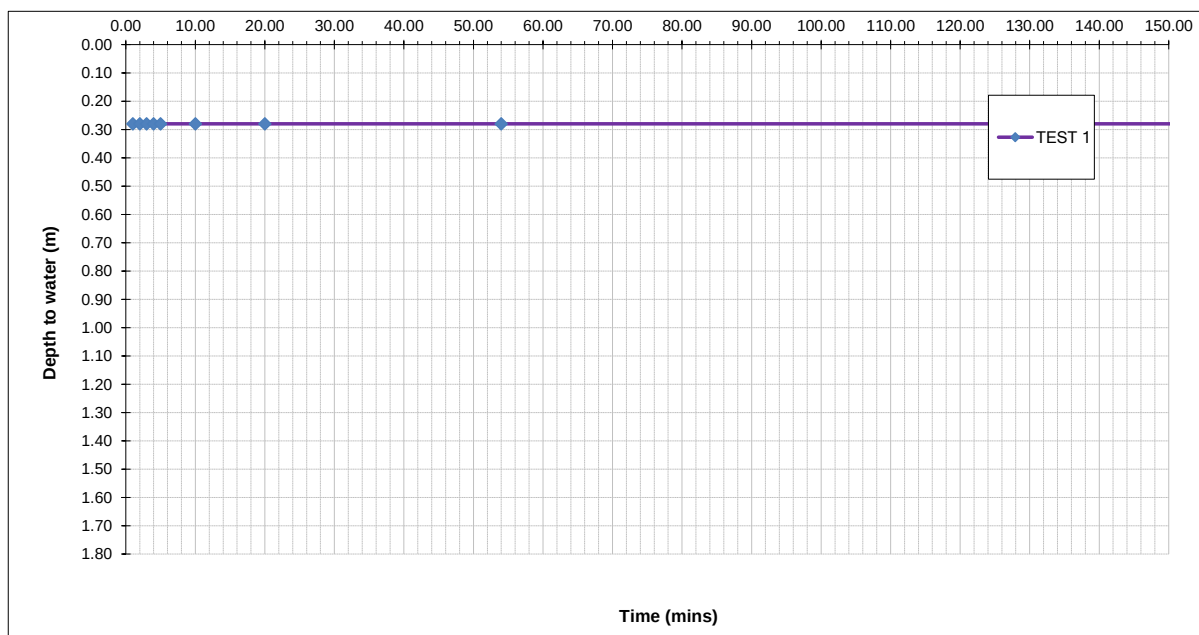
		Site: Chapel Lane, Widnes Job Number: 13-759 Date of Test: 24/08/2020		Trial Pit Number: SA105 Length: 1.85 m Width: 0.67 m Depth: 1.90 m Groundwater Level: N/A		
	TEST 1		TEST 2		TEST 3	
	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
	1.00	0.32	0.00	0.00	0.00	0.00
	2.00	0.32				
	3.00	0.32				
	4.00	0.32				
	5.00	0.32				
	11.00	0.32				
	16.00	0.32				
	26.00	0.32				
	41.00	0.32				
	71.00	0.32				
	134.00	0.32				
	1084.00	0.32				
Effective Storage Depth	m	1.58	1.90	1.90		
75% Effective Storage Depth	m	1.19	1.43	1.43		
(i.e. depth below GL)	m	0.72	0.48	0.48		
25% Effective Storage Depth	m	0.40	0.48	0.48		
(i.e. depth below GL)	m	1.51	1.43	1.43		
Effective Storage Depth 75%-25%	m	0.79	0.95	0.95		
Time to fall to 75% effective depth	mins	N/A	0.00	0.00		
Time to fall to 25% effective depth	mins	N/A	0.00	0.00		
V (75%-25%)	m3	0.98	1.18	1.18		
a (50%)	m2	5.22	6.03	6.03		
t (75%-25%)	mins	N/A	0.00	0.00		
SOIL INFILTRATION RATE	m/s	N/A	#DIV/0!	#DIV/0!		

DESIGN SOIL INFILTRATION RATE, f	N/A
----------------------------------	-----



		Site: Chapel Lane, Widnes Job Number: 13-759 Date of Test: 24/08/2020		Trial Pit Number: SA106 Length: 1.70 m Width: 0.67 m Depth: 1.80 m Groundwater Level: N/A		
	TEST 1		TEST 2		TEST 3	
	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
	1.00	0.28				
	2.00	0.28				
	3.00	0.28				
	4.00	0.28				
	5.00	0.28				
	10.00	0.28				
	20.00	0.28				
	54.00	0.28				
	1016.00	0.28				
Effective Storage Depth	m	1.52	1.80	1.80		
75% Effective Storage Depth	m	1.14	1.35	1.35		
(i.e. depth below GL)	m	0.66	0.45	0.45		
25% Effective Storage Depth	m	0.38	0.45	0.45		
(i.e. depth below GL)	m	1.42	1.35	1.35		
Effective Storage Depth 75%-25%	m	0.76	0.90	0.90		
Time to fall to 75% effective depth	mins	N/A	0.00	0.00		
Time to fall to 25% effective depth	mins	N/A	0.00	0.00		
V (75%-25%)	m3	0.87	1.03	1.03		
a (50%)	m2	4.74	5.41	5.41		
t (75%-25%)	mins	N/A	0.00	0.00		
SOIL INFILTRATION RATE	m/s	N/A	#DIV/0!	#DIV/0!		

DESIGN SOIL INFILTRATION RATE, f	N/A
----------------------------------	-----



APPENDIX X

GEOTECHNICAL TESTING

RESULTS



LABORATORY REPORT



4043

Contract Number: PSL20/4574

Report Date: 30 September 2020
Client's Reference: 13-759
Client Name: E3P
Heliport Business Park
Liverpool Road
Eccles
Manchester
M30 7RU

For the attention of: Veronique Wilkinson

Contract Title: Chapel Lane, Widnes
Date Received: 3/9/2020
Date Commenced: 3/9/2020
Date Completed: 30/9/2020

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson
(Director)

L Knight
(Senior Technician)

A Watkins
(Director)

S Eyre
(Senior Technician)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)

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Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
TP102		B	0.80		Brown slightly gravelly very sandy CLAY.
TP107		B	1.80		Brown slightly gravelly very sandy CLAY.
TP123		B	0.50		Brown gravelly clayey silty SAND.
WS104		U	1.50		Brown gravelly very sandy CLAY.
WS108		U	0.50		Stiff brown slightly gravelly sandy CLAY.
WS122		D	1.00		Brown slightly gravelly very sandy CLAY.
WS125		U	2.50		Firm brown slightly gravelly sandy CLAY.
WS127		U	0.50		Brown gravelly very sandy CLAY.
WS112		D	2.00		Brown slightly gravelly very sandy CLAY.
WS131		D	1.00		Brown mottled grey slightly gravelly very sandy CLAY.
WS133		U	2.50		Very stiff brown slightly gravelly very sandy CLAY.
WS133		D	2.00		Brown slightly gravelly very sandy CLAY.
CP101		U	2.00		Soft brown slightly gravelly very sandy CLAY.



4043

PSL

Professional Soils Laboratory

Chapel Lane, Widnes

Contract No:

PSL20/4574

Client Ref:

13-759

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

[illegible]

SYMBOLS : NP : Non Plastic

*** : Liquid Limit and Plastic Limit Wet Sieved.**



4043

PSL

Professional Soils Laboratory

Chapel Lane, Widnes

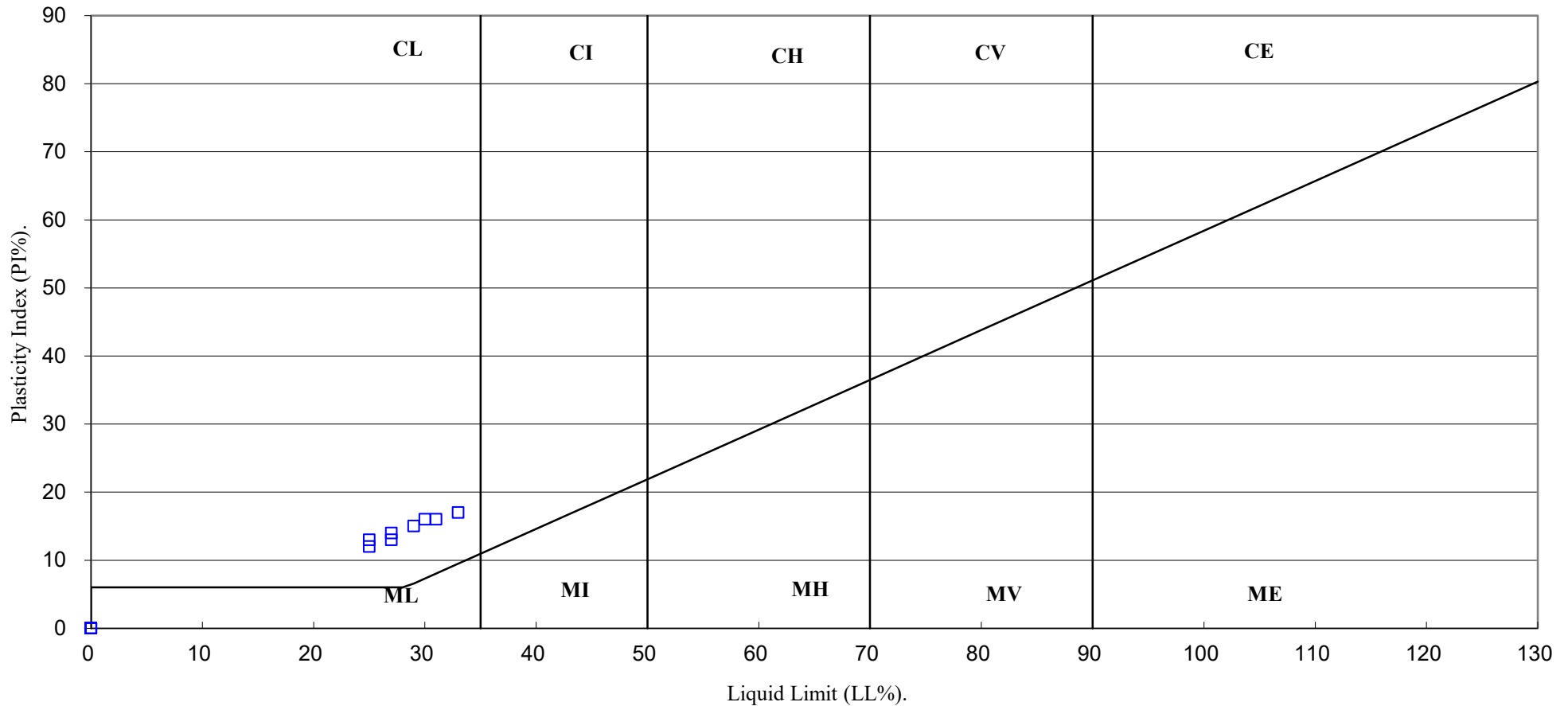
Contract No:

PSL20/4574

Client Ref:

13-759

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



4043

PSL

Professional Soils Laboratory

Chapel Lane, Widnes

Contract No:

PSL20/4574

Client Ref:

13-759

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

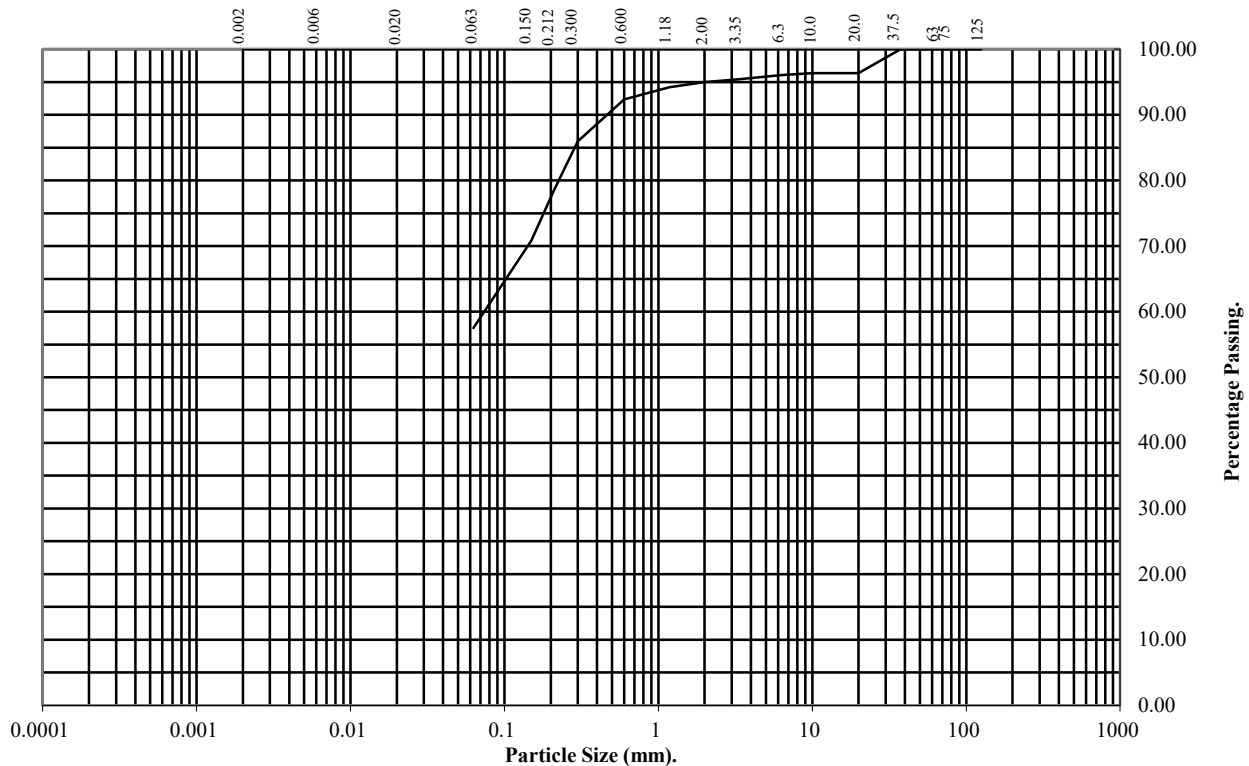
Hole Number: TP102

Top Depth (m): 0.80

Sample Number:

Base Depth(m):

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	96
10	96
6.3	96
3.35	95
2	95
1.18	94
0.6	92
0.3	86
0.212	79
0.15	71
0.063	58

Soil Fraction	Total Percentage
Cobbles	0
Gravel	5
Sand	37
Silt/Clay	58

Remarks:

See Summary of Soil Descriptions



PSL
Professional Soils Laboratory

Chapel Lane, Widnes

Contract No:
PSL20/4574
Client Ref:
13-759

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

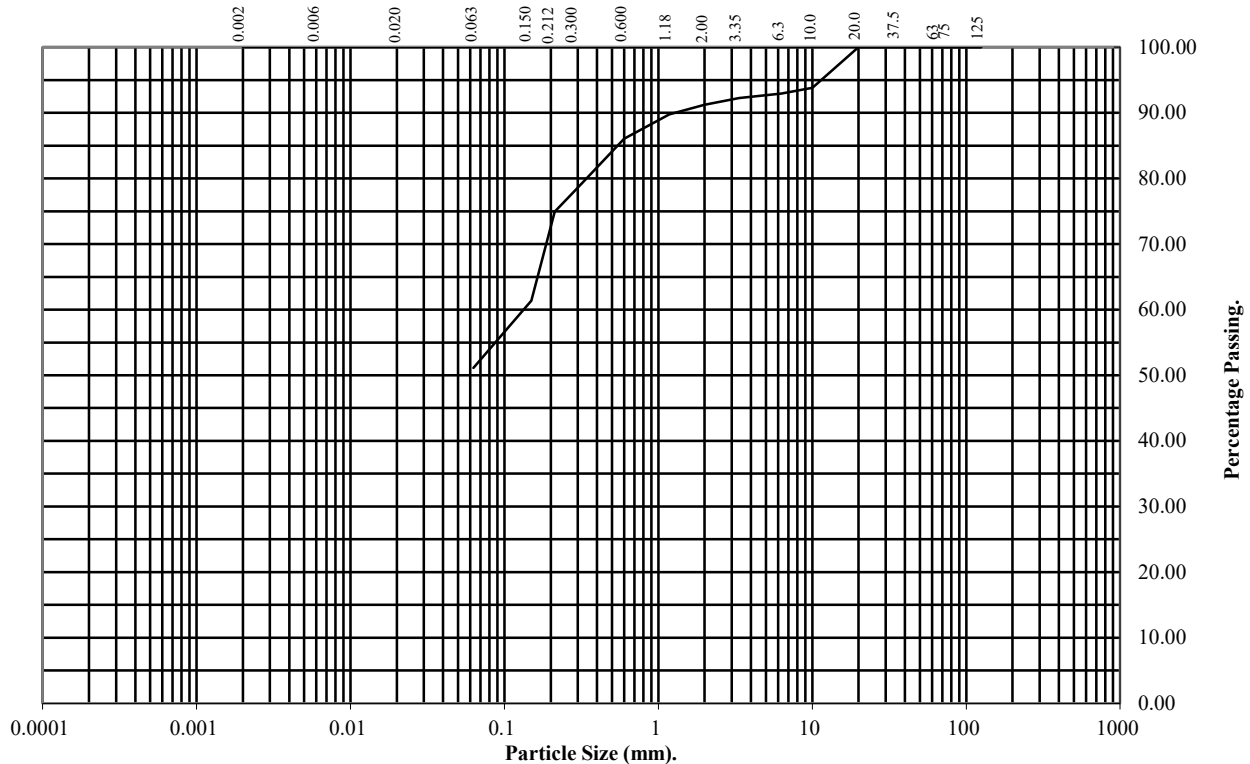
Hole Number: TP107

Top Depth (m): 1.80

Sample Number:

Base Depth(m):

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	94
6.3	93
3.35	92
2	91
1.18	90
0.6	86
0.3	79
0.212	75
0.15	61
0.063	51

Soil Fraction	Total Percentage
Cobbles	0
Gravel	9
Sand	40
Silt/Clay	51

Remarks:

See Summary of Soil Descriptions



PSL
Professional Soils Laboratory

Chapel Lane, Widnes

Contract No:
PSL20/4574
Client Ref:
13-759

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

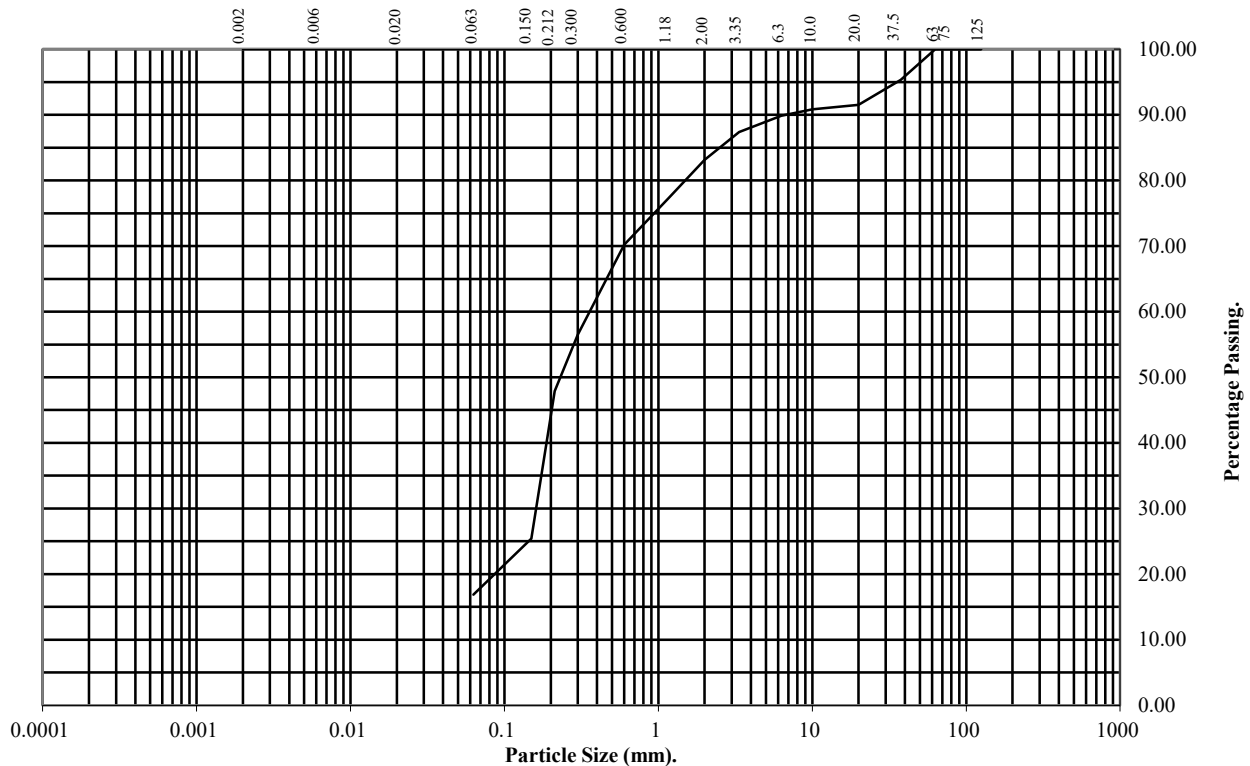
Hole Number: TP123

Top Depth (m): 0.50

Sample Number:

Base Depth(m):

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	95
20	92
10	91
6.3	90
3.35	87
2	83
1.18	77
0.6	70
0.3	56
0.212	48
0.15	25
0.063	17

Soil Fraction	Total Percentage
Cobbles	0
Gravel	17
Sand	66
Silt/Clay	17

Remarks:

See Summary of Soil Descriptions



PSL
Professional Soils Laboratory

Chapel Lane, Widnes

Contract No:
PSL20/4574
Client Ref:
13-759

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : Clause 3.3 : 1990

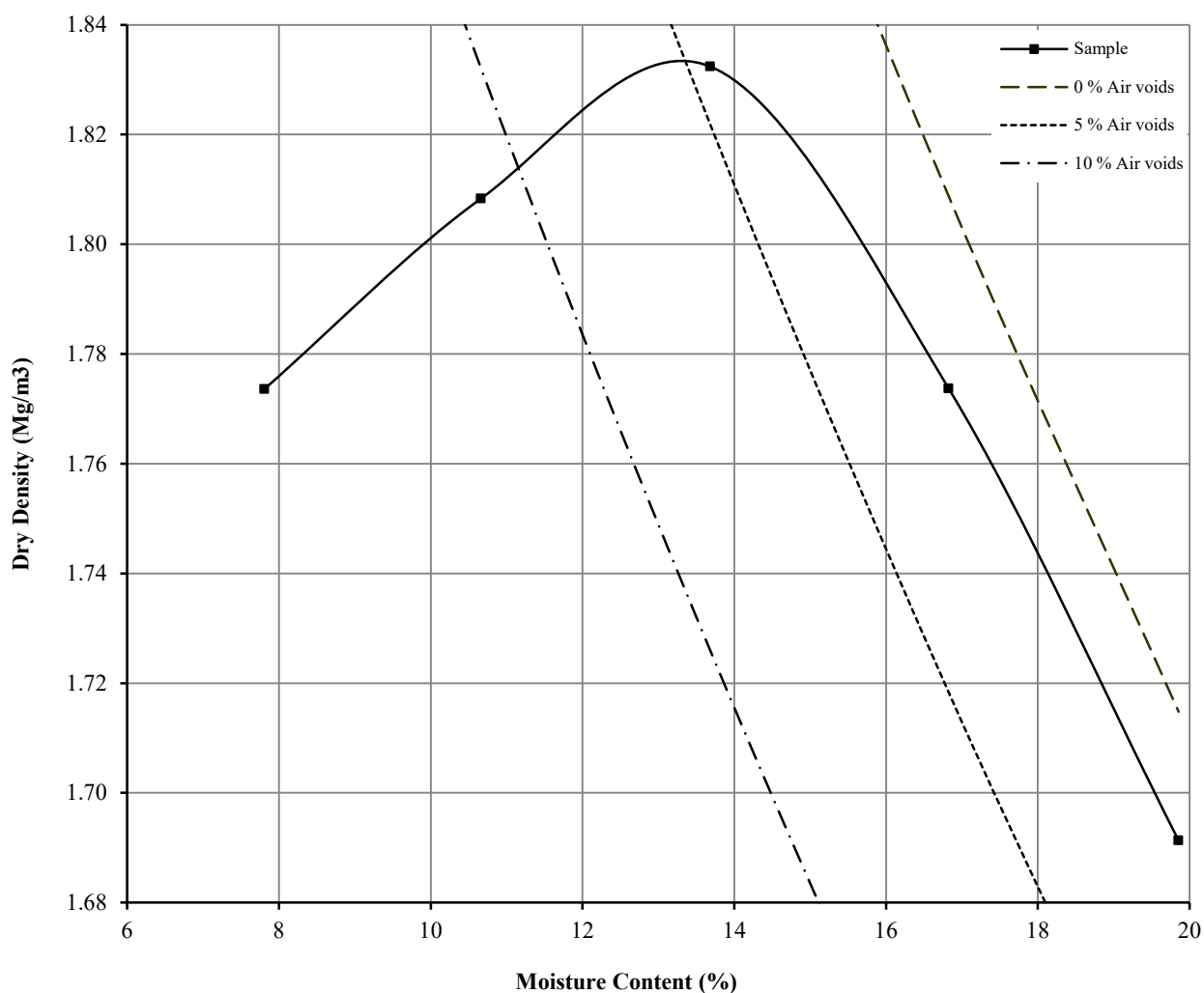
Hole Number: TP102

Top Depth (m) : 0.80

Sample Number:

Base Depth (m) :

Sample Type: B



Initial Moisture Content:	20	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m ³):	2.60	Assumed	Material Retained on 37.5 mm Test Sieve (%):	0
Maximum Dry Density (Mg/m ³):	1.83		Material Retained on 20.0 mm Test Sieve (%):	4
Optimum Moisture Content (%):	14			
Remarks				
See summary of soil descriptions.				



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DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : Clause 3.3 : 1990

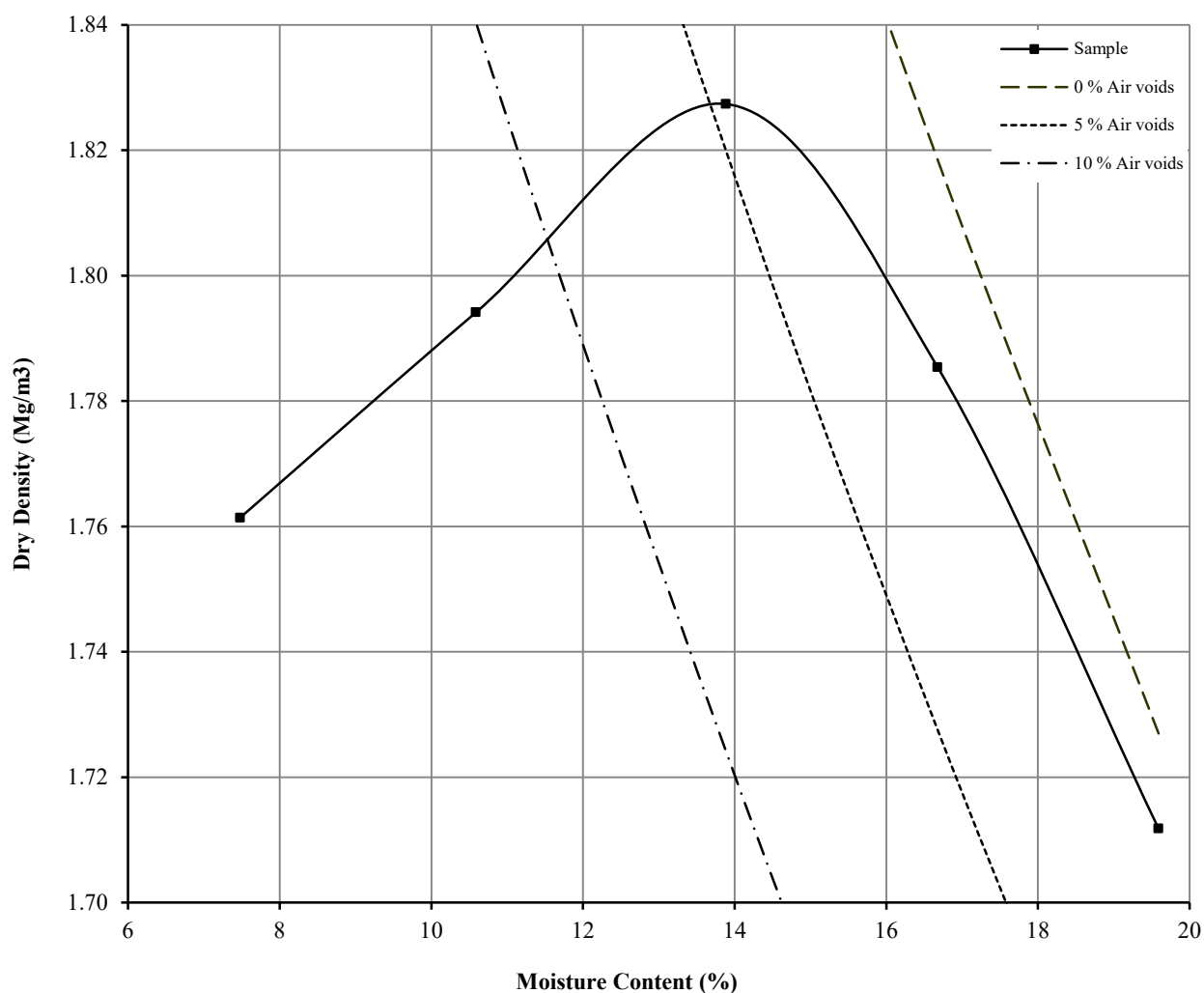
Hole Number: TP107

Top Depth (m) : 1.80

Sample Number:

Base Depth (m) :

Sample Type: B



Initial Moisture Content:	17	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m ³):	2.61	Assumed	Material Retained on 37.5 mm Test Sieve (%):	0
Maximum Dry Density (Mg/m ³):	1.83		Material Retained on 20.0 mm Test Sieve (%):	0
Optimum Moisture Content (%):	14			
Remarks				
See summary of soil descriptions.				



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DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : Clause 3.4 : 1990

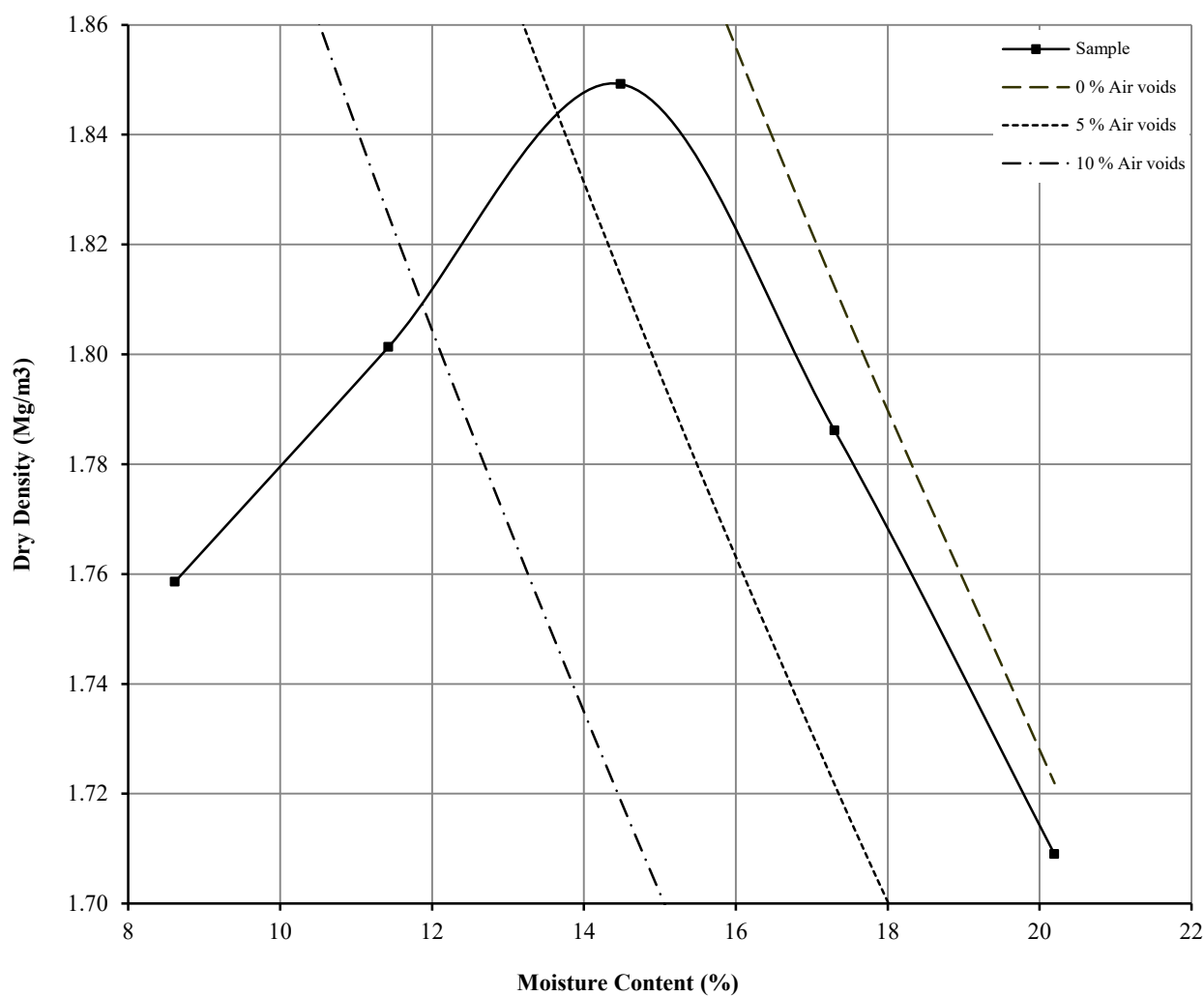
Hole Number: TP123

Top Depth (m) : 0.50

Sample Number:

Base Depth (m) :

Sample Type: B



Initial Moisture Content:	17	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.64	Assumed	Material Retained on 37.5 mm Test Sieve (%):	5
Maximum Dry Density (Mg/m3):	1.85		Material Retained on 20.0 mm Test Sieve (%):	3
Optimum Moisture Content (%):	14			
Remarks				
See summary of soil descriptions.				



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UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 9

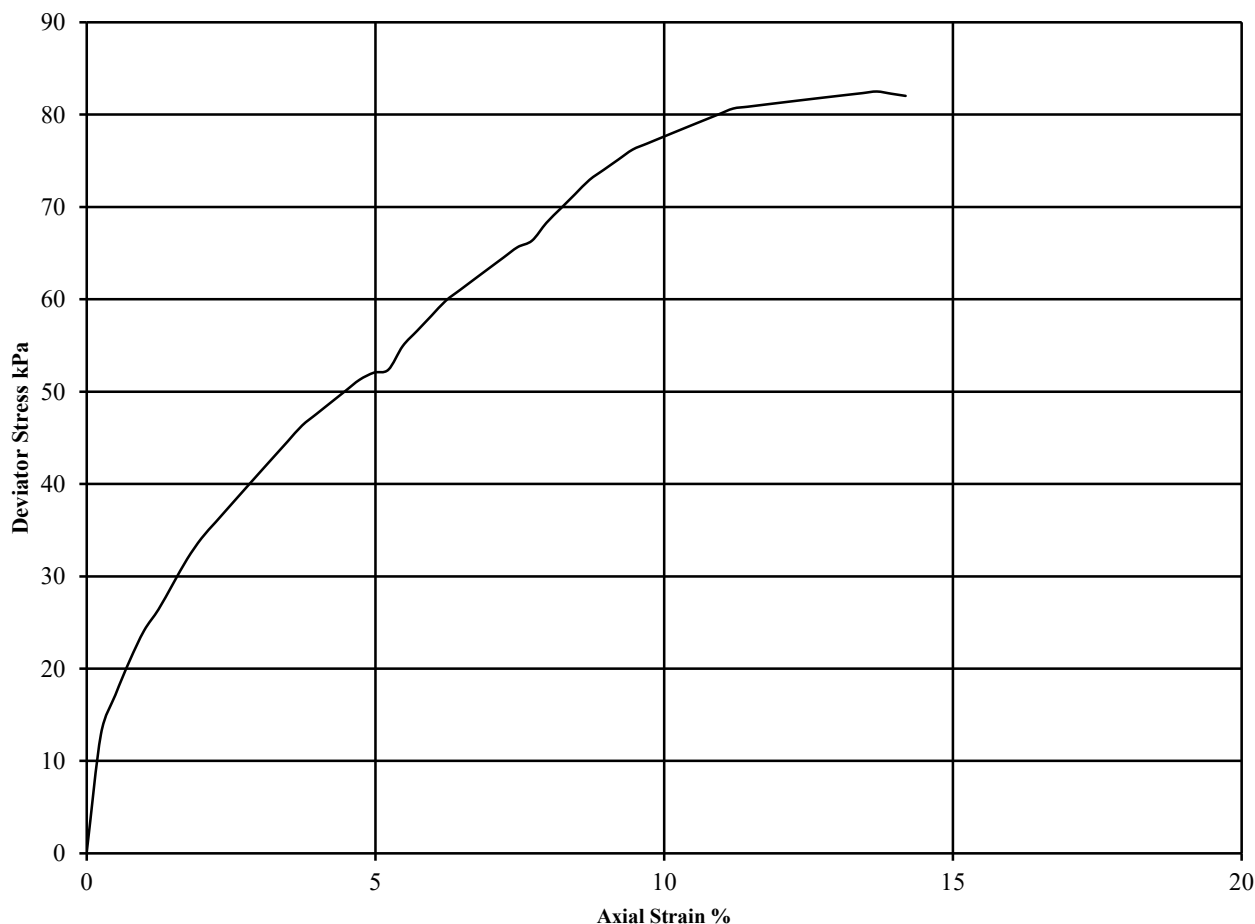
Hole Number: CP101

Top Depth (m): 2.00

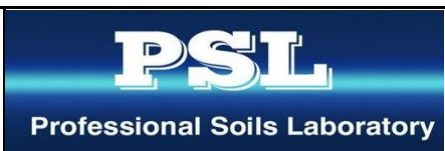
Sample Number:

Base Depth (m):

Sample Type UT100



Diameter (mm):		103		Height (mm):		207	Test:	UU Multistage		Remarks
Specimen	Moisture Content (%)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure		Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick Membrane Correction applied (kPa) 0.36 0.35 0.34 See summary of soil descriptions
1	16	2.17	1.87	20	52	26	5.2			
				40	66	33	7.7			
				80	82	41	13.7	Plastic		



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UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

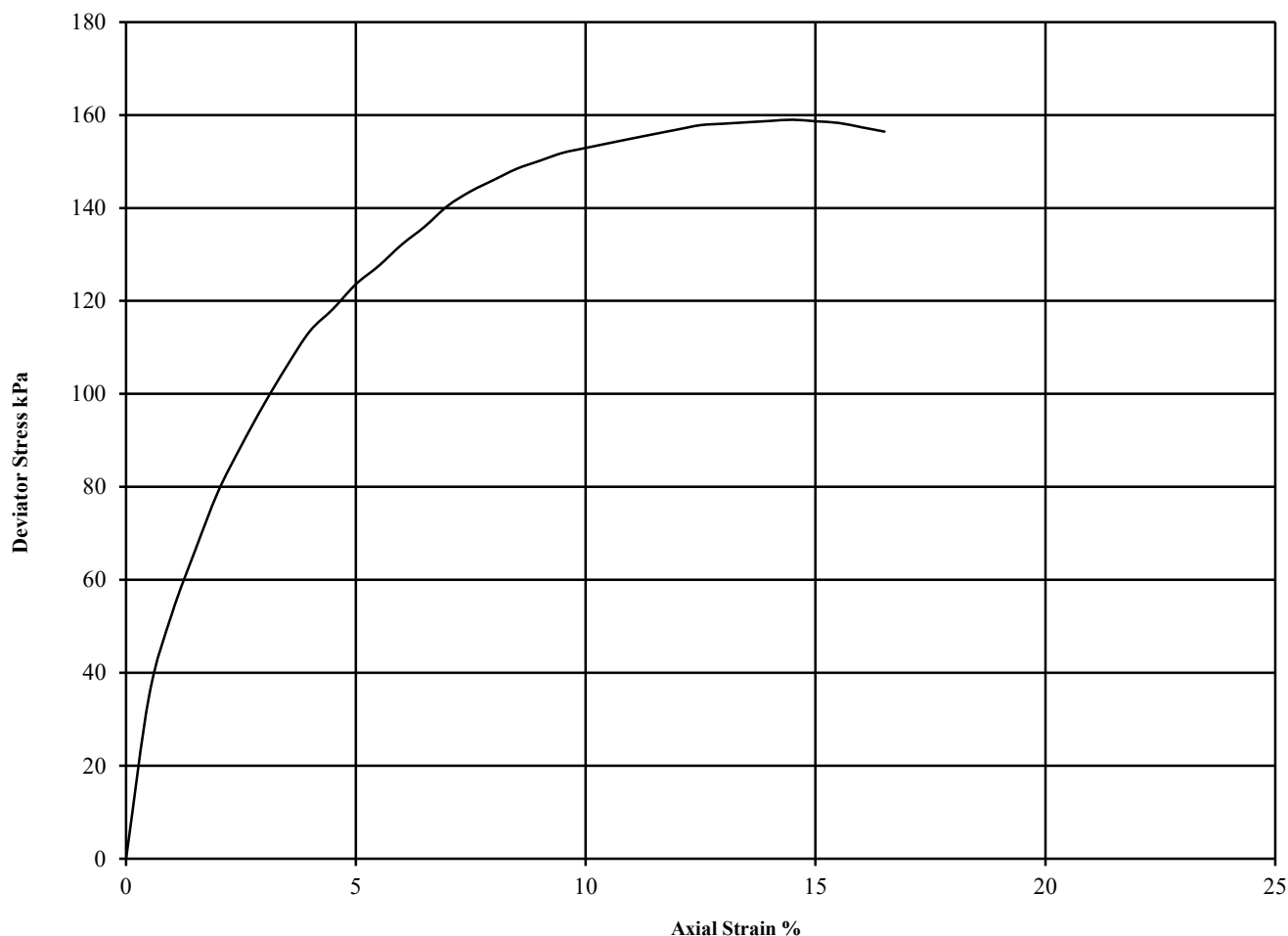
Hole Number: WS108

Top Depth (m): 0.50

Sample Number:

Base Depth (m):

Sample Type U



Diameter (mm):		85		Height (mm):		170		Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.41 See summary of soil descriptions		
1	19	2.11	1.78	θ_3 10	$(\theta_1 - \theta_3)_f$ 159	$\frac{1}{2}(\theta_1 - \theta_3)_f$ 79	14.5	Plastic			



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UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

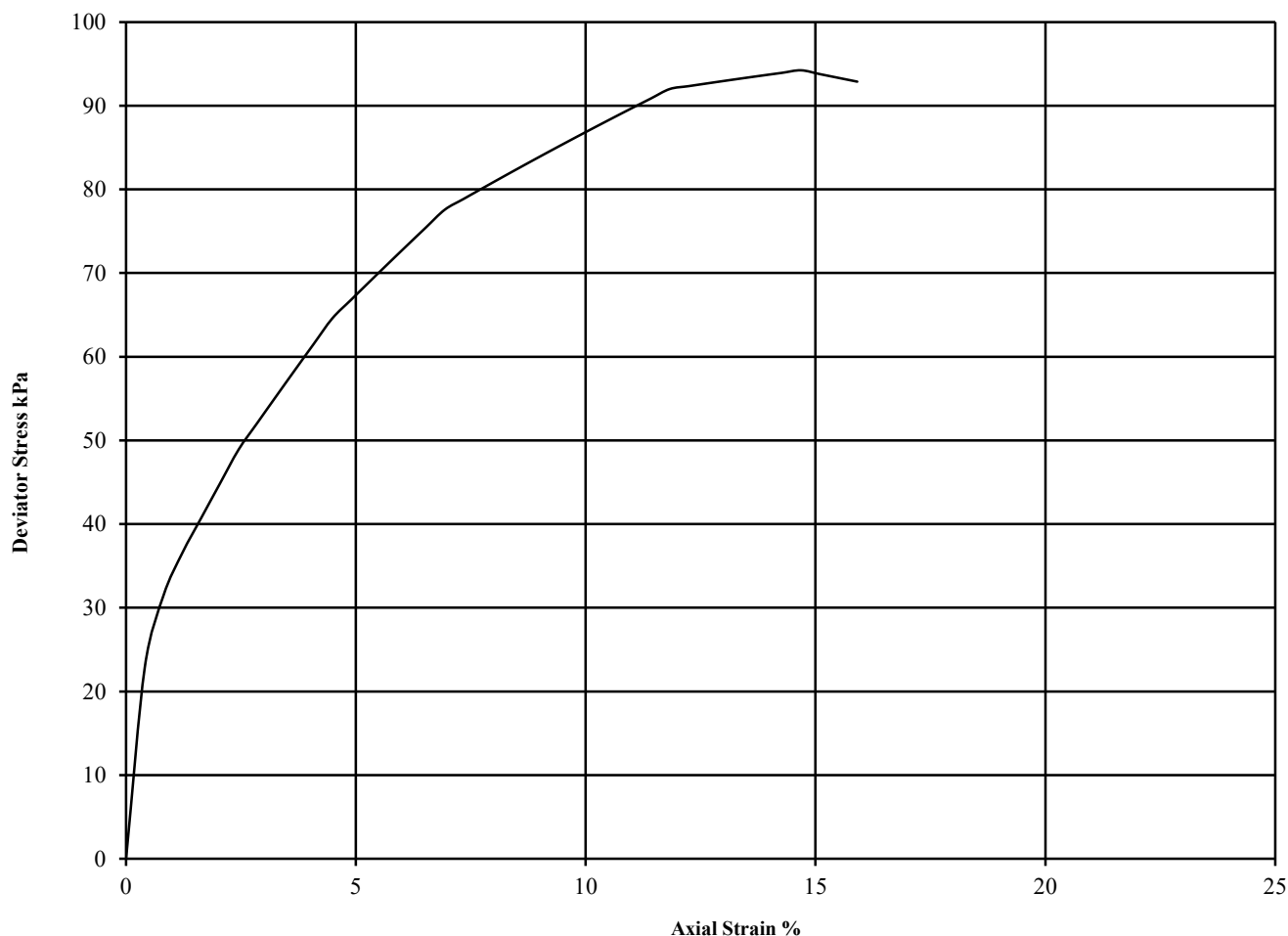
Hole Number: WS125

Top Depth (m): 2.50

Sample Number:

Base Depth (m):

Sample Type U



Diameter (mm):		62		Height (mm):		152		Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.54 See summary of soil descriptions		
1	14	2.18	1.91	θ_3 50	$(\theta_1 - \theta_3)_f$ 94	$\frac{1}{2}(\theta_1 - \theta_3)_f$ 47	14.7	Plastic			



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UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

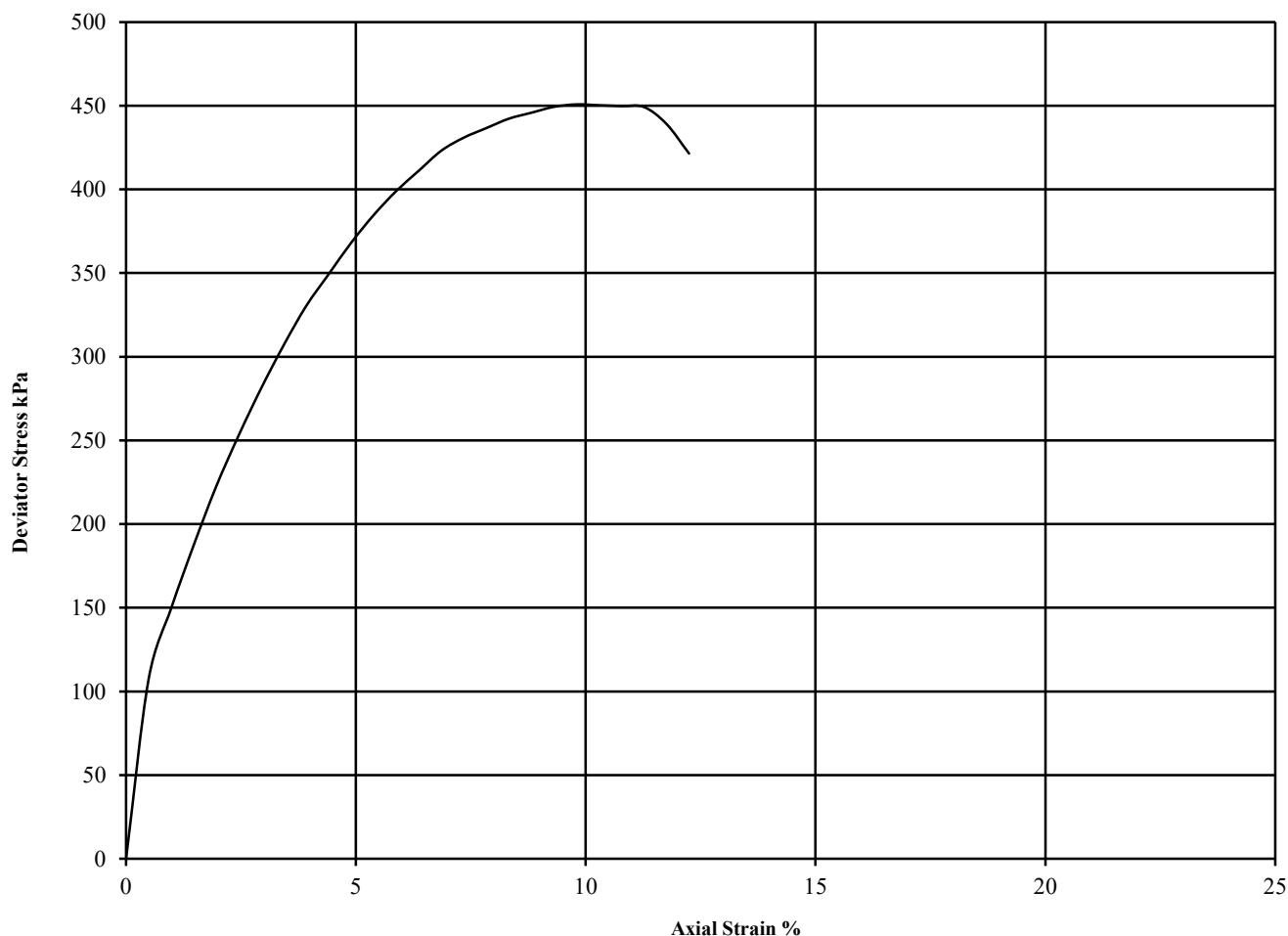
Hole Number: WS133

Top Depth (m): 2.50

Sample Number:

Base Depth (m):

Sample Type U



Diameter (mm):		73		Height (mm):		149		Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.48 See summary of soil descriptions		
				θ_3	$(\theta_1 - \theta_3)_f$	$\frac{1}{2}(\theta_1 - \theta_3)_f$					
1	11	2.21	1.99	50	451	225	9.8	Brittle			



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ONE DIMENSIONAL CONSOLIDATION TEST

BS 1377: Part 5: 1990: Clause 3

Hole Number: WS108

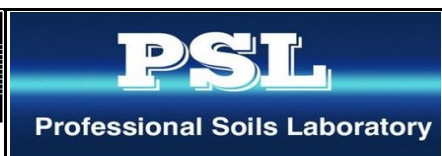
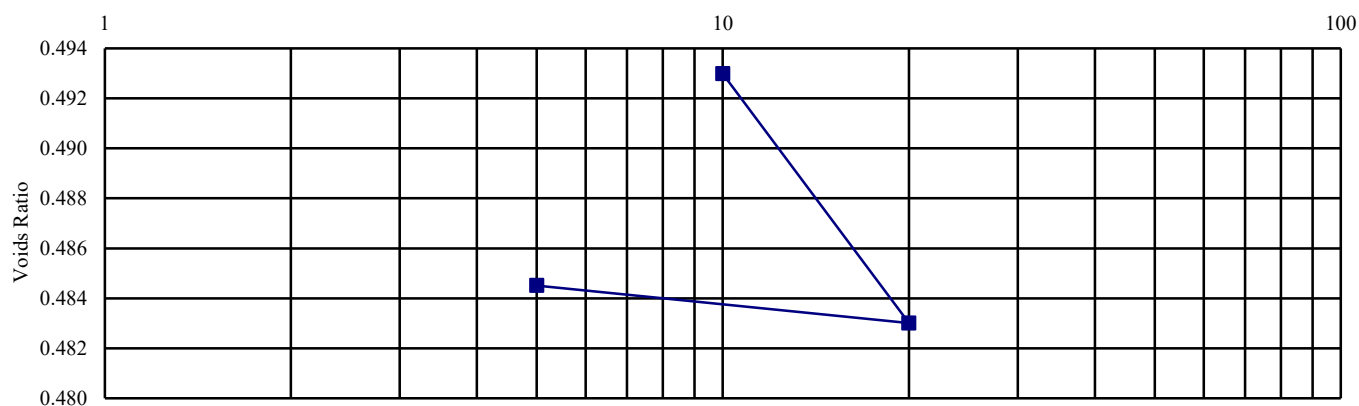
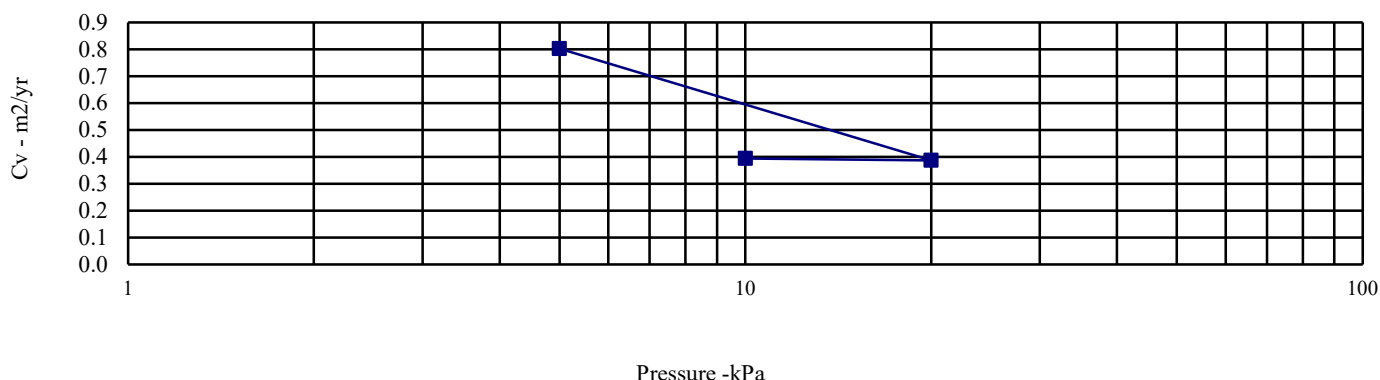
Top Depth (m): 0.50

Sample Number:

Base Depth (m) :

Sample Type: U

Initial Conditions		Pressure Range		Mv	Cv	Specimen location	
Moisture Content (%):	19	kPa		m2/MN	m2/yr	within tube:	Top
Bulk Density (Mg/m3):	2.11	0	5	Swelling	Swelling	Method used to	
Dry Density (Mg/m3):	1.77	5	10	1.109	0.394	determine CV:	T90
Voids Ratio:	0.501	10	20	0.668	0.386	Nominal temperature	
Degree of saturation:	102.8	20	5	0.067	0.802	during test ' C:	20
Height (mm):	20.012	Remarks: See summary of soil descriptions					
Diameter (mm)	75.035						
Particle Density (Mg/m3): Assumed	2.65						



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ONE DIMENSIONAL CONSOLIDATION TEST

BS 1377: Part 5: 1990: Clause 3

Hole Number: WS125

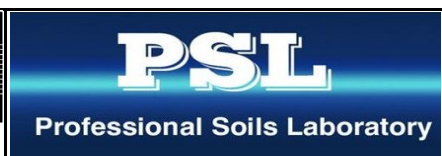
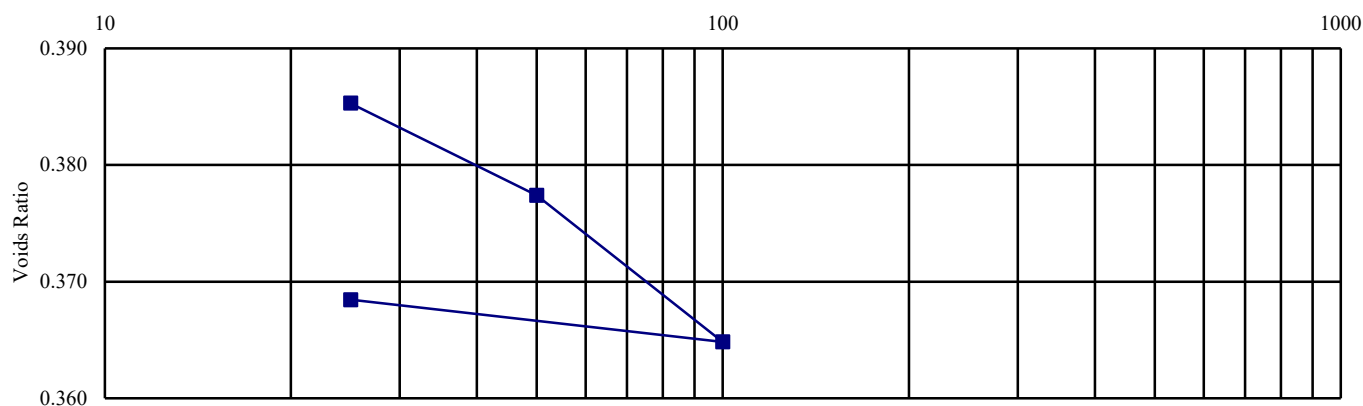
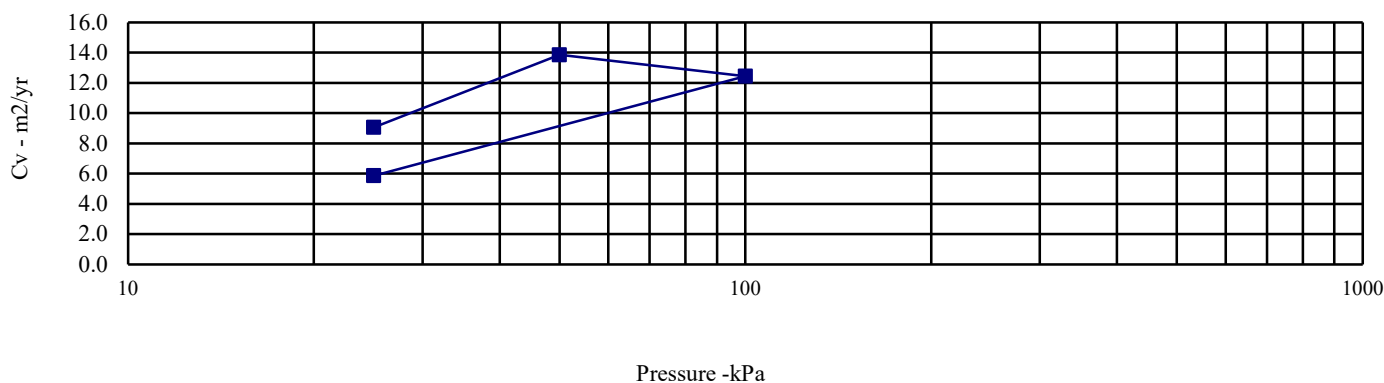
Top Depth (m): 2.50

Sample Number:

Base Depth (m) :

Sample Type: U

Initial Conditions		Pressure Range		Mv	Cv	Specimen location	
Moisture Content (%):	14	kPa		m2/MN	m2/yr	within tube:	Top
Bulk Density (Mg/m3):	2.18	0	25	0.070	9.054	Method used to	
Dry Density (Mg/m3):	1.91	25	50	0.228	13.855	determine CV:	T90
Voids Ratio:	0.388	50	100	0.182	12.438	Nominal temperature	
Degree of saturation:	95.6	100	25	0.035	5.853	during test ' C:	20
Height (mm):	20.012	Remarks: See summary of soil descriptions					
Diameter (mm)	50.025						
Particle Density (Mg/m3): Assumed	2.65						



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ONE DIMENSIONAL CONSOLIDATION TEST

BS 1377: Part 5: 1990: Clause 3

Hole Number: WS133

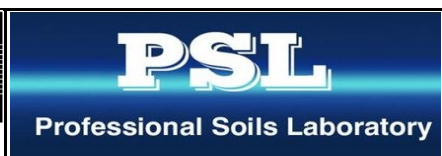
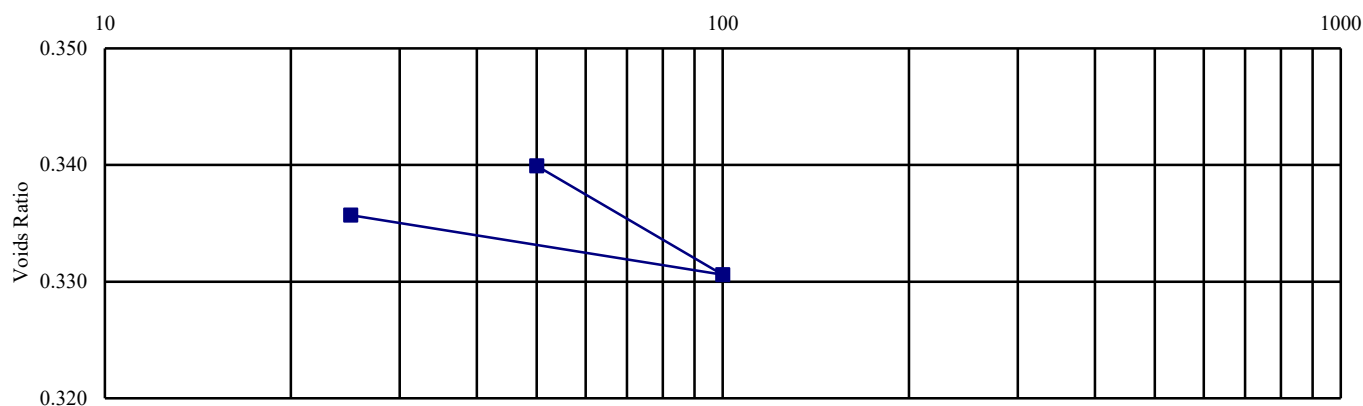
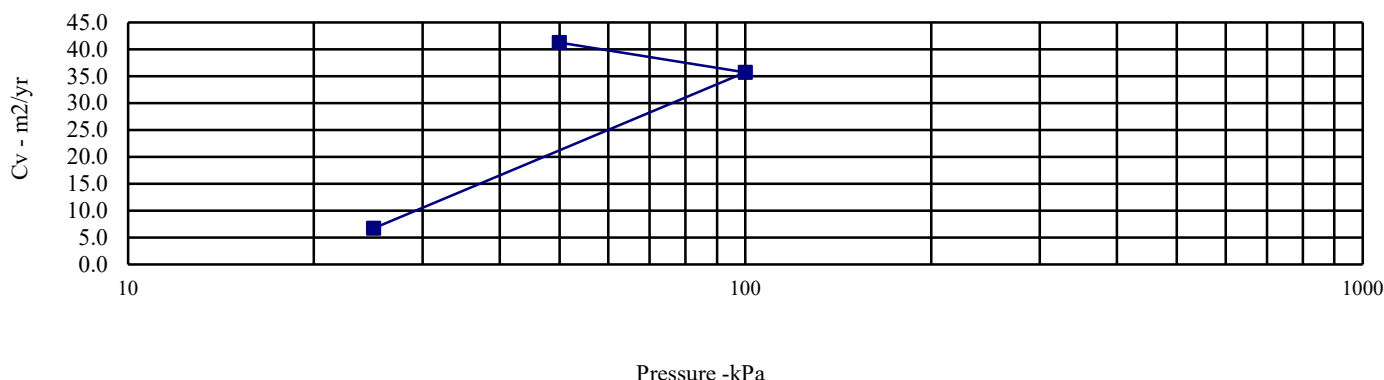
Top Depth (m): 2.50

Sample Number:

Base Depth (m) :

Sample Type: U

Initial Conditions		Pressure Range		Mv	Cv	Specimen location	
Moisture Content (%):	11	kPa		m2/MN	m2/yr	within tube:	Top
Bulk Density (Mg/m3):	2.19	0	25	Swelling	Swelling	Method used to	
Dry Density (Mg/m3):	1.97	25	50	0.130	41.225	determine CV:	T90
Voids Ratio:	0.344	50	100	0.139	35.700	Nominal temperature	
Degree of saturation:	84.0	100	25	0.051	6.691	during test ' C:	20
Height (mm):	20.024	Remarks: See summary of soil descriptions					
Diameter (mm)	50.04						
Particle Density (Mg/m3): Assumed	2.65						



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ONE DIMENSIONAL CONSOLIDATION TEST

BS 1377: Part 5: 1990: Clause 3

Hole Number: CP101

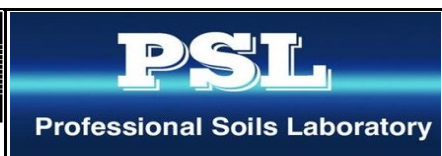
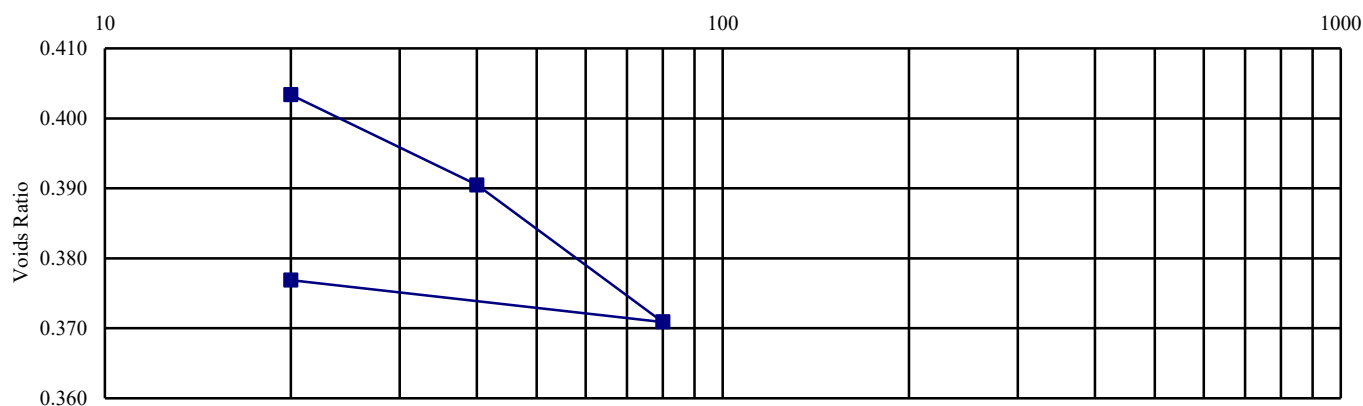
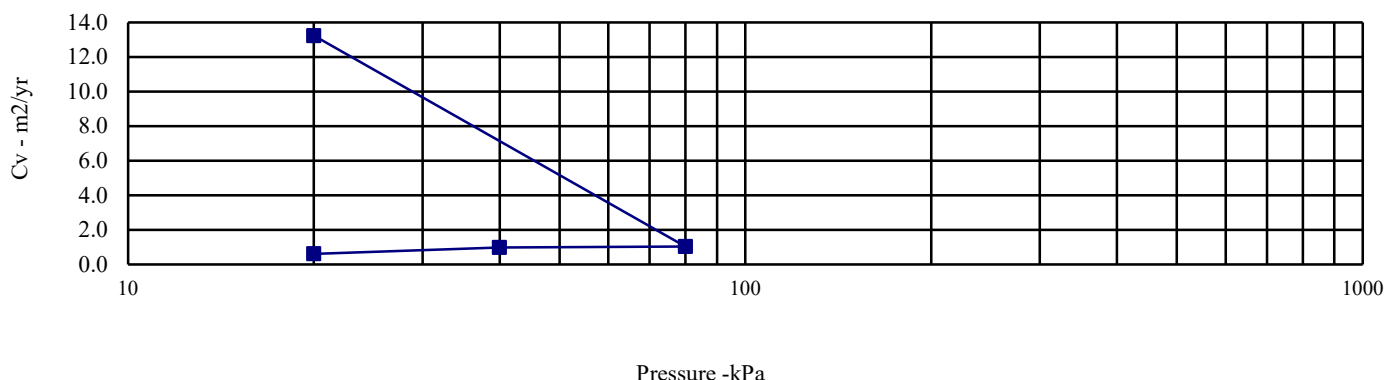
Top Depth (m): 2.00

Sample Number:

Base Depth (m) :

Sample Type: U

Initial Conditions		Pressure Range		Mv	Cv	Specimen location	
Moisture Content (%):	16	kPa		m2/MN	m2/yr	within tube:	Top
Bulk Density (Mg/m3):	2.17	0	20	0.423	0.612	Method used to	
Dry Density (Mg/m3):	1.87	20	40	0.460	0.968	determine CV:	T90
Voids Ratio:	0.415	40	80	0.352	1.024	Nominal temperature	
Degree of saturation:	103.0	80	20	0.073	13.235	during test ' C:	20
Height (mm):	20.082	Remarks: See summary of soil descriptions					
Diameter (mm)	75.025						
Particle Density (Mg/m3):	2.65						
Assumed							



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APPENDIX XI M-BAT AND PB ASSESSMENT

Clear Data

[illegible]

Pb Screening Tool 1.0

Back

Calculate

Clear Data

[illegible]