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ROPEMAKER

PHASE 2 GROUND INVESTIGATION REPORT

Curtins Ref: **088474-CUR-XX-XX-T-GE-00002**
Revision: P01
Issue Date: 10 June 2026

Client Name: Ropemaker Propco Ltd

Client Address: 10 Fenchurch Avenue, London, EC3M 5AG

Site Address: Ropemaker Court, Moss Lane East, Manchester, M14 4PL

Rev	Description	Issued by	Checked	Date
P01	First Issue	JL	NF	10 June 2026

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EXECUTIVE SUMMARY

Appointment	Curtins were instructed by Ropemaker Propco Ltd to undertake a review of the CCG Phase 1 Geoenvironmental Report and undertake an intrusive site investigation at Ropemaker Court, Moss Lane East, Manchester, M14 4PL. The site is centred on NGR 384973, 395629 and covers an area of approximately 0.55 Ha. It is understood that development proposals comprise the construction of 3 No. amenity pavilions situated within external courtyards, re-arrangement of parking and external hardscaping and landscaping.
Current Site Status	The site is occupied by Ropemaker Court Student Accommodation, and is located within Rusholme, Manchester. The site comprises a student accommodation building, with various external courtyards, bike storage sheds, carparking and hard and soft landscaping. Moss Lane East / the B5219 with Whitworth Park is located north of the site; commercial businesses and Wilmslow Road to the east; carparking and student accommodation to the south; and Heald Grove, student accommodation and a carwash to the west of the site.
Summary of Phase 1	Earliest historical mapping (1891) shows the site to have comprised of residential housing in the north, and a carriage and tramway depot within the centre of the site. The south of the site comprised of tramlines and associated hardstanding until 1908 when it was demolished. By 1922, the site comprised of a factory in the north-west, centre and south with the residential properties still present within the north-east of the site. By the late 1980s to early 1990s, the entirety of site comprised of a factory up until at least 2003. The Ropemaker Student Accommodation building was constructed in c. 2010. BGS mapping records indicate the site to be underlain by Glacial Till (Secondary Undifferentiated Aquifer), underlain by the Chester Sandstone Formation bedrock (Principal Aquifer). The site is situated within an area where <1% of homes are at or above the radon action level. There are no surface water features located within 250m of the site. There are no surface or groundwater abstraction points within 1km of the site.
Fieldworks Undertaken	Site investigation works were undertaken on the 11th and 12th of February 2026, comprising of 4 No. window sample boreholes (16 No. locations attempted) and 5 No. hand excavated trial pits for TRL probes. Ground gas and groundwater monitoring boreholes were installed within 4 No. window samples, with 6 No. return visits undertaken between the 18th of February and 28th of April 2026.
Encountered Ground Conditions	Made Ground Topsoil was encountered within 15 no. locations, from ground level with a maximum thickness of 0.49m (WS105A). This material was described as grass over black, slightly clayey, gravelly sand with frequent rootlets and a low cobble content. Gravel comprised of anthropogenic materials such as brick, slate, broken glass, ceramic and quartzite. Made Ground was encountered within all exploratory hole locations, from ground level (surface covering of tarmac) or beneath Made Ground Topsoil, thicknesses of Made Ground ranged between 0.79m and 1.61m. Cohesive Made Ground was encountered in 2 No. locations only, described as dark brown slightly sandy gravelly clay and as brown gravelly clay. Granular Made Ground was encountered within the majority of positions, typically described as brown sandy gravelly clay, yellowish grey sandy gravel, grey sandy gravel or as black/dark greyish brown sandy ashy clayey gravel. Gravel comprised of brick, limestone, sandstone, quartzite, slate, ceramic, charcoal and broken glass. Cohesive Glacial Till deposits were encountered underlying Made Ground within 6 No. locations, encountered from depths ranging between 0.30m to 1.70m bgl, with thicknesses ranging between 3.75m to 4.66m (base of this deposit not encountered). This material was typically described as firm becoming stiff, brown mottled grey, slightly sandy, slightly gravelly, silty clay. Gravel comprised of sandstone, mudstone and coal. Bedrock deposits of the Chester Formation Sandstone were not encountered during this site investigation. 11 No. concrete obstructions were encountered, suggesting there is a wider obstruction present beneath soft landscaped areas in the centre and south of the site, requiring further investigation. 8 No. groundwater strikes were encountered during this ground investigation, ranging between 0.20m to 0.80m bgl, described as perched water. 6 No. return post-investigation groundwater monitoring visits were undertaken between the 18th of February and 28th of April 2026, with perched water present ranging between 0.96m bgl (37.15m AOD) and 3.78m bgl (34.27m AOD).
Environmental Laboratory Testing and Ground Gas Monitoring Results	With respect to the proposed 'Residential without Plant Uptake' end-use, 4 No. exceedances were recorded within 1 No. sample taken from WS103A at 0.65m bgl. All samples were screened for asbestos. No asbestos was identified. 6 No. ground gas monitoring visits have been undertaken, evaluation of the 'borehole' scenario results for WS101 calculated a maximum Qhg of 0.0008 l/hr for methane and 0.0006 l/hr for carbon dioxide, due to a methane concentration of 0.8%, carbon dioxide concentration of 0.6% and a flow of <0.1 l/hr installed within Glacial Till. Utilising the borehole Qhg of 0.0008 l/hr, this GSV indicates a CS-1 classification, requiring no protection measures/requiring gas protection measures in the north and centre of the site. Further investigation within the south of the site is required to determine whether ground conditions are consistent, and to assign a CS value.

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Ground Contamination and Ground Gas Assessment	A **Moderate/Low** risk rating is identified to construction workers, site end-users (future occupants), maintenance workers and off-site receptors, from contamination in soils from direct ingestion, dermal contact, fibre inhalation and leaching through the unsaturated zone. 4 No. PAH exceedances above Residential without Plant Uptake GACs were identified. No asbestos containing materials or fibres were identified. The site area is proposed to be partially covered by hardstanding which would break the source-pathway-receptor linkage; however, any new soft landscaped areas within the centre of the site would require a clean capping layer with an underlying geotextile membrane, detailed within a Remediation Strategy. A **Low** risk rating is identified to construction workers, site end-users (future occupants), maintenance workers and off-site receptors, from inhalation of vapours associated with onsite Made Ground deposits. No evidence of significant olfactory contamination was encountered during the ground investigation. A **Low** risk rating is identified to site end-users (future occupants) from inhalation of ground gases from on-site or off-site sources (i.e. Made Ground). The north and centre of the site was assigned CS-1 following a ground gas monitoring regime, which indicates no ground gas protection measures are required. Further investigation within the south of the site is required to determine if ground conditions are consistent and to assign a Characteristic Situation for this section of the site. A **Very Low** risk rating was identified to the future building from pH and sulphate attack on concrete. The classification of the site in terms of concrete in aggressive, based on the guidance provided in Table C2 of the Building Research Establishment (BRE) Special Digest 1, assigns a DS-1 AC-1 for Made Ground and Glacial Till. A **Low** risk rating was identified off-site receptors and the Principal Aquifer from organic contamination associated with historic onsite land uses. No significant sources of contamination identified in site soils, and there are no potable boreholes located within influencing distance of the site; and superficial deposits comprised of cohesive material limiting the migration potential of any contaminants. Distance to the nearest surface water receptor off-site for contamination migration over and through predominantly cohesive superficial soils. A **Moderate/Low** risk rating was identified to the potable water supply and site end-users (future occupants) from organic and inorganic contamination associated with historic on-site land uses. No significant sources of contamination were identified within site soils, however, a United Utilities Water Supply Risk Assessment should be carried out to determine barrier pipe suitability requirements for the site.
Geotechnical Assessment	The Made Ground deposits are not considered a suitable bearing stratum for foundations given their inherent variability. Dependent on proposed building loads, shallow strip (450mm) foundations are likely to be feasible, founding in the firm to stiff Glacial Till (with an assumed safe bearing capacity of 80kPa) below the Made Ground deposits at a depth of approximately 2.00m bgl. If a higher bearing resistance is required for the proposed loads or changes in the foundation dimensions are proposed, then further assessment/review should be undertaken. Further ground instigation is required to provide a safe bearing capacity for the proposed Outdoor Amenity Space within the south of the site, due to impenetrable concrete obstructions using window sampling methods in the south of the site. A suspended floor slab is likely suitable for the proposed development, owing to the depth of Made Ground encountered within areas of the site. The formations should be inspected by an experienced geotechnical engineer prior to casting. The preliminary design of buried concrete according to Table C2 of BRE Special Digest 1:2005 should be in accordance with Class DS-1 AC-1.
Recommendations	Based on the findings of the ground investigation, the following recommendations are made: • Construction workers to be provided with appropriate PPE and sanitary facilities with reference to environmental testing certificates appended herein. • Proposed loads have not been provided at the time of writing this report. It is recommended that the geotechnical recommendations are reviewed upon receipt of this information. • Remediation Strategy to specify requirements for a clean capping cover system to break the source pathway receptor linkage of PAH exceedances for any new soft landscaped areas within the centre of the site. • Enabling works are likely to be required in order to address the shallow below ground obstructions in both the centre and south of the site. • Further ground investigation is recommended to confirm that ground conditions are consistent across the uncharacterised areas of the site, beneath obstructions encountered within the centre and south of the site, which would also inform an updated ground gas risk assessment. • A United Utilities Water Supply Pipe Risk Assessment should be undertaken to inform barrier pipe suitability requirements for the site.

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1 INTRODUCTION

1.1 Project Background

Curtins were instructed by Ropemaker Propco Ltd to undertake a review of CCG's Phase 1 Geoenvironmental Report (Ref. 1) and undertake an intrusive site investigation at Ropemaker Court, Moss Lane East, Manchester, M14 4PL. The site is approximately centred on National Grid Reference 384973, 395629 and covers an area of approximately 0.55 Ha.

Development proposals comprise the construction of 3 No. amenity pavilions situated within external courtyards, re-arrangement of parking and external hardscaping and landscaping.

A proposed site plan is included in *Appendix A*.

1.2 Scope of Services

This investigation aims to characterise the geo-environmental and geotechnical conditions for the proposed works.

Specifically, the Phase 2 report is intended to determine:

a) If there is a risk of the proposed end user being adversely impacted upon by potential contamination in shallow site soils that may be present on the site due to its known current, recent and historical use;
b) If there is a risk of groundwater and/or surface water being adversely impacted upon by potential contamination that may be present on the site due to its known current, recent and historical use;
c) If there is a risk to the end user from soil gases including methane, carbon dioxide, carbon monoxide and hydrogen sulphide; and,
d) Likelihood of the proposed works being adversely impacted by potential geo-hazards across the site.

In addition, engineering recommendations for the proposed amenity pavilions are provided.

Detailed flood risk assessment, ecology and archaeological studies are outside the scope of this report.

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2 PRELIMINARY SITE ASSESSMENT SUMMARY

This section presents a summary of the current site setting, history, geology, and hydrogeology/hydrology, previously detailed in the CCG Phase 1 Report (Ref. 1). As such, it is advised that this report is read in conjunction with the CCG Phase 1 Report (Ref. 1).

A summary of the pertinent Phase 1 Preliminary Risk Assessment Report information specifically for the proposed development site is presented in the following sub-sections.

This information will feed into the geotechnical assessment (refer to Section 11.0) and geo-environmental risk assessments (refer to Section 7.0).

2.1 Current Setting

The site is occupied by Ropemaker Court Student Accommodation, and is located within Rusholme, Manchester, as shown in Figure 1 below. The site comprises a student accommodation building, with various external courtyards, bike storage sheds, carparking and hard and soft landscaping.

The topography of site is generally flat.

Figure 1 – Satellite imagery of the Site,
red line boundary indicating the approximate location of the site.

The site surrounding land use is summarised in Table 1.

Table 1 – Surrounding Area

Surrounding Area	N	Moss Lane East / B5219 with Whitworth Park beyond.
	E	Several commercial businesses, Wilmslow Road and further commercial businesses beyond.
	S	Carparking and further Student Accommodation.
	W	Heald Grove, Student Accommodation, and a Car Wash.

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2.2 Previous Site Use

A review of the available historical map information for the site, as presented within CCG Phase 1 Report (Ref. 1) has been undertaken with specific reference to potential sources of contamination and geohazards.

Historical Mapping shows the site to have comprised of residential housing in the north, and a carriage and tramway depot within the centre and south of the site in 1891. The south of the site comprised of tramlines and hardstanding until 1908 when this was demolished. By 1922, the site comprised of a factory in the north-west, centre and south with residential properties still present in the north-east. By the late 1980s to early 1990s, the entirety of site comprised of a factory up until at least 2003 (end of historical mapping records). The Ropemaker Student Accommodation building was constructed in c. 2010.

2.3 Published Geology

A review of British Geological Survey (BGS) map, 1:50,000 Scale, Bedrock and Superficial Editions, Manchester, Sheet 085, 2010, indicates the following geological sequence:

- Glacial Till overlying;
- Chester Formation Sandstone.

2.3.1 Made Ground Deposits

The BGS maps do not indicate Made Ground on site, however given the phases of development both on-site and in the immediate surrounding area, Made Ground is anticipated.

2.3.2 Superficial Deposits

Superficial deposits are recorded as Glacial Till.

Glacial Till is typically described as a heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape.

2.3.3 Bedrock Deposits

Bedrock deposits are indicated to comprise the Chester Formation Sandstone, which generally comprise conglomerates and reddish brown, cross-bedded, pebbly sandstones with subordinate beds of red-brown mudstone.

2.3.4 Mining and Quarrying

According to the Mining Remediation Authority, the site is not located within a Coal Mining Reporting Area. The risk to development from historic coal mining legacy has not been considered further.

There are no non-coal mining records within 500m of the site. The risk to development from historic non-coal mining has not been considered further.

2.3.5 Other Pertinent Existing Geological Records

The CCG Phase 1 Report (Ref.1) confirms that there is ‘negligible to very low risk’ from the following ground stability hazards on and around the site: collapsible ground, compressible ground, running sands, landslides, shrinking or swelling clay and ground dissolution.

UK Radon Mapping (Ref. 2) confirms the site is situated in an area where <1% of homes are above the radon action level.

2.4 Hydrogeology and Hydrology

The Chester Formation bedrock is classified as a Principal Aquifer, defined as:

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> *"Rocks that provide significant quantities of water and can support water supply and/or baseflow to rivers, lakes and wetlands on a strategic scale. They typically have a high intergranular and/or fracture permeability, meaning they usually provide a high level of water storage."*

The Glacial Till deposits are classed as a Secondary Undifferentiated Aquifer, defined where:

> *"This is assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type."*

There are no surface water features located within 250m of the site.

There have been no records of substantiated pollution incidents within 500m of the site.

There are no groundwater abstraction points within 1km of the site.

There are no surface water abstraction points within 1km of the site.

The closest active discharge consent is located 238m south-east of the site at Walmer Street/Wilmslow Road relating to sewage discharges.

2.5 Landfill & Pollution

A review of existing report undertaken within CCG Phase 1 (Ref. 1) identified no historical or active landfill sites within 500m of the site.

2.6 Ground Gas Sources

The closest area of infilled ground is located 149m west of the site, noted as an artificial deposit.

CCG's Phase 1 (Ref. 1) and UK Radon mapping (Ref. 2) confirms the site is situated in an area of where less than 1% of homes are estimated to be at or above the Radon Action Level. On this basis, it is unlikely that radon protection measures will be required.

2.7 Summary of Phase 1 PCSM

A summary of potential pollutant linkages at the development site identified in the CCG Phase 1 Report (Ref. 1) presented in Table 2, were identified as requiring further investigation to enable the safe development at the site.

Curtins have made minor amendments where errors have been identified within the original CCG PCSM.

Table 2 – Summary of Phase 1 PCSM

Source	Pathway	Receptor	Risk
Broad spectrum of heavy metals, aggressive pH, hydrocarbons, PAHs in Made Ground associated with the development and redevelopment of the site and adjoining area.	**Soil and/or dust ingestion** **Dermal contact** **Leaching through Unsaturated Zone**	**Construction Workers** **Future Occupants including Residing Students** **Maintenance Workers** **Offsite Receptors**	**Moderate**
	Fibre Inhalation		**High**

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Inhalation of vapours associated with onsite Made Ground deposits.	**Inhalation**	**Construction Workers** **Future Occupants including Residing Students** **Maintenance Workers** **Offsite Receptors**	**Moderate**
Inhalation of ground gases from onsite or offsite sources (i.e. Made Ground).	**Inhalation**	**Future Occupants including Residing Students**	**Moderate**
pH and sulphate attack on concrete.	**Future Building**	**Future Building**	**Moderate/Low**
Organic and inorganic contamination associated with historical onsite land uses.	**Leaching through Unsaturated Zone**	**Offsite Receptors & Principal Aquifer**	**Moderate**
	Direct contact with water mains	**Potable water supply** **Future Occupants including Residing Students**	**Moderate**

Potential contaminants of concern associated with the sources identified within the CCG Conceptual Site Model include but are not limited to broad range aliphatic and aromatic hydrocarbons; polycyclic aromatic hydrocarbons (PAHs), inorganic compounds including heavy metals; ground gases; asbestos and aggressive pH.

It was recommended that a ground investigation is conducted to both confirm this assessment and provide data in support of the structural and civil engineering design. The scope of the investigation undertaken in detailed in *Section 3.0*.

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3 PRELIMINARY UNEXPLODED ORDNANCE (UXO) RISK ASSESSMENT

It should be noted that the following assessment is only applicable to the Curtins Ground Investigation described in this report only. Where the client is looking to determine the risk from UXO throughout the entire enabling works and construction phase of below ground level development, the Principal Contractor appointed for the enabling and construction works must obtain their own Detailed UXO Risk Assessment Report to advise their specific works.

UXO Risk Mapping indicates that the risk posed by UXO associated with WW2 bombing to be Moderate-Risk within the site. Areas designated as Moderate-Risk are those that shows a low bombing density of 15 to 49 bombs per 1000 acres.

With reference to historical mapping, there are no ‘ruins’ (evidence of bomb damage) detailed on-site or within the immediate surrounding area.

The Principal Contractor should undertake their own risk assessments with respect to encountering UXO during construction.

If unexploded ordnance is discovered during any works, stop immediately, prevent access to the area, and inform the police. If the site boundary or location changes then the UXO risk should be reassessed.

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4 PHASE 2 INVESTIGATION SCOPE OF WORKS

Site investigation works were undertaken on the 11th and 12th of February 2026.

The scope of the ground investigation was designed in general accordance with current UK guidance including Land Contamination Risk Management (LCRM) (Ref. 3), BS10175 (Ref. 4), BS5930:2020 (Ref. 5) and BSEN1997-2:2007 Eurocode 7 (Ref. 6).

The scope and rationale are summarised in *Table 3.*

Table 3 – Scope and Rationale of Works

Exploratory Hole Type	Exploratory Hole Reference	Exploratory Hole Depth (m bgl)	Rationale
Window Sample Boreholes	WS101 WS102A WS102B WS102C WS103A WS103B WS103C WS104A WS104B WS105A WS105B WS105C WS106A WS106B WS106C WS107	5.45 0.33 0.26 0.36 0.77 1.10 5.45 0.76 5.45 0.50 0.50 0.47 0.26 0.22 0.33 5.45	Confirm shallow ground conditions. Collect soil samples for chemical and geotechnical testing. Undertake in-situ testing. Install boreholes for gas and groundwater monitoring in 4 No. boreholes for ground gas and groundwater monitoring.
Hand Excavated Trial Pits with TRL/DCP Probes	HP101 HP102 HP103 HP104 HP105	0.25 0.29 0.36 0.36 0.33	Confirm shallow ground conditions. To undertake TRL/DCP Tests.

Potential sources of on-site contamination are further discussed in *Section 7.0*.

4.1 Soil Logging and Sampling

Exploratory borehole arisings were logged on site by a qualified Engineer. All exploratory holes were logged in accordance with the requirements of BS5930:2020 (Ref. 5) including recording observed visual and olfactory indications of contamination. Exploratory hole logs are provided in *Appendix B*.

4.2 Monitoring Well Installations

Ground gas and groundwater monitoring slotted 50 mm diameter pipes were installed within 4 No. window sample boreholes.

A bentonite seal was placed above and below the screened section of the borehole to minimise potential for downward migration of contaminants and the creation of a preferential migratory pathway. A gravel aggregate surround was installed in the annulus between the sides of the borehole and the slotted sections of pipe. The monitoring wells were primarily designed to assess the potential for ground gas and water monitoring.

The installed response zones are summarised in *Table 4*.

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Table 4 – Monitoring Well Response Zones

Exploratory Hole Ref	Response Zone(s) m bgl (m AOD)	Strata Description
WS101	2.00 – 4.00 (36.11 – 34.11)	Slightly sandy, slightly gravelly silty CLAY (Glacial Till)
WS103C	0.50 – 1.50 (37.92 – 36.92)	MADE GROUND: Sandy, ashy, clayey gravel.
WS104B	1.00 – 5.00 (37.05 – 33.05)	Slightly sandy, slightly gravelly silty CLAY. (Glacial Till)
WS107	1.00 – 3.00 (37.04 – 35.04)	Slightly sandy, slightly gravelly silty CLAY. (Glacial Till)

Copies of borehole logs can be referred to in *Appendix B* of this report.

4.3 Post Investigation Monitoring

4.3.1 Ground Gas and Groundwater Monitoring

Six gas and groundwater level monitoring visits have been undertaken, between 18th of February and the 28th of April 2026 to assess the groundwater and gas conditions as identified in the Preliminary Conceptual Site Model in the CCG Phase 1 Preliminary Site Assessment (Ref. 1).

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5 LABORATORY ANALYSIS

Representative soil samples were selected for laboratory geotechnical and chemical testing, based on field observations, to inform the proposed works.

Selected environmental soil samples were placed in laboratory provided containers and stored in cool boxes prior to being transported to the nominated laboratory under the laboratory's chain of custody documentation. The laboratory selected by Curtins for chemical analysis was Envirolab (UKAS and MCERTS accredited), and for geotechnical analysis was i2 Analytical (UKAS accredited).

Sampling positions were generally located in a non-targeted, systematic array to give adequate and representative coverage of the site's proposed end use and the immediate environmental setting.

5.1 Environmental Chemical Analysis

The contaminants of concern potentially present on the site were considered to include, amongst others; organic matter, fill, hydrocarbons (e.g. fuel/oils) the extent of which is captured by the broad environmental testing suite listed in Table 5.

Table 5 – Environmental Chemistry Analysis Suite: Soils

Suite Ref	Analyte	LOD
Soils Suite A	Asbestos Screen, pH and Soil Organic Matter (SOM)	-
	Arsenic, Chromium, Chromium VI, Copper, Lead, Selenium, Zinc, Nickel	1 to 5 mg/kg
	Boron (water soluble)	1 mg/kg
	Cadmium	0.5 mg/kg
	Mercury	0.17 mg/kg
	Cyanide (total)	1 mg/kg
	Phenols (screen)	0.2 mg/kg
	PAHs (USEPA 16)	0.1 to 0.8 mg/kg
	TPH (Aro/Ali Split)	0.01 to 0.1 mg/kg
	Water Soluble 2:1 Sulphate	0.01 g/l

5 No. soil samples were obtained from site and tested for Soils Suite A.

- 2 No. Made Ground soils
- 2 No. Made Ground Topsoil
- 1 natural soils.

5.2 Groundwater Analysis

The ground investigation did not encountered groundwater strikes within natural strata; therefore, no groundwater samples were obtained as part of this investigation.

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5.3 Geotechnical Analysis

Soil samples for testing were prepared in accordance with BS1377: Part 1:2016 (Ref. 8). The geotechnical testing undertaken is summarised in Table 6.

Table 6 – Geotechnical Testing Soils

Test Type.	Quantity	Standard
In Situ Testing		
Standard Penetration Test	20	BS 5930: 2015+2020, Clause 41
Laboratory Testing		
pH	8	BS1377 1990, Part 3 (clause 9.4 & 9.5)
Water Soluble Sulphate 2:1 SO4	8	BS1377 1990, Part 3 (clause 5.3 & 5.5)
Moisture Content	16	BS 1377 Part 2: 1990, Clause 3.2
Atterberg 4 Point	8	BS 1377: Part 2: 1990, Clause 3.2 4.3, & 5

The results of the geotechnical testing are summarised in *Section 6.0* of this report. Copies of the geotechnical testing certificates are presented in *Appendix D*.

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6 GROUND CONDITIONS

The ground conditions across the site, determined during the Curtins 2026 ground investigation works, generally comprises either grass over Made Ground Topsoil, or tarmac hardstanding, over predominantly granular Made Ground overlying cohesive Glacial Till.

6.1 General

A summary of the ground conditions encountered during the site investigation works is presented in Table 7, with detailed information presented in the exploratory hole logs included in *Appendix B*.

Table 7 – Summary of Ground Conditions Encountered

Strata	Depth to Top of Strata m bgl (m AOD)	Recorded Thickness (m) Min	 Max	Description
Made Ground Topsoil	0.00 (38.62 – 38.04)	0.09	0.49	Grass over black slightly clayey, slightly gravelly sand with frequent rootlets and a low cobble content.
Made Ground	0.00 – 0.49 (38.41 – 38.01)	0.79	1.61	**Surface coverings:** Black/dark grey tarmac with concrete inclusions.
				Subbase: Yellowish grey sandy gravel underlain by a geotextile membrane.
				General Made Ground: Dark brown slightly sandy gravelly clay with a low cobble content. *Or* Yellowish grey sandy gravel. *Or* Black/dark grey and grey sandy ashy clayey gravel.
Glacial Till*	0.30 – 1.70 (38.31 – 36.72)	3.75*	4.66*	Firm becoming stiff, brown mottled grey, slightly sandy, slightly gravelly, silty CLAY.

*Base of this strata not encountered

6.2 Made Ground Topsoil

Made Ground Topsoil was encountered within 15 No. exploratory hole locations, from ground level. The maximum thickness of this material was recorded as 0.49m within WS105A.

Made Ground Topsoil typically comprised of grass over black, slightly clayey, gravelly sand with frequent rootlets and a low cobble content. Gravel comprised of anthropogenic materials such as brick, slate, broken glass and ceramic along with quartzite.

6.3 Made Ground

Made Ground was encountered within all exploratory hole locations, from ground level where tarmacadam hardstanding was encountered, or beneath Made Ground Topsoil, encountered from between ground level and 0.49m bgl. The thickness of Made Ground encountered ranged between 0.79m and 1.61m.

Cohesive Made Ground was encountered within WS101 and WS103A only, described as dark brown slightly sandy gravelly clay with a low cobble content and as brown gravelly clay respectively.

Granular Made Ground was encountered within the majority of exploratory hole positions, typically described as brown, sandy, gravelly clay with a medium cobble content; yellowish grey sandy gravel; grey sandy gravel; black/dark greyish brown sandy ashy clayey gravel.

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Gravel comprised of brick, limestone, sandstone, quartzite, slate, ceramic, charcoal and broken glass. Cobbles comprised of ceramic and whole bricks.

Obstructions were recorded in the Made Ground as detailed in Section 5.6.

6.4 Glacial Till Deposits

Superficial deposits of cohesive Glacial Till were encountered underlying the Made Ground deposits within WS101, WS103C, WS104B, WS107, HP103 and HP104. The clay was encountered at depths ranging between 0.30m bgl (HP103) and 1.70m bgl (WS103C). Thicknesses ranged between 3.75m to 4.66m, with the base of this deposit not encountered.

This cohesive material was typically described as firm becoming stiff, brown mottled grey, slightly sandy, slightly gravelly, silty clay. Gravel comprised of sandstone, mudstone and coal.

6.5 Chester Formation Sandstone

Bedrock deposits of the Chester Formation Sandstone were not encountered during the site investigation.

6.6 Obstructions Encountered

Obstructions were encountered during the intrusive investigation works, described as below:

- WS102A at 0.32m bgl (38.18m AOD): Concrete.
- WS102B at 0.25m bgl (38.25m AOD): Concrete.
- WS102C at 0.35m bgl (38.15m AOD): Concrete.

- WS103A at 0.76m bgl (37.69m AOD): Concrete.
- WS103B at 1.10m bgl (37.35m AOD): Concrete.

- WS104A at 0.75m bgl (37.30m AOD): Unrecorded Service (position moved).

- WS105A at 0.49m bgl (38.01m AOD): Concrete.
- WS105B at 0.48m bgl (38.02m AOD): Tarmac underlain by concrete.
- WS105C at 0.46m bgl (38.04m AOD): Concrete.

- WS106A at 0.25m bgl (38.37m AOD): Tarmac underlain by concrete.
- WS106B at 0.22m bgl (38.40m AOD): Tarmac underlain by concrete.
- WS106C at 0.32m bgl (38.30m AOD): Tarmac underlain by concrete.

These obstructions suggest that there is a wider obstruction present beneath the soft landscaped areas in both the centre and the south of the site, requiring further investigation. Obstructions are discussed in further detail within Section 12.4.

6.7 Groundwater

Water strikes were encountered during the intrusive investigation works, described as below:

- WS101 at 0.80m bgl (37.31m AOD) described as perched water.
- WS102A at 0.20m bgl (38.30m AOD) described as perched water.
- WS102B at 0.21m bgl (38.29m AOD) described as perched water.
- WS102C at 0.24m bgl (38.26m AOD) described as perched water.
- WS105A at 0.49m bgl (38.01m AOD) described as perched water.
- WS105B at 0.51m bgl (37.99m AOD) described as perched water.
- WS105C at 0.46m bgl (38.04m AOD) described as perched water.
- WS107 at 0.75m bgl (37.29m AOD) described as perched water.

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Six groundwater monitoring visits have been undertaken between the 18th of February 2026 and the 28th of April 2026, the results of which are presented in Table 8.

Table 8 – Groundwater Monitoring Results

Strata	Installation Strata	Response Zone(s) m bgl (m AOD)	Depth, m bgl (m AOD)					
			18/02/26	10/03/26	20/03/26	31/03/26	15/04/26	28/04/26
WS101	Glacial Till	2.00 – 4.00 (36.11 – 34.11)	1.49 (36.62)	1.00 (37.11)	0.96 (37.15)	1.03 (37.08)	1.02 (37.09)	1.02 (37.09)
WS103C	Made Ground	0.50 – 1.50 (37.92 – 36.92)	1.53 (36.89)	1.50 (36.92)	1.53 (36.89)	1.52 (36.90)	1.52 (36.90)	Dry
WS104B	Glacial Till	1.00 – 5.00 (37.05 – 33.05)	3.78 (34.27)	2.05 (36.00)	1.87 (36.18)	1.75 (36.30)	1.69 (36.36)	1.60 (36.42)
WS107	Glacial Till	1.00 – 3.00 (37.04 – 35.04)	2.50 (35.54)	1.55 (36.49)	1.54 (36.50)	1.47 (36.57)	1.47 (36.57)	1.40 (36.69)

It is likely that these groundwater monitoring results represent perched water collecting within the monitoring wells, rather than a groundwater body.

6.8 Observed Potential Contamination

Olfactory evidence of potential contamination was encountered during the intrusive investigation works, described as below:

- WS103A between 0.34m – 0.77m bgl (38.11m – 37.68m AOD): slight hydrocarbon odour.
- WS103B between 0.23m – 1.10m bgl (38.22m – 37.35m AOD): slight hydrocarbon odour.
- WS103C between 0.21m – 1.70m bgl (38.21m – 36.72m AOD): slight hydrocarbon odour.

Anthropogenic inclusions were encountered throughout the Made Ground deposits.

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7 GROUND MODEL

7.1 Made Ground

Made Ground was encountered within all exploratory hole locations, from ground level or beneath Made Ground Topsoil, encountered from between ground level and 0.49m bgl. The thickness of Made Ground encountered ranged between 0.79m and 1.61m bgl.

Due to the variable nature of Made Ground in terms of strength and composition, this layer is not deemed to be a suitable founding stratum. As such, limited geotechnical testing was undertaken on this stratum and geotechnical designer parameters have not been derived for the Made Ground.

Table 9 – Summary of Geotechnical Test Results – Made Ground

Parameter	No. of Tests	Results	
		Min	Max
In Situ Tests			
SPT 'N60' Value (corrected)	1	1	
Laboratory Tests – General			
pH	5	6.45	8.49
Water Soluble Sulphate (g/l)	5	0.02	0.13

7.2 Glacial Till Deposits

Superficial deposits of cohesive Glacial Till were encountered underlying the Made Ground deposits within WS101, WS103C, WS104B, WS107, HP103 and HP104. The clay was encountered at depths ranging between 0.30m bgl (HP103) and 1.70m bgl (WS103C). Thicknesses ranged between 3.75m to 4.66m, with the base of this deposit not encountered.

The geotechnical tests recorded within the Glacial Till deposits are summarised in Table 10.

Table 10 – Summary of Geotechnical Test Results – Glacial Till Deposits: Cohesive

Parameter		No. of Tests	Results	
			Min	Max
In Situ Tests				
SPT 'N60' Value (corrected)		19	8	35
Laboratory Tests – General				
Atterberg Tests	Liquid Limit (%)[1]	8	32	48
	Plastic Limit (%)[1]	8	13	21
	Plasticity Index (%)[1]	8	19	27
	Modified Plasticity Index (%)[2]	8	14	25
Moisture Content (%)		17	11	24

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Parameter	No. of Tests	Results	
		Min	Max
pH	9	7.3	9.2
Water Soluble Sulphate (g/l)	9	0.057	0.17

(1) Excludes non-plastic test results.

(2) Modified plasticity index in accordance with the NHBC Chapter 4.2.

The SPT 'N60' (corrected) results for natural cohesive deposits range between 8 and 35, with the results presented on *Figure 3*, generally increasing with depth.

A total of eight Atterberg Tests were undertaken within the natural cohesive Glacial Till deposits and the results suggest that the clay is of low to intermediate plasticity and has a low to medium volume change potential in accordance with guidance from NHBC Standards Chapter 4.2 (Ref. 8). A plasticity chart is presented in *Figure 2.*

The undrained shear strength (Cu) of the cohesive superficial deposits has been determined by laboratory testing and estimated through the relationship between SPT 'N60' Values and Plasticity Indices. The results of geotechnical testing are presented in within *Appendix D*. The results indicate the clays are generally of medium to very high strength.

The estimated undrained shear strength (Cu) of the cohesive superficial deposits has been determined using the relationship between SPT N values and the Plasticity Indices (PI) (After Stroud, 1975, Ref. 9) as presented in Equation 1:

$$Cu = SPT\ N.f_1 \qquad \textbf{[Equation 1]}$$

Where:

SPT N is Characteristic Standard Penetration Test Result

f1 is the Stroud factor

A Stroud factor f_1 value of 5.2 was chosen for an average PI of 23. Therefore, for SPT N60 values between 8 and 35, estimated Cu values range between 42 kPa and 182 kPa, indicating medium to very high strength clay. The relationship between clay strength and depth is presented in *Figure 4*.

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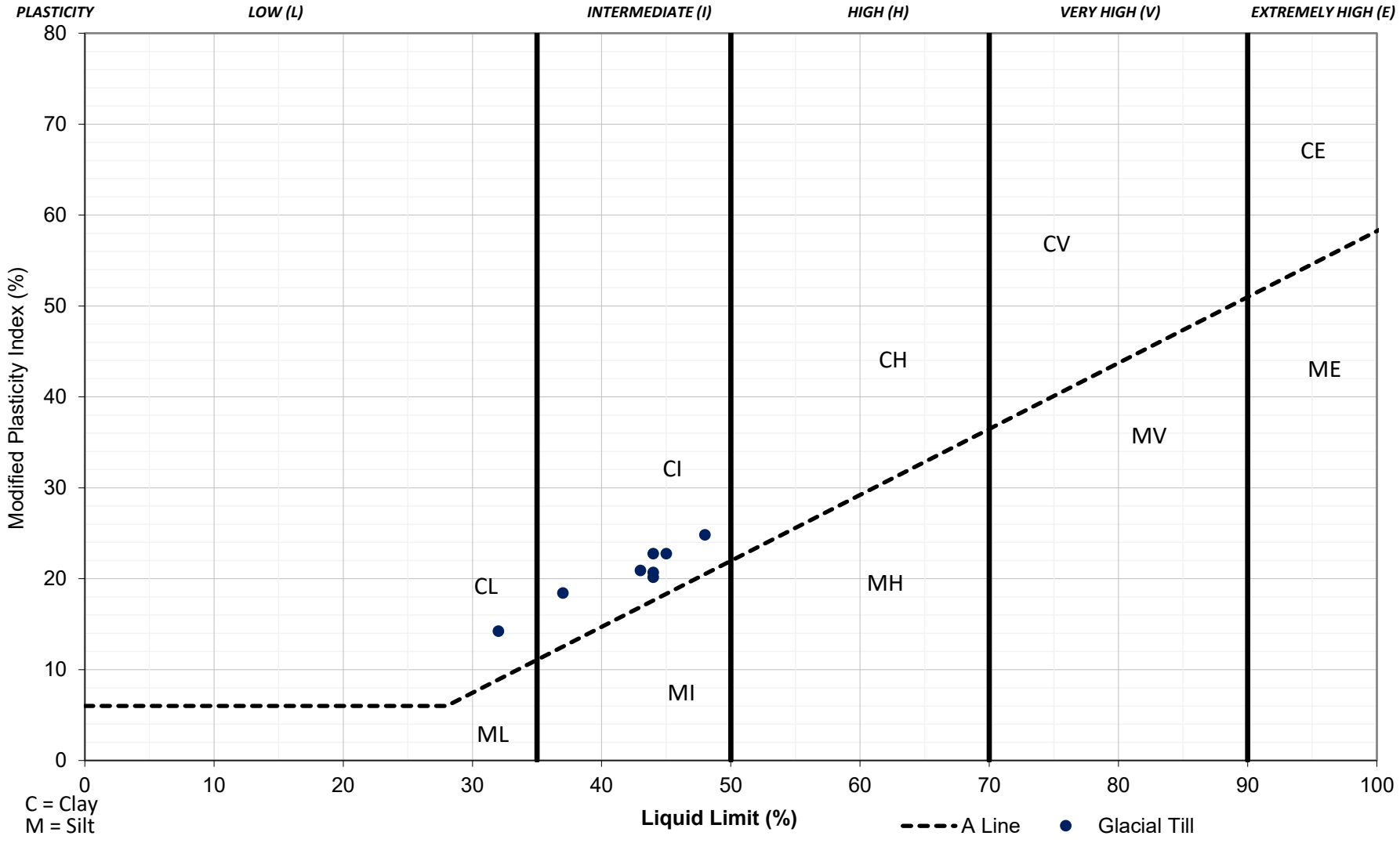

Figure 2 – Plasticity Chart

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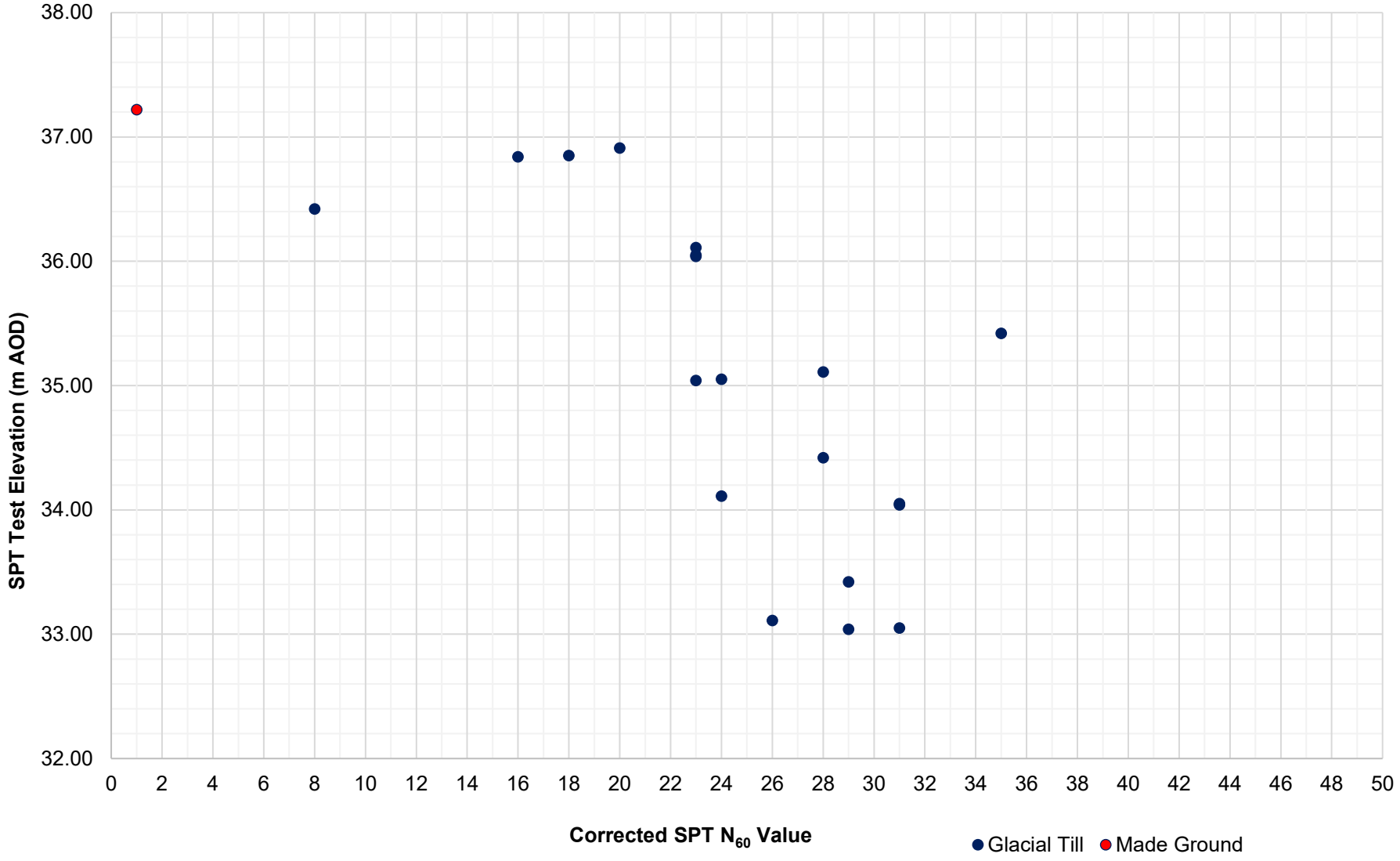

Figure 3 – Corrected SPT '60N' Values vs. Elevation (m AOD)

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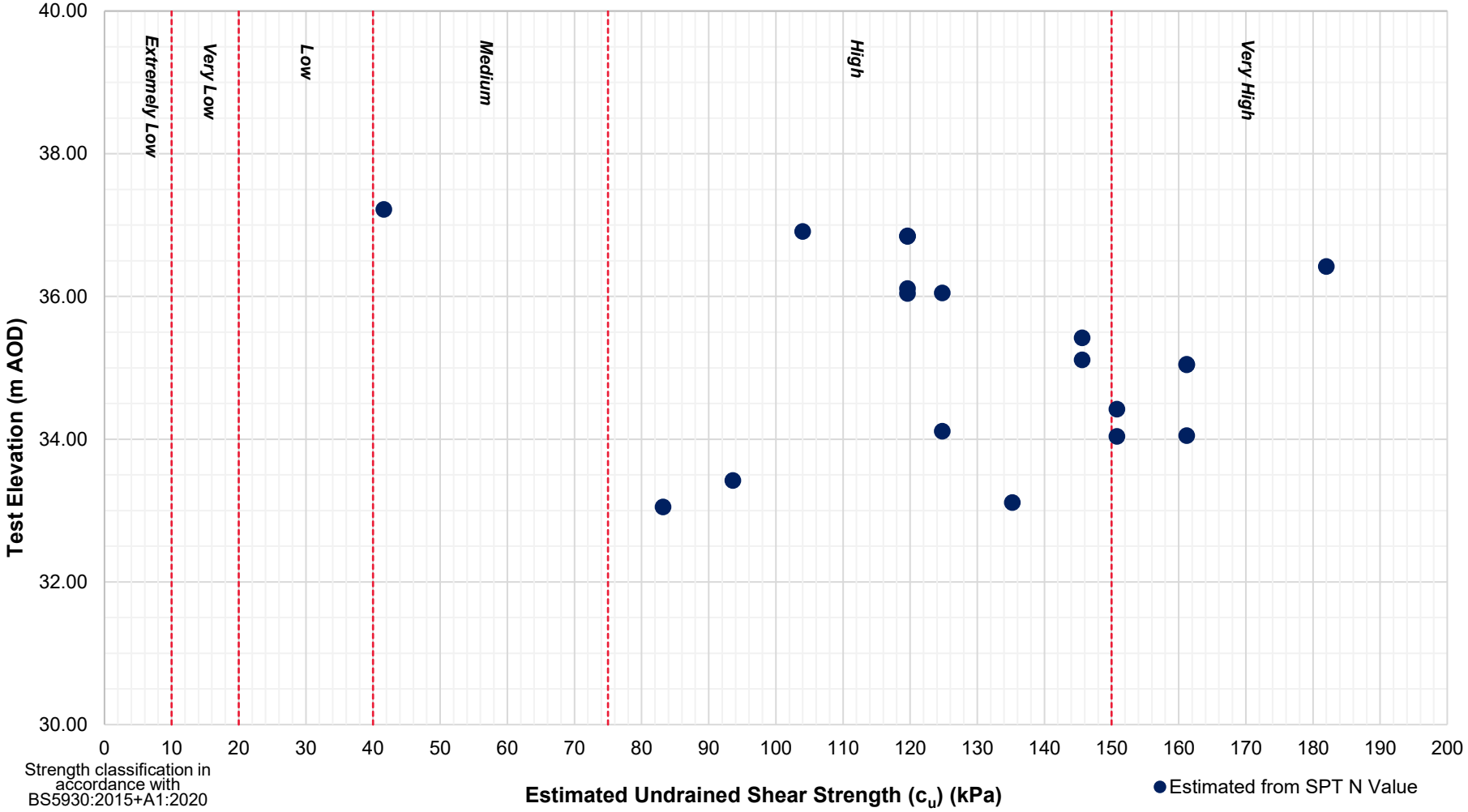

Figure 4 – Estimated Undrained Shear Strength (cu) (kPa) vs. Elevation (m AOD)

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7.3 Aggressive Ground Conditions

The classification of the site in terms of concrete in aggressive ground is based on the guidance provided in Table C2 of the Building Research Establishment (BRE) Special Digest 1, 3rd edition of 2005 (Ref. 13). A summary of the results obtained during are summarised in Table 11, and Table 12 details the classification.

Table 11 – Summary of Results

Stratum	Quantity	Range
Made Ground	pH	6.45 – 8.49
	Water Soluble Sulphate (g/l)	0.02 – 0.13
Glacial Till	pH	7.3 – 9.2
	Water Soluble Sulphate (g/l)	0.057 – 0.17

Table 12 – Aggressive Chemical Environment for Concrete (ACEC) Site Classification

Stratum	Design Sulphate Class	ACEC Class (1)
Made Ground	DS-1	AC-1
Glacial Till	DS-1	AC-1

(1) ACEC assessment was based on the mobile groundwater condition in a brownfield scheme area.

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8 GROUND AND GROUNDWATER CONTAMINATION ASSESSMENT

This section of the report includes the assessment of the potential contamination identified on the subject site which may present a risk to the proposed end users, associated utilities, and the wider environment.

In LCRM guidance published by the Environment Agency (Ref. 3), the risk to human health or controlled waters is determined through an assessment of pollutant linkages between a source of contamination (within the ground or groundwater either on or off site) and a sensitive receptor such as end users of the site, building materials, edible plants grown in gardens or groundwater abstracted for drinking. This is termed a source-pathway-receptor relationship. The same model is applied to the assessment of risk arising from ground gases as detailed within BS8576:2013 (Ref. 15).

These models have a common approach, which is one of a tiered assessment. At each stage of the assessment further detail can be applied to the conceptual site model to provide a detailed interpretation on a site by site basis. As part of the planning process this approach is adopted to establish either if the site is 'suitable for use' or whether additional work or else remedial work is required for the site to be deemed so.

The sub-sections hereafter therefore incorporate the second Tier (Tier 2) of the approach described in EA guidance, otherwise referred to as the Generic Quantitative Risk Assessment (GQRA). The GQRA builds on the qualitative risk assessment (Tier 1) presented in the CCG Phase 1 Desk Study (Ref. 1), in conjunction with observations made during the Curtins ground investigation and is based solely on the results of the chemical and other testing data obtained as part of Curtins ground investigation. The GQRA is used to build/refine the Conceptual Site Model (CSM) for the site as detailed and presented in Section 10.0 of this report.

More detail on Curtins risk assessment methodology, rationale and hierarchy for human health risk assessment is enclosed in *Appendix G*.

8.1 Human Health GQRA

8.1.1 Adopted Soil Human Health GACs Screening Methodology

The proposed use of the site is most analogous with a '*Residential without Plant Uptake'* end use scenario.

The soil organic matter (SOM) content has an influence on the volatilisation of organic contaminants (i.e., the higher the SOM, the lower the volatilisation rate and therefore inhalation exposure risk). Soil organic matter (SOM) values for the site soils ranged from 1.04% to 28.8%. Consideration of the geometric mean results in a calculated value of 1.04% for Glacial Till, 6.49% for Made Ground Topsoil and 15.23% for Made Ground.

As such a comparison against Tier 1 thresholds for a SOM of 1% for Glacial Till and 6% for the Made Ground Topsoil and Made Ground samples has been adopted for *Residential without Plant Uptake* end-use.

Due to the limited data set (6 No. samples total across the site), an individual PAH compound assessment will be carried out on the samples.

The adopted GAC's are listed in *Appendix F*.

8.1.2 Generic Assessment Criteria Screening of Soil Laboratory Results

The results of the environmental testing can be referred to in *Appendix C,* with testing undertaken on a total 1 No. Glacial Till sample, 2 No. Made Ground Topsoil samples and 3 No. Made Ground samples across the site.

With respect to the proposed '*Residential without Plant Uptake'* end use, soil chemical analysis results 4 No. exceedances were recorded when compared against GAC screening thresholds, described below:

- Benzo(a)anthracene of 30.3mg/kg (GAC of 15mg/kg) within WS103A at 0.65m bgl.
- Benzo(a)pyrene of 18.2mg/kg (GAC of 3.2mg/kg) within WS103A at 0.65m bgl.

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- Benzo(b)fluoranthene of 19.6mg/kg (GAC of 4mg/kg) within WS103A at 0.65m bgl.
- Chrysene of 34.1mg/kg (GAC of 32mg/kg) within WS103A at 0.65m bgl.

All soil samples were screened for asbestos. No asbestos was identified.

8.2 Groundwater

No significant groundwater strikes were encountered during the Curtins intrusive ground investigation works; therefore, no groundwater samples have been obtained as part of this investigation.

No evidence of gross contamination was encountered within the Made Ground soils, which were underlain by cohesive Glacial Till deposits which are likely to prevent the lateral migration of any contaminant hotspots within Made Ground to the underlying Principal Aquifer in the bedrock deposits.

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9 GROUND GAS ASSESSMENT

The assessment of risk presented by ground gases is assessed with reference to guidance published by CIRIA (Assessing Risks Posed by Hazardous Ground Gases to Buildings, C665 (Ref. 15), BSI Publication Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings BS8485:2019 (Ref. 16) and other broadly accepted references such as the Ground Gas Handbook 2009 (Ref. 17).

The ground gas risk assessment adopts a tiered approach. In the first instance this involves a re-evaluation of the Conceptual Site Model described within the CCG Phase 1 Report (Ref. 1) and thereafter validating this conceptual model with the ground gas data, the semi-quantitative risk assessment.

9.1 Ground Gas Monitoring Results

To characterise the site's ground gas regime and validate the qualitative assessment of ground gas risk standpipe installations were incorporated within four borehole locations as detailed in *Section 4.2*.

Six ground gas monitoring visits have been undertaken between the 18th February and 28th April 2026, with barometric pressure recorded between 1000mb and 1024mb. Falling barometric pressures were recorded on the first, second, fifth and sixth monitoring visits, with steady barometric pressure on the third visit and rising barometric pressure on the fourth visit. The results log sheets are contained within *Appendix E* and summarised in *Table 13.*

Table 13 – Summary of Ground Gas Monitoring Results

Exploratory Hole ID	Maximum Methane Concentration (%)	Maximum Carbon Dioxide Concentration (%)	Minimum Steady Oxygen Concentration (%)	Maximum Gas Flow (l/hr)	
				Maximum	Steady State
WS101	0.8	0.6	19.8	93.6	<0.1
WS103C	<0.1	0.1	19.9	-0.1	<0.1
WS104B	<0.1	0.1	20.1	1.2	<0.1
WS107	<0.1	0.5	18.7	<0.1	<0.1

Maximum methane concentrations were recorded at 0.8% within WS101 during the third visit, before returning to a steady state of <0.1% after 5 seconds. Methane concentrations were recorded below the limit of detection of the monitoring instrument in every other position during each monitoring visit.

Maximum carbon dioxide concentrations were recorded at 0.6% within WS101 during the third visit.

Carbon Monoxide and Hydrogen Sulphide were recorded below the limit of detection in both wells throughout the monitoring period.

Peak air flow rates of 93.6l/hr were recorded in WS101 during the first visit, before reaching a steady state of <0.1l/hr in 5 minutes. Steady State air flow rates were <0.1l/hr in all positions during each monitoring visit.

9.2 Ground Gas Assessment

The Preliminary Conceptual Site Model (PCSM) presented within the CCG Phase 1 Report identified Made Ground as a potential source of ground gas generation. The Phase 1 PCSM identified a **Moderate** Risk.

During the ground investigation Made Ground soils were encountered from ground level to a maximum depth of 1.70m bgl typically with limited putrescible content. Natural deposits were encountered as generally cohesive Glacial Till with limited organic matter to 5.45m bgl.

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The development plans comprise the construction of 3 No. amenity pavilions situated within external courtyards, re-arrangement of parking and external hardscaping and landscaping. This risk assessment considers the monitoring data from borehole installations within the site. The assessment has been undertaken in accordance with guidance within BS8485:2019 (Ref. 25).

Using the available data set including air flow rates and gas concentrations, the hazardous gas flow rates (Q_{hg}) can be evaluated. Q_{hg} can be derived for both individual 'borehole' and 'worst case check' scenarios and a comparison made in support of an appropriate assessment of ground gas risk. For a 'borehole' scenario (highest hazardous gas flow rate that is realistically possible, i.e. in a single borehole) steady state flow rates and peak gas concentrations are adopted, whilst for a 'worst case check' scenario (highest Q_{hg} across the entire dataset for well screens in the same strata irrespective of location and discrete monitoring events) peak flows and gas concentrations are adopted (discounting any deemed to be unrepresentative such as peak flows in flooded boreholes).

9.2.1 Ground Gas Assessment

An assessment has been undertaken to determine the risk to site end users and maintenance workers from ground gas migration build up and inhalation.

Consideration of the quantity of monitoring data, range of barometric states, and weather conditions, it is deemed that the available dataset is representative of the gas regime pertaining to the development site. As such, the steady state flow rates are deemed suitable for use when deriving the Q_{hg} and Gas Screening Value (GSV) for the site.

Evaluation of the 'borehole' scenario records a calculated maximum Q_{hg} of 0.0008 l/hr for a methane concentration of 0.8% and a flow of <0.1l/hr in WS101 installed within Glacial Till.

Evaluation of the 'borehole' scenario records a calculated maximum Q_{hg} of 0.0006 l/hr for a carbon dioxide concentration of 0.6% and a flow of <0.1l/hr in WS101 installed within Glacial Till.

This GSV indicates a **Characteristic Situation 1 (CS-1)** for the investigated areas of the site, therefore no gas protection measures would be required. Subject to further ground investigation within the south of the site, if ground conditions are consistent with those found in the north and centre of the site, and the absence of significant gassing sources, the south is likely to be assigned as CS-1.

The potential risks from ground gases to the excavations are to be dealt with by the Contractor, in accordance with the Confined Space Regulations, during construction. Appropriate ground gas monitoring and safety measures should be in place during the works, as the potential presence of ground gases could pose a risk in any confined spaces of deep excavations.

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10 REVISED CONCEPTUAL SITE MODEL

The Preliminary Conceptual Site Model (PCSM) presented in the CCG Phase 1 Report (Ref. 1) and discussed in *Section 2.8* of this report has been revised following the GQRA in *Section 8.0* above. The Revised Conceptual Site Model (CSM) is summarised in the table overleaf.

The CSM details the source-pathway-receptor linkages or potential pollutant linkages (PPL) that have been identified as relevant for the site. The GQRA details the associated level of risk relating to these potential pollutant linkages.

The CSM follows the framework outlined within CIRIA C552 (Ref. 18) which is summarised within *Appendix G*.

The 'risk rating' within the CSM refers to the risk that the source, pathway, receptor linkage or PPL is complete. Unless specifically stated it does not necessarily refer to an immediate risk and is intended to be used as a tool to assess the necessity for further assessment/investigation.

Risks presented by Mining are discussed and assessed within *Section 2.3.4.*

Risks presented by Unexploded Ordnance are discussed and assessed in *Section 2.7*.

Under current health and safety legislation, employers are required to carry out their own appropriate risk assessments and mitigation to protect themselves and their employees, other human receptors, and the environment from potential contamination. Such risks must be adequately mitigated by law, specifically the Construction Design Management (CDM) Regulations, 2015 (Ref. 19) which require that potential risks to human health and the environment from construction activities are appropriately identified and all necessary steps taken to eliminate / manage that risk. It has been assumed that any future construction works on site will be undertaken in compliance with these requirements. Reference should be given to the environmental testing results discussed within *Section 8.0* and presented within *Appendix C*.

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Qualitative Risk Assessment → **Generic Quantitative Risk Assessment** → Detailed Quantitative Risk Assessment or; Remedial Action

- The table below represents the Second stage in the land quality risk assessment process; the Revised Conceptual Site Model following the Quantitative Risk Assessment.
- For a development site to be deemed 'suitable for use' the level of risk needs to be brought down to acceptable levels, i.e. low to very low risk. The purpose of each stage of risk assessment is ultimately to establish if there is a requirement for additional levels of assessment to be made to have sufficient confidence to support a risk characterisation or management decision, e.g., remedial action.

Conceptual Site Model			Qualitative Risk Assessment			Recommended Actions	Actions
Source	Pathway(s)	Receptor(s)	Consequence	Likelihood of Occurrence	Risk Rating		
Broad spectrum of heavy metals, aggressive pH, hydrocarbons, PAHs in Made Ground associated with the development and redevelopment of the site and adjoining area.	**Soil and/or dust ingestion** **Dermal contact** **Leaching through Unsaturated Zone** **Fibre Inhalation**	**Construction Workers** **Future Occupants including Residing Students** **Maintenance Workers** **Offsite Receptors**	**Medium** *Chronic health risk.*	**Low**	**Moderate/Low**	4 No. PAH exceedances above Residential without Plant Uptake General Assessment Criteria were identified. No asbestos containing materials or fibres have been identified on site. Site to be partially covered by hardstanding which would break a source pathway receptor linkage.	Clean capping layer within any new soft landscaped areas within the centre of the site to break the source pathway receptor linkage. Construction workers to be provided with appropriate PPE and sanitary facilities.
Inhalation of vapours associated with onsite Made Ground deposits.	**Inhalation**	**Construction Workers** **Future Occupants including Residing Students** **Maintenance Workers** **Offsite Receptors**	**Medium** *Chronic health risk.*	**Unlikely**	**Low**	No evidence of significant olfactory contamination during the ground investigation. No elevated concentrations of volatile contaminants.	No further action required.
Inhalation of ground gases from onsite or offsite sources (i.e. Made Ground).	**Inhalation**	**Future Occupants including Residing Students**	**Medium** *Chronic health risk.*	**Unlikely**	**Low**	During the monitoring period, a maximum methane concentration of 0.8%, a maximum carbon dioxide concentration of 0.6% and a maximum steady state flow rate of <0.1l/hr was recorded, indicating the site to be CS-1, requiring no ground gas protection measures within the north and centre of the site.	Further investigation within the south of the site required to determine if ground conditions are consistent.
pH and sulphate attack on concrete.	**Future Building**	**Future Building**	**Mild** *Significant damage to buildings/structures.*	**Unlikely**	**Very Low**	The classification of the site in terms of concrete in aggressive, based on the guidance provided in Table C2 of the Building Research Establishment (BRE) Special Digest 1, assigns a DS-1 AC-1 for Made Ground and Glacial Till.	Concrete should be designed to DS-1 and AC-1.
Organic and inorganic contamination associated with historical onsite land uses.	**Leaching through Unsaturated Zone**	**Offsite Receptors & Principal Aquifer**	**Medium** *Pollution of classified groundwater.*	**Unlikely**	**Low**	No significant sources of contamination identified in site soils, and there are no potable boreholes located within influencing distance of the site; and superficial deposits comprised of cohesive material limiting the migration potential of any contaminants.	No further action required
	Direct contact and ingress through water mains	**Potable water supply** **Future Occupants including Residing Students**	**Medium** *Pollution of sensitive water resources*	**Unlikely**	**Moderate/Low**	No significant sources of contamination identified in site soils. Distance to the nearest surface water receptor off-site for contamination migration over and through predominantly cohesive superficial soils.	United Utilities Water Supply Pipe Risk Assessment should be undertaken to determine barrier pipe requirements.

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11 SUMMARY OF POTENTIAL POLLUTANT LINKAGES

A **Moderate/Low** risk rating is identified to construction workers, site end-users (future occupants), maintenance workers and off-site receptors, from contamination in soils from direct ingestion, dermal contact, fibre inhalation and leaching through the unsaturated zone. 4 No. PAH exceedances above Residential without Plant Uptake GACs were identified. No asbestos containing materials or fibres were identified. The site area is proposed to be partially covered by hardstanding which would break the source-pathway-receptor linkage; however, any new soft landscaped areas within the centre of the site would require a clean capping layer with an underlying geotextile membrane, detailed within a Remediation Strategy.

A **Low** risk rating is identified to construction workers, site end-users (future occupants), maintenance workers and off-site receptors, from inhalation of vapours associated with onsite Made Ground deposits. No evidence of significant olfactory contamination was encountered during the ground investigation.

A **Low** risk rating is identified to site end-users (future occupants) from inhalation of ground gases from on-site or off-site sources (i.e. Made Ground). The north and centre of the site was assigned CS-1 following a ground gas monitoring regime, which indicates no ground gas protection measures are required. Further investigation within the south of the site is required to determine if ground conditions are consistent and to assign a Characteristic Situation for this section of the site.

A **Very Low** risk rating was identified to the future building from pH and sulphate attack on concrete. The classification of the site in terms of concrete in aggressive, based on the guidance provided in Table C2 of the Building Research Establishment (BRE) Special Digest 1, assigns a DS-1 AC-1 for Made Ground and Glacial Till.

A **Low** risk rating was identified to off-site receptors and the Principal Aquifer from organic contamination associated with historic onsite land uses. No significant sources of contamination identified in site soils, and there are no potable boreholes located within influencing distance of the site; and superficial deposits comprised of cohesive material limiting the migration potential of any contaminants. Distance to the nearest surface water receptor off-site for contamination migration over and through predominantly cohesive superficial soils.

A **Moderate/Low** risk rating was identified to the potable water supply and site end-users (future occupants) from organic and inorganic contamination associated with historic on-site land uses. No significant sources of contamination were identified within site soils, however, a United Utilities Water Supply Risk Assessment should be carried out to determine barrier pipe suitability requirements for the site.

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12 ENGINEERING ASSESSMENT AND RECOMMENDATIONS

12.1 Introduction

This section will assess the relevant geotechnical issues for the proposed development comprising 3 No. amenity pavilions situated within external courtyards, re-arrangement of parking and external hardscaping and landscaping.

The engineering assessment considers foundation design, bearing capacity, excavations, and ground floor slabs for the site. Structural details and loadings have not yet been provided. It should be noted that detail may change in the development of designs beyond the issue of this Phase 2 Report and the Construction Designer should satisfy themselves regarding the adequacy of their design and proposed approach to construction by reference to the on-going project design proposals, the site investigation information, and their own examination of the site.

It should also be noted that none of the investigation locations encountered bedrock.

12.2 Summary of Ground Conditions

The ground conditions at the site generally comprised Made Ground underlain by cohesive Glacial Till. Localised obstructions are present in the Made Ground. Bedrock deposits of the Chester Formation Sandstone were not encountered during the site investigation.

The geotechnical parameters recommended for use in the design based on the ground conditions encountered are discussed in *Section 6.0* and *Section 7.0*.

12.3 Excavations

Based on observations on site, together with the results of in-situ and laboratory tests, it is considered that excavations to <1.20m bgl may not stand unsupported in the short term due to the granular nature of Made Ground. Side support for safety purposes should of course be provided to all excavations which appear unstable, and those >1.20m deep, in accordance with Health and Safety Regulations. These must be designed by a suitably qualified temporary works contractor for any excavations.

Groundwater may be encountered as seepages in shallow excavations for foundations or services as perched water. It is considered that groundwater inflows, if encountered, may be controlled by pumping from sumps.

Several obstructions were encountered within the centre and south of the site, excavation through these may be feasible with conventional site plant with a breaker attachment.

All excavation temporary works shall be designed by a suitably qualified temporary works contractor for any excavations.

12.4 Obstructions

Obstructions were encountered in both the centre of the site (proposed Pavillion No. 2) and the south of the site (proposed Outdoor Amenity).

- Obstructions encountered within the centre of the site comprised of concrete, ranging in depths from 0.25m to 1.10m bgl (38.25m – 37.35m AOD).
- Obstructions encountered within the south of the site comprised of tarmac underlain by concrete, ranging in depths from 0.22m to 0.49m bgl (38.40m – 38.01m AOD).

Aerial imagery of the site taken in 2009, *Figure 5*, shows the entirety of the site comprising of a hardstood ground surface prior to the construction of the Ropemaker Court Student Accommodation building. It is possible that some of this hardstanding was left in-situ during/following construction, and this could explain the obstructions encountered within the soft landscaped areas in the centre and south of the site.

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Satellite Imagery of the site taken in 2023, *Figure 6*, appears to show construction/material storage in the south of the site with the entirety of the soft landscaped area covered in suspected concrete hardstanding in March 2023. By June 2023 this area now appears to comprise of soft landscaping.

Historical Mapping shows the site to have comprised of residential housing in the north, and a carriage and tramway depot within the centre and south of the site in 1891. The south of the site comprised of tramlines and hardstanding until 1908 when this was demolished. By 1922, the site comprised of a factory in the north-west, centre and south with residential properties still present in the north-east. By the late 1980s to early 1990s, the entirety of site comprised of a factory up until at least 2003 (end of historical mapping records).

Figure 5 – Aerial photograph of the site from 2009 (CCG, Phase 1 Report Appendices)

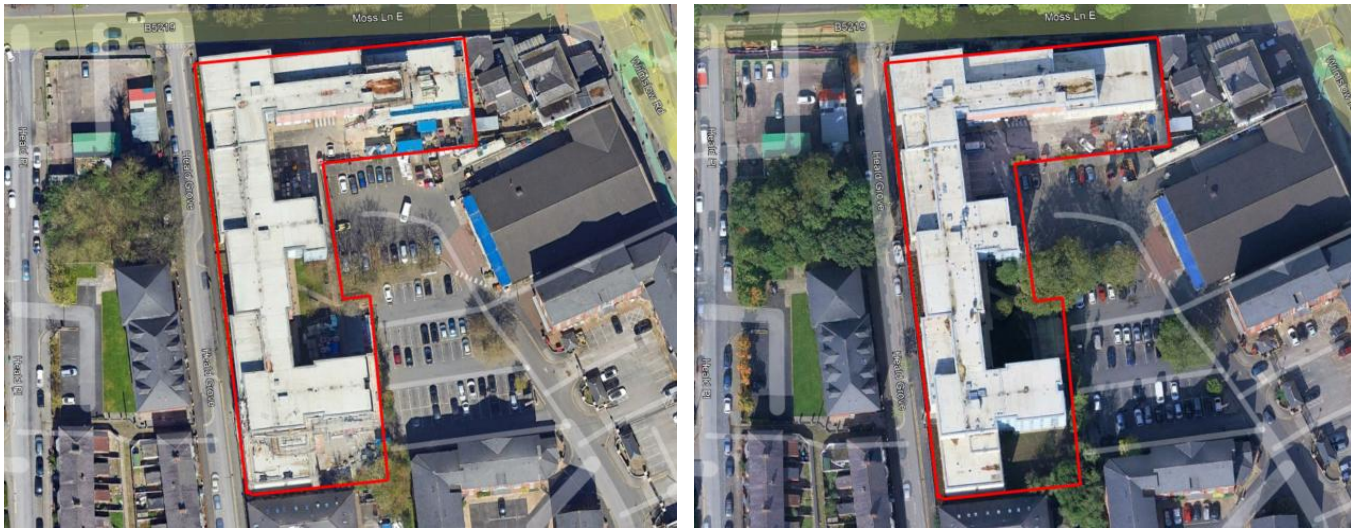

Figure 6 – March 2023 vs. June 2023 – Google Earth Satellite Imagery

The hardstanding present in *Figure 5* is likely to be associated with the historical factory building on site.

Considerations need to be made for the impact of these shallow obstructions on construction of the proposed scheme. It is recommended that any below ground relic obstructions should be removed before construction commences.

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12.5 Foundation Design

It is understood that the proposed development comprises 3 No. amenity pavilions situated within external courtyards, re-arrangement of parking and external hardscaping and landscaping.

Structural loadings have not been provided at the time of writing this report.

The shallow ground conditions onsite generally comprise Made Ground Topsoil and Made Ground overlying cohesive Glacial Till. The superficial deposits have been recorded as comprising firm becoming stiff, brown mottled grey, slightly sandy, slightly gravelly silty clay. The gravel comprised of sandstone, mudstone and coal.

The Made Ground deposits are not considered a suitable bearing stratum for foundations given their inherent variability.

Based on the information available from the exploratory hole logs, it is considered the cohesive Glacial Till will provide suitable founding strata for the proposed development. As such, it is recommended that foundations are taken through the Made Ground to the medium to high strength, low to medium compressibility cohesive clay encountered at approximately 2.00m bgl.

Shallow strip foundations (450mm strips) are likely to be suitable for the proposed development, founding on cohesive Glacial Till at approximately 2.00m bgl, subject to an undrained Cu of 40kPa being proven, with a presumed safe bearing capacity of 80kPa likely achievable.

Localised deepening of foundations may be required where soft shallow superficial soils are encountered, for example in the location of WS103C where an SPT of 7 at 2.00m bgl was recorded.

No foundation recommendations can be provided for the south of the site owing to the shallow obstructions encountered in which window sample boreholes could not progress. It is recommended that further ground investigation via Cable Percussive Boreholes or Trial Pits is conducted in this area to understand the extent of shallow obstructions and allow for sample collection.

Further ground investigation is required to provide a safe bearing capacity for the proposed Outdoor Amenity Space within the south of the site, as the depth to Glacial Till is not known in this area due to obstructions encountered during the intrusive site investigation. Enabling works are likely to be required in order to address the shallow below ground obstructions in both the centre and south of the site.

12.6 Ground Floor Slabs

A suspended floor slab is likely suitable for the proposed development owing to the depth of Made Ground. This may also reduce the extent of enabling works required.

For a ground bearing floor slab solution, removal of obstructions would be required along with the re-engineering of shallow soils to prevent differential settlement. Soft, loose or deleterious materials, including any topsoil, Made Ground and low strength cohesive Glacial Till must be removed and replaced with suitable compacted granular fill, for a ground bearing floor slab solution.

The formation should be inspected by an experienced geotechnical engineer prior to casting.

Further ground investigation is required within the south of the site where the Outdoor Amenity Space is proposed to determine the suitability of ground bearing slabs within the south of the site.

12.7 Pavement Design

The design of capping materials is presented in CD 225 ‘Design for new pavement foundations. 5 no. DCPs were undertaken across the site to estimate in-situ CBR values in areas of proposed hardstanding.

The DCP tests were undertaken between ground level and between 0.60m and 1.00m bgl (max) and all of the estimated CBR values were >3%. The results are shown in Appendix B.

The results obtained from DCP testing are affected by soil properties including particle size, soil water content and dry density. However, the variable, slow or sometimes negligible rate of penetration of mixed cohesive / granular materials

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with large particles as per the Made Ground encountered onsite, can result in an overestimation of subgrade surface modulus.

Taking this into consideration a characteristic design CBR value of 2.5% (subgrade surface modulus of 30MPa) should be assumed in preliminary designs, with further in-situ validation CBR tests undertaken on the subgrade at the time of exposure.

12.8 Chemical Attack on Buried Concrete

The site has been classified in accordance with BRE Special Digest (Ref. 13) and laboratory testing undertaken accordingly in *Section 7.3*. Based on the laboratory test results for Design Sulphate Class and an ACEC class, DS-1 and AC-1 for both Made Ground and Superficial would be appropriate.

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13 CONCLUSION AND RECOMMENDATIONS

13.1 Geotechnical

The Made Ground deposits encountered on site are considered to be an unsuitable founding stratum.

Obstructions were encountered in both the centre of the site (proposed Pavillion No. 2) and the south of the site (proposed Outdoor Amenity). Considerations need to be made for the impact of these shallow obstructions on construction of the proposed scheme. It is recommended that any below ground relic obstructions should be removed before construction commences. Enabling works are likely to be required in order to address the shallow below ground obstructions in both the centre and south of the site.

Shallow strip foundations (450mm strips) are likely to be suitable for the proposed development, founding on cohesive Glacial Till at approximately 2.00m bgl, subject to an undrained Cu of 40kPa being proven, with a presumed safe bearing capacity of 80kPa likely achievable.

Localised deepening of foundations may be required where soft shallow superficial soils are encountered, for example in the location of WS103C where an SPT of 7 at 2.00m bgl was recorded.

Further ground investigation is required to provide a safe bearing capacity for the proposed Outdoor Amenity Space within the south of the site, as the depth to Glacial Till is not known in this area due to obstructions encountered during the intrusive site investigation. Enabling works are likely to be required in order to address the shallow below ground obstructions in both the centre and south of the site.

A suspended floor slab is likely suitable for the proposed development owing to the depth of Made Ground. This may also reduce the extent of enabling works required.

For a ground bearing floor slab solution, removal of obstructions would be required along with the re-engineering of shallow soils to prevent differential settlement.

The formations should be inspected by an experienced geotechnical engineer prior to casting.

The preliminary design of buried concrete according to Table C2 of BRE Special Digest 1:2005 should be in accordance with Class DS-1 AC-1.

13.2 Ground and Groundwater Contamination

A revised tabulated revised Conceptual Site Model has been derived following the findings on the Generic Quantitative Risk Assessment risk assessment and is presented in Section 10.0.

13.2.1 Ground Contamination

A **Moderate/Low** risk rating is identified to construction workers, site end-users (future occupants), maintenance workers and off-site receptors, from contamination in soils from direct ingestion, dermal contact, fibre inhalation and leaching through the unsaturated zone. 4 No. PAH exceedances above Residential without Plant Uptake GACs were identified. No asbestos containing materials or fibres were identified. The site area is proposed to be partially covered by hardstanding which would break the source-pathway-receptor linkage; however, any new soft landscaped areas within the centre of the site would require a clean capping layer with an underlying geotextile membrane, detailed within a Remediation Strategy.

A **Low** risk rating is identified to construction workers, site end-users (future occupants), maintenance workers and off-site receptors, from inhalation of vapours associated with onsite Made Ground deposits. No evidence of significant olfactory contamination was encountered during the ground investigation.

A **Low** risk rating is identified to site end-users (future occupants) from inhalation of ground gases from on-site or off-site sources (i.e. Made Ground). The north and centre of the site was assigned CS-1 following a ground gas monitoring regime, which indicates no ground gas protection measures are required. Further investigation within the south of the

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site is required to determine if ground conditions are consistent and to assign a Characteristic Situation for this section of the site.

A **Very Low** risk rating was identified to the future building from pH and sulphate attack on concrete. The classification of the site in terms of concrete in aggressive, based on the guidance provided in Table C2 of the Building Research Establishment (BRE) Special Digest 1, assigns a DS-1 AC-1 for Made Ground and Glacial Till.

A **Low** risk rating was identified to off-site receptors and the Principal Aquifer from organic contamination associated with historic onsite land uses. No significant sources of contamination identified in site soils, and there are no potable boreholes located within influencing distance of the site; and superficial deposits comprised of cohesive material limiting the migration potential of any contaminants. Distance to the nearest surface water receptor off-site for contamination migration over and through predominantly cohesive superficial soils.

A **Moderate/Low** risk rating was identified to the potable water supply and site end-users (future occupants) from organic and inorganic contamination associated with historic on-site land uses. No significant sources of contamination were identified within site soils, however, a United Utilities Water Supply Risk Assessment should be carried out to determine barrier pipe suitability requirements for the site.

13.3 Recommendations

Based on the findings of the ground investigation, the following recommendations are made:

1. Construction workers to be provided with appropriate PPE and sanitary facilities with reference to environmental testing certificates appended herein.
2. Proposed loads have not been provided at the time of writing this report. It is recommended that the geotechnical recommendations are reviewed upon receipt of this information.
3. Remediation Strategy to specify requirements for a clean capping cover system within any new soft landscaping installed within the centre of the site to break the source pathway receptor linkage of PAH exceedances within soft landscaped areas.
4. Enabling works are likely to be required in order to address the shallow below ground obstructions in both the centre and south of the site.
5. Further ground investigation is recommended to confirm that ground conditions are consistent across the uncharacterised areas of the site, beneath obstructions encountered within the centre and the south of the site, which would also inform an updated ground gas risk assessment.
6. A United Utilities Water Supply Pipe Risk Assessment should be undertaken to inform barrier pipe suitability requirements for the site.

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15 APPENDICES

Appendix A – Drawings

Appendix B – Exploratory Hole & DCP Logs

Appendix C – Chemical Laboratory Test Results

Appendix D – Geotechnical Laboratory Test Results

Appendix E – Ground Gas Monitoring Results

Appendix F – GAC Screening Thresholds

Appendix G – Risk Assessment Methodology

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Appendix A – Drawings

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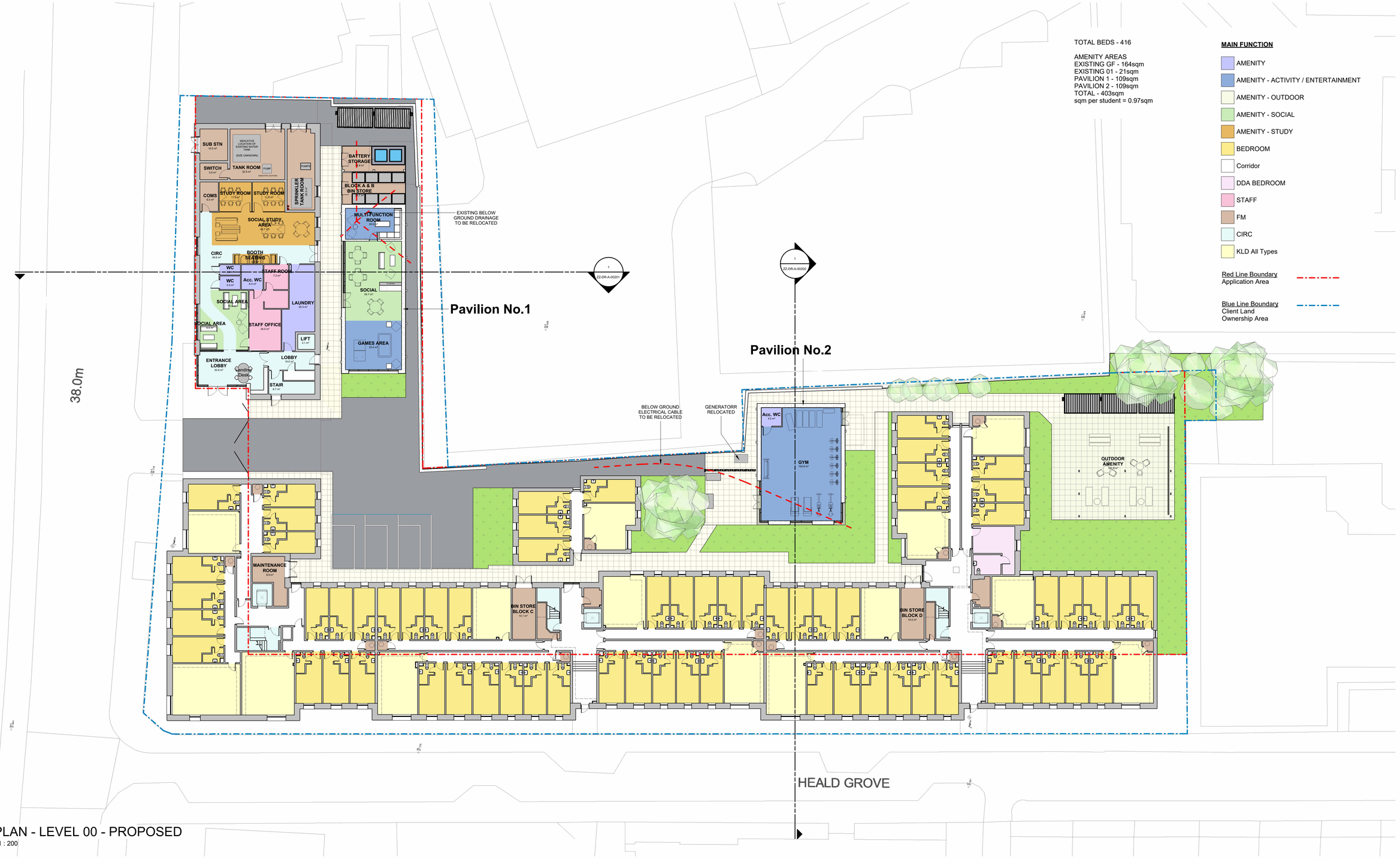
ISO A1 - 594mmx841mm



GA PLAN - LEVEL 00 - PROPOSED

SCALE: 1 : 200

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DATE	REVISION	REV	DR	CH
02/10/25	FIRST ISSUE	P01	DS	RL
08/10/25	DESIGN CHANGES	P02	RL	SB
17/10/25	DESIGN CHANGES	P03	DS	SB
31/10/25	STAGE 02 & PLANNING PRE-APP	P04	DS	TC
06/11/25	AMENDMENTS TO PRE-APP ISSUE	P05	DS	TC
02/01/26	REMOVAL OF SOUTH PAVILLION, RELOCATION OF FM WORKSHOP AND EXTERNAL BIN STORE	P06	RL	TC
09/01/26	POTENTIAL BATTERY LOCATIONS, RELOCATION OF FM WORKSHOP AND SPRINKLER TANK	P07	RL	TC
23/01/26	BATTERY LOCATION FINALISED, CENTRAL SOCIAL AREA FINALISED	P08	RL	TC
05/03/26	UPDATES IN-LINE WITH SPRINKLER DESIGN AND INTERIOR DESIGN COORDINATION	P09	RL	TC
11/03/26	UPDATES FOLLOWING DTM 10/03/26	P10	TC	SB
13/03/26	DRAFT PLANNING APPLICATION SUBMISSION	P11	RL	JF
19/03/26	PLANNING APPLICATION SUBMISSION	P12	RL	TC

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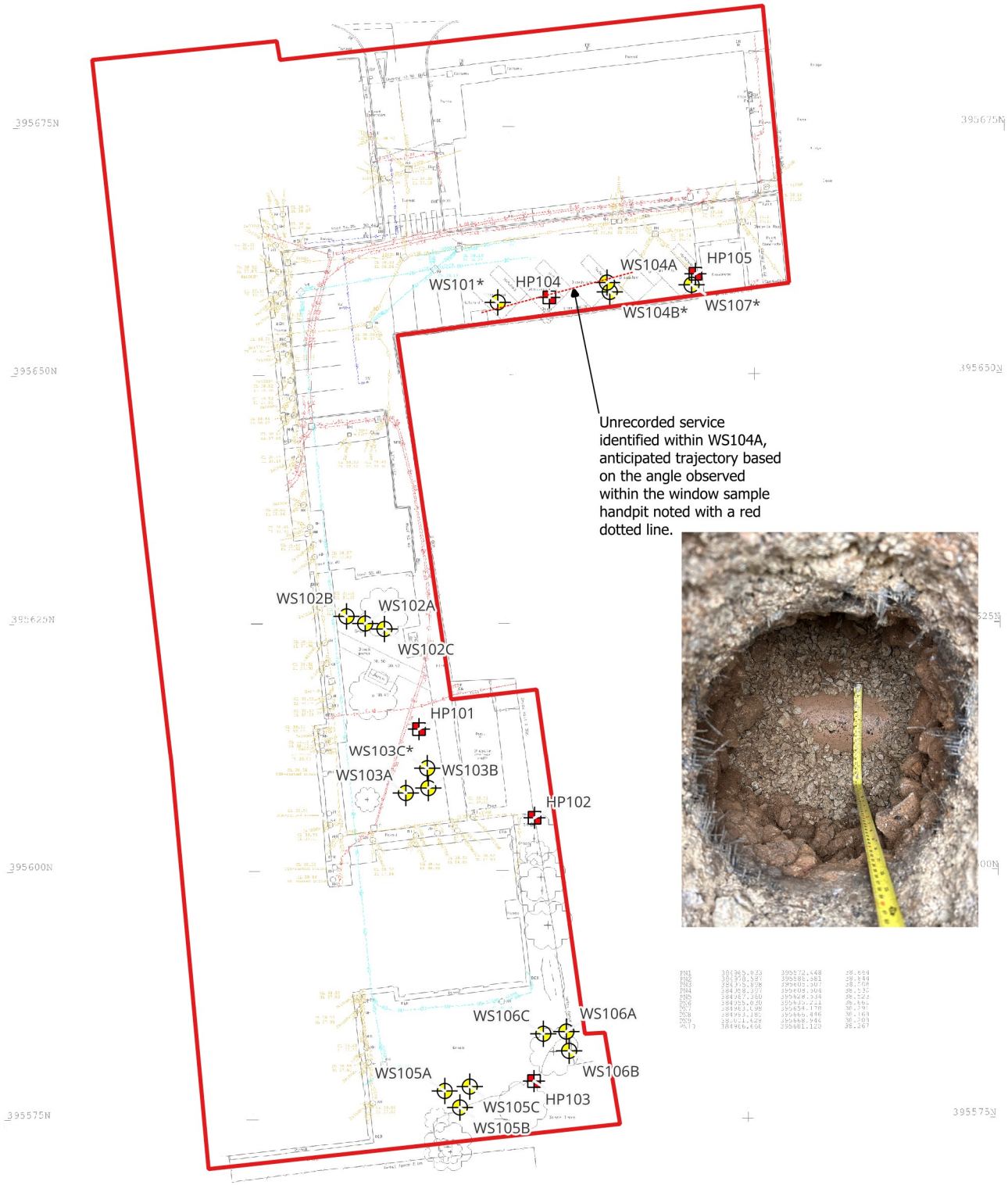
Project: SPINNAKER ESTATES	Drawing Title: GA PLAN - LEVEL 00 - PROPOSED
Project: Ropemaker Court	
Drawn: DS / Date: 17/10/25	Sheet Status: S0 - WORK IN PROGRESS
Checked: SB / Date: 17/10/25	Project No.: RZ3025-0074
Scale: 1 : 200 @ A1	Drawing No.: RMCT-NOR-XX-00-DR-A-00001 / Rev.: P12



Legend

Exploratory Positions

- Hand Excavated Pits with TRL Probes
- Window Sample Boreholes
  * denotes a monitoring well installation

692336 Ropemaker Court, Manchester
Utilites Survey-A0 1-200

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Status	INFORMATION
Project:	**ROPEMAKER**
Drg Title:	**Exploratory Hole Location Plan with Utilities Plan**

Scale:	Size:	Issue Date:	Drawn:	Checked:
NTS	A3	18/02/2026	LW	JL

Drg No:	Rev:
088474-CUR-XX-XX-D-GE-80003	P02

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Appendix B – Exploratory Hole & DCP Logs

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Borehole Log

Borehole No. **WS101**

Sheet 1 of 1

Project Name: Ropemaker	Project No. B088474	Co-ords: 384975.85 - 395658.34	Hole Type WS
Location: Manchester		Level: 38.11	Scale 1:40
Client: Ropemaker Propco Ltd		Dates: 11/02/2026 - 11/02/2026	Logged By LW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.24	37.87		MADE GROUND: Black/dark grey tarmac with concrete inclusions.
					0.35	37.76		MADE GROUND: Yellowish grey sandy gravel underlain by a geotextile membrane. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone.
		0.50	ES					
	▼				0.84	37.27		MADE GROUND: Dark brown slightly sandy gravelly clay with a low cobble content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone, brick, slate and ceramic.
		1.20		N=17 (3,4/4,4,4,5)	1.15	36.96		MADE GROUND: Yellowish grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone and sandstone.
		2.00		N=20 (3,3/4,5,5,6)				Firm becoming stiff, brown mottled grey slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is fine to coarse, subrounded of sandstone, mudstone and coal.
		2.00 - 2.45	D					
		3.00		N=24 (3,3/5,5,7,7)				
		3.00 - 3.45	D					
		4.00		N=21 (4,4/4,5,5,7)				
		5.00		N=23 (4,4/5,5,6,7)				
					5.45	32.66		End of borehole at 5.45 m

Remarks

Position GPR cleared by specialist subcontractor prior to excavation. Ground surface broken via breaker. Hand excavated pit beneath the hardstanding to 1.20m bgl. Perched water encountered at 0.80m bgl, described as a slow seepage. Borehole completed at 5.45m bgl.

Borehole Log

Borehole No.
WS102A
Sheet 1 of 1

Project Name: Ropemaker	Project No. B088474	Co-ords: 384957.29 - 395625.88	Hole Type WS
Location: Manchester		Level: 38.50	Scale 1:40
Client: Ropemaker Propco Ltd		Dates: 11/02/2026 - 11/02/2026	Logged By LW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
	▼	0.10	ES		0.18	38.32		MADE GROUND TOPSOIL: Grass over black slightly clayey gravelly sand with frequent rootlets and a low cobble content. Sand is fine to coarse. Gravel is fine to coarse, subangular of metal, brick, slate, quartzite and ceramic. Cobbles are subangular of brick.
					0.32	38.18		MADE GROUND: Dark grey and grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, subangular to angular of limestone, quartzite and brick.
					0.33	38.17		MADE GROUND: Concrete.
								End of borehole at 0.33 m

Remarks
Position GPR cleared by specialist subcontractor prior to excavation. Ground level estimated from Lucion Survey (Landform) Ltd Drawing Ref. 691546-001. Hand excavated to 0.33m bgl upon which a concrete obstruction was encountered. Perched water encountered at 0.20m bgl, described as a slow seepage. Exploratory hole location terminated at 0.33m bgl.

Borehole Log

Borehole No. **WS102B**

Sheet 1 of 1

Project Name:	Ropemaker	Project No. B088474	Co-ords:	384958.96 - 395625.54	Hole Type WS
Location:	Manchester		Level:	38.50	Scale 1:40
Client:	Ropemaker Propco Ltd		Dates:	11/02/2026 - 11/02/2026	Logged By LW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
	▼				0.16	38.34		MADE GROUND TOPSOIL: Grass over black slightly clayey gravelly sand with frequent rootlets and a low cobble content. Sand is fine to coarse. Gravel is fine to coarse, subangular of metal, brick, slate, quartzite and ceramic. Cobbles are subangular of brick.
					0.25	38.25		MADE GROUND: Dark grey and grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, subangular to angular of limestone, quartzite and brick.
					0.26	38.24		MADE GROUND: Concrete.
								End of borehole at 0.26 m

Remarks

Position GPR cleared by specialist subcontractor prior to excavation. Ground level estimated from Lucion Survey (Landform) Ltd Drawing Ref. 691546-001. Hand excavated to 0.26m bgl upon which a concrete obstruction was encountered. Perched water encountered at 0.21m bgl, described as a slow seepage. Exploratory hole location terminated at 0.26m bgl.

Borehole Log

Borehole No. **WS102C**

Sheet 1 of 1

Project Name: Ropemaker	Project No. B088474	Co-ords: 384956.26 - 395627.04	Hole Type WS
Location: Manchester		Level: 38.50	Scale 1:40
Client: Ropemaker Propco Ltd		Dates: 11/02/2026 - 11/02/2026	Logged By LW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
	▼				0.18	38.32		MADE GROUND TOPSOIL: Grass over black slightly clayey gravelly sand with frequent rootlets and a low cobble content. Sand is fine to coarse. Gravel is fine to coarse, subangular of metal, brick, slate, quartzite and ceramic. Cobbles are subangular of brick.
					0.35	38.15		MADE GROUND: Dark grey and grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, subangular to angular of limestone, quartzite and brick.
					0.36	38.14		MADE GROUND: Concrete.
								End of borehole at 0.36 m

Remarks

Position GPR cleared by specialist subcontractor prior to excavation. Ground level estimated from Lucion Survey (Landform) Ltd Drawing Ref. 691546-001. Hand excavated to 0.36m bgl upon which a concrete obstruction was encountered. Perched water encountered at 0.24m bgl, described as a slow seepage. Exploratory hole location terminated at 0.36m bgl.

Borehole Log

Borehole No. **WS103A**

Sheet 1 of 1

Project Name: Ropemaker	Project No. B088474	Co-ords: 384968.68 - 395606.51	Hole Type WS
Location: Manchester		Level: 38.45	Scale 1:40
Client: Ropemaker Propco Ltd		Dates: 11/02/2026 - 11/02/2026	Logged By LW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.65	ES		0.13	38.32		MADE GROUND TOPSOIL: Grass over black slightly clayey gravelly sand with frequent rootlets and a low cobble content. Sand is fine to coarse. Gravel is fine to coarse, subangular of brick, slate, quartzite and ceramic. Cobbles are subangular of brick.
					0.21	38.24		
					0.34	38.11		MADE GROUND: Grey sandy gravel. Sand is fine to coarse. Gravel is fine to medium, subangular of limestone, quartzite and brick.
					0.76	37.69		MADE GROUND: Brown gravelly clay. Gravel is fine to coarse, subangular of brick, slate and ceramic.
					0.77	37.68		MADE GROUND: Black/dark greyish brown sandy ashy clayey gravel. Sand is fine to coarse. Gravel is fine to coarse, subangular of brick, slag, metal, concrete, quartzite and charcoal.
								From 0.34m - 0.77m bgl: slight hydrocarbon odour.
								MADE GROUND: Concrete.
								End of borehole at 0.77 m

Remarks

Position GPR cleared by specialist subcontractor prior to excavation. Hand excavated to 0.77m bgl upon which a concrete obstruction was encountered. No groundwater encountered. Exploratory hole location terminated at 0.77m bgl.

Borehole Log

Borehole No.
WS103B
Sheet 1 of 1

Project Name:	Ropemaker	Project No. B088474	Co-ords:	384966.26 - 395606.31	Hole Type WS
Location:	Manchester		Level:	38.45	Scale 1:40
Client:	Ropemaker Propco Ltd		Dates:	11/02/2026 - 11/02/2026	Logged By LW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.11	38.34		MADE GROUND TOPSOIL: Grass over black slightly clayey gravelly sand with frequent rootlets and a low cobble content. Sand is fine to coarse. Gravel is fine to coarse, subangular of brick, slate, quartzite and ceramic. Cobbles are subangular of brick.
					0.23	38.22		MADE GROUND: Grey sandy gravel. Sand is fine to coarse. Gravel is fine to medium, subangular of limestone, quartzite and brick.
					1.09	37.36		MADE GROUND: Black/dark greyish brown sandy ashy clayey gravel. Sand is fine to coarse. Gravel is fine to coarse, subangular of brick, slag, metal, concrete, quartzite and charcoal.
					1.10	37.35		*From 0.23m - 1.10m bgl: slight hydrocarbon odour.*
								MADE GROUND: Concrete.
								End of borehole at 1.10 m

Remarks
Position GPR cleared by specialist subcontractor prior to excavation. Hand excavated to 1.10m bgl upon which a concrete obstruction was encountered. No groundwater encountered. Exploratory hole location terminated at 1.10m bgl.

Borehole Log

Borehole No.
WS103C
Sheet 1 of 1

Project Name: Ropemaker	Project No. B088474	Co-ords: 384968.42 - 395607.89	Hole Type WS
Location: Manchester		Level: 38.42	Scale 1:40
Client: Ropemaker Propco Ltd		Dates: 11/02/2026 - 11/02/2026	Logged By LW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.09	38.33		MADE GROUND TOPSOIL: Grass over black slightly clayey gravelly sand with frequent rootlets and a low cobble content. Sand is fine to coarse. Gravel is fine to coarse, subangular of brick, slate, quartzite and ceramic. Cobbles are subangular of brick.
					0.21	38.21		MADE GROUND: Grey sandy gravel. Sand is fine to coarse. Gravel is fine to medium, subangular of limestone, quartzite and brick.
		1.20		N=1 (1,0/1,0,0,0)				MADE GROUND: Black/dark greyish brown sandy ashy clayey gravel. Sand is fine to coarse. Gravel is fine to coarse, subangular of brick, slag, metal, concrete, quartzite and charcoal.
								From 0.21m - 1.70m bgl: slight hydrocarbon odour.
					1.70	36.72		Firm becoming stiff, brown mottled grey slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is fine to coarse, subrounded of sandstone, mudstone and coal.
		2.00		N=7 (1,0/0,2,2,3)				
		2.00 - 2.45	D					
		3.00		N=30 (4,4/6,7,8,9)				
		4.00		N=24 (5,5/5,6,6,7)				
		4.00 - 4.45	D					
		5.00		N=25 (5,5/6,6,6,7)				
					5.45	32.97		End of borehole at 5.45 m

Remarks
Position GPR cleared by specialist subcontractor prior to excavation. Hand excavated to 1.20m bgl. No groundwater encountered. Borehole completed at 5.45m bgl.

Borehole Log

Borehole No.
WS104A
Sheet 1 of 1

Project Name: Ropemaker	Project No. B088474	Co-ords: 384989.39 - 395659.91	Hole Type WS
Location: Manchester		Level: 38.05	Scale 1:40
Client: Ropemaker Propco Ltd		Dates: 12/02/2026 - 12/02/2026	Logged By LW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.21	37.84		MADE GROUND: Black/dark grey tarmac.
					0.34	37.71		MADE GROUND: Yellowish grey sandy gravel underlain by a geotextile membrane. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone.
					0.75	37.30		MADE GROUND: Yellowish grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone and sandstone.
					0.76	37.29		UNRECORDED SERVICE.
								End of borehole at 0.76 m

Remarks
Position GPR cleared by specialist subcontractor prior to excavation. Ground surface broken via breaker. Hand excavated pit beneath the hardstanding to 0.76m bgl upon a ceramic pipe was encountered. Exploratory hole position terminated due to unrecorded service.

Borehole Log

Borehole No.
WS104B
Sheet 1 of 1

Project Name: Ropemaker	Project No. B088474	Co-ords: 384989.39 - 395660.00	Hole Type WS
Location: Manchester		Level: 38.05	Scale 1:40
Client: Ropemaker Propco Ltd		Dates: 12/02/2026 - 12/02/2026	Logged By LW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.21	37.84		MADE GROUND: Black/dark grey tarmac.
					0.34	37.71		MADE GROUND: Yellowish grey sandy gravel underlain by a geotextile membrane. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone.
		1.00	ES		0.90	37.15		MADE GROUND: Yellowish grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone and sandstone.
		1.20		N=16 (4,4/4,4,4,4)				Firm becoming stiff, brown mottled grey slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is fine to coarse, subrounded of sandstone, mudstone and coal.
		2.00		N=20 (3,3/4,5,5,6)				
		3.00		N=21 (2,2/5,5,5,6)				
		4.00		N=27 (3,4/5,7,7,8)				
		4.00 - 4.45	D					
		5.00		N=27 (4,4/6,6,7,8)				
		5.00 - 5.45	D					
					5.45	32.60		End of borehole at 5.45 m

Remarks
Position GPR cleared by specialist subcontractor prior to excavation. Ground surface broken via breaker. Hand excavated pit beneath the hardstanding to 1.20m bgl. No groundwater encountered. Borehole completed at 5.45m bgl.

Borehole Log

Borehole No.
WS105A
Sheet 1 of 1

Project Name:	Ropemaker	Project No. B088474	Co-ords:	384969.93 - 395577.69	Hole Type WS
Location:	Manchester		Level:	38.50	Scale 1:40
Client:	Ropemaker Propco Ltd		Dates:	12/02/2026 - 12/02/2026	Logged By LW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
	▼				0.49	38.01		MADE GROUND TOPSOIL: Grass over black slightly clayey gravelly sand with frequent rootlets and a low cobble content. Sand is fine to coarse. Gravel is fine to coarse, subangular of brick, slate, quartzite, broken glass and ceramic. Cobbles are subangular of brick.
					0.50	38.00		MADE GROUND: Concrete obstruction.
								End of borehole at 0.50 m

Remarks
Position GPR cleared by specialist subcontractor prior to excavation. Hand excavated to 0.50m bgl upon which a concrete obstruction was encountered. Perched water encountered at 0.49m bgl, described as a slow seepage. Exploratory hole location terminated at 0.50m bgl.

Borehole Log

Borehole No.
WS105B
Sheet 1 of 1

Project Name:	Ropemaker	Project No. B088474	Co-ords:	384968.00 - 395578.00	Hole Type WS
Location:	Manchester		Level:	38.50	Scale 1:40
Client:	Ropemaker Propco Ltd		Dates:	12/02/2026 - 12/02/2026	Logged By LW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
	▼				0.48 0.49 0.50	38.02 38.01 38.00		MADE GROUND TOPSOIL: Grass over black slightly clayey gravelly sand with frequent rootlets and a low cobble content. Sand is fine to coarse. Gravel is fine to coarse, subangular of brick, slate, quartzite, broken glass and ceramic. Cobbles are subangular of brick. MADE GROUND: Black tarmac. MADE GROUND: Concrete obstruction. End of borehole at 0.52 m

Remarks
Position GPR cleared by specialist subcontractor prior to excavation. Hand excavated to 0.52m bgl upon which a concrete obstruction was encountered. Perched water encountered at 0.51m bgl, described as a slow seepage. Exploratory hole location terminated at 0.52m bgl.

Borehole Log

Borehole No. **WS105C**

Sheet 1 of 1

Project Name:	Ropemaker	Project No. B088474	Co-ords:	384969.00 - 395578.00	Hole Type WS
Location:	Manchester		Level:	38.50	Scale 1:40
Client:	Ropemaker Propco Ltd		Dates:	12/02/2026 - 12/02/2026	Logged By LW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
	▼				0.46 0.47	38.04 38.03		MADE GROUND TOPSOIL: Grass over black slightly clayey gravelly sand with frequent rootlets and a low cobble content. Sand is fine to coarse. Gravel is fine to coarse, subangular of brick, slate, quartzite, broken glass and ceramic. Cobbles are subangular of brick. MADE GROUND: Concrete obstruction. End of borehole at 0.47 m

1 2 3 4 5 6 7 8

Remarks

Position GPR cleared by specialist subcontractor prior to excavation. Hand excavated to 0.47m bgl upon which a concrete obstruction was encountered. Perched water encountered at 0.46m bgl, described as a slow seepage. Exploratory hole location terminated at 0.47m bgl.

AGS

Borehole Log

Borehole No.
WS106A
Sheet 1 of 1

Project Name: Ropemaker	Project No. B088474	Co-ords: 384978.95 - 395583.56	Hole Type WS
Location: Manchester		Level: 38.62	Scale 1:40
Client: Ropemaker Propco Ltd		Dates: 12/02/2026 - 12/02/2026	Logged By LW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.15	ES		0.25 0.26	38.37 38.36		MADE GROUND TOPSOIL: Grass over black slightly clayey gravelly sand with frequent rootlets and a low cobble content. Sand is fine to coarse. Gravel is fine to coarse, subangular of brick, slate, quartzite, broken glass and ceramic. Cobbles are subangular of brick. MADE GROUND: Black tarmac underlain by concrete. End of borehole at 0.26 m

Remarks
Position GPR cleared by specialist subcontractor prior to excavation. Hand excavated to 0.26m bgl upon which a concrete obstruction was encountered. No groundwater encountered. Exploratory hole location terminated at 0.26m bgl.

Borehole Log

Borehole No.
WS106B
Sheet 1 of 1

Project Name:	Ropemaker	Project No. B088474	Co-ords:	384979.00 - 395586.00	Hole Type WS
Location:	Manchester		Level:	38.62	Scale 1:40
Client:	Ropemaker Propco Ltd		Dates:	12/02/2026 - 12/02/2026	Logged By LW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.21 0.22	38.41 38.40		MADE GROUND TOPSOIL: Grass over black slightly clayey gravelly sand with frequent rootlets and a low cobble content. Sand is fine to coarse. Gravel is fine to coarse, subangular of brick, slate, quartzite, broken glass and ceramic. Cobbles are subangular of brick. MADE GROUND: Black tarmac underlain by concrete. End of borehole at 0.22 m

Remarks
Position GPR cleared by specialist subcontractor prior to excavation. Hand excavated to 0.22m bgl upon which a concrete obstruction was encountered. No groundwater encountered. Exploratory hole location terminated at 0.22m bgl.

Borehole Log

Borehole No.
WS106C
Sheet 1 of 1

Project Name: Ropemaker	Project No. B088474	Co-ords: 384978.00 - 395585.00	Hole Type WS
Location: Manchester		Level: 38.62	Scale 1:40
Client: Ropemaker Propco Ltd		Dates: 12/02/2026 - 12/02/2026	Logged By LW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.32	38.30		MADE GROUND TOPSOIL: Grass over black slightly clayey gravelly sand with frequent rootlets and a low cobble content. Sand is fine to coarse. Gravel is fine to coarse, subangular of brick, slate, quartzite, broken glass and ceramic. Cobbles are subangular of brick.
					0.33	38.29		MADE GROUND: Black tarmac underlain by concrete.
								End of borehole at 0.33 m

1 2 3 4 5 6 7 8

Remarks
Position GPR cleared by specialist subcontractor prior to excavation. Hand excavated to 0.33m bgl upon which a concrete obstruction was encountered. No groundwater encountered. Exploratory hole location terminated at 0.33m bgl.

AGS

Borehole Log

Borehole No. **WS107**

Sheet 1 of 1

Project Name: Ropemaker	Project No. B088474	Co-ords: 384993.52 - 395659.20	Hole Type WS
Location: Manchester		Level: 38.04	Scale 1:40
Client: Ropemaker Propco Ltd		Dates: 12/02/2026 - 12/02/2026	Logged By LW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.22	37.82		MADE GROUND: Black/dark grey tarmac.
					0.29	37.75		MADE GROUND: Yellowish grey sandy gravel underlain by a geotextile membrane. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone.
	▼	0.50	ES					
					0.79	37.25		MADE GROUND: Brown sandy gravelly clay with a medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of brick, slate, ceramic, charcoal and broken glass. Cobbles are subangular of ceramic and whole brick.
		1.20		N=14 (2,2/3,3,4,4)				
		1.20 - 1.65	D					Stiff brown mottled grey slightly sandy slightly gravelly slightly silty CLAY. Sand is fine to coarse. Gravel is fine to coarse, subrounded of sandstone, mudstone, coal and quartz.
		2.00		N=20 (2,3/4,5,5,6)				
		3.00		N=20 (2,3/4,5,5,6)				
		3.00 - 3.45	D					
		4.00		N=27 (3,4/5,6,7,9)				
		5.00		N=25 (4,5/5,6,6,8)				
					5.45	32.59		End of borehole at 5.45 m

Remarks

Position GPR cleared by specialist subcontractor prior to excavation. Ground surface broken via breaker. Hand excavated pit beneath the hardstanding to 1.20m bgl. Perched water encountered at 0.75m bgl, described as a slow seepage. Borehole completed at 5.45m bgl.

Curtins

Trial Pit Log

Trialpit No
HP101
Sheet 1 of 1

Project Name: Ropemaker	Project No. B088474	Co-ords: 384965.95 - 395611.33 Level: 38.33	Date 12/02/2026
Location: Manchester		Dimensions (m): Depth 0.25 (0.2 x 0.2)	Scale 1:20
Client: Ropemaker Propco Ltd			Logged LW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.17	38.16		MADE GROUND TOPSOIL: Grass over black slightly clayey gravelly sand with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subangular of brick, slate, quartzite and ceramic.
				0.25	38.08		MADE GROUND: Grey sandy gravel. Sand is fine to coarse. Gravel is fine to medium, subangular of limestone, quartzite and brick.
							End of pit at 0.25 m

1
2
3
4

Remarks: Position GPR cleared by specialist subcontractor prior to excavation. Hand excavated to 0.25m bgl to facilitate a TRL.

Stability: Stable

AGS

Curtins

Trial Pit Log

Trialpit No
HP102
Sheet 1 of 1

Project Name: Ropemaker	Project No. B088474	Co-ords: 384977.55 - 395605.38 Level: 38.48	Date 12/02/2026
Location: Manchester		Dimensions (m): Depth 0.29 — 0.2 × 0.2	Scale 1:20
Client: Ropemaker Propco Ltd			Logged LW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.25	38.23		MADE GROUND TOPSOIL: Grass over black slightly clayey gravelly sand with frequent rootlets and rootlets. Sand is fine to coarse. Gravel is fine to coarse, subangular of brick, slate, quartzite and ceramic.
				0.29	38.19		MADE GROUND: Greyish brown gravel. Gravel is fine to coarse, subangular of limestone, quartzite and brick. End of pit at 0.29 m

1
2
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4

Remarks: Position GPR cleared by specialist subcontractor prior to excavation. Hand excavated to 0.29m bgl to facilitate a TRL.

Stability: Stable

AGS

Curtins

Trial Pit Log

Trialpit No
HP103
Sheet 1 of 1

Project Name: Ropemaker	Project No. B088474	Co-ords: 384978.49 - 395579.11 Level: 38.61	Date 12/02/2026
Location: Manchester		Dimensions (m): Depth 0.36 — 0.2 × 0.2	Scale 1:20
Client: Ropemaker Propco Ltd			Logged LW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30	38.31		MADE GROUND TOPSOIL: Grass over black slightly clayey gravelly sand with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subangular of brick, slate, quartzite and ceramic.
				0.36	38.25		Firm brown CLAY. End of pit at 0.36 m

1
2
3
4

Remarks: Position GPR cleared by specialist subcontractor prior to excavation. Hand excavated to 0.36m bgl to facilitiate a TRL.

Stability: Stable

AGS

Curtins

Trial Pit Log

Trialpit No
HP104
Sheet 1 of 1

Project Name: Ropemaker	Project No. B088474	Co-ords: 384984.98 - 395658.81 Level: 38.04	Date 12/02/2026
Location: Manchester		Dimensions (m): Depth 0.36 (0.2 x 0.2)	Scale 1:20
Client: Ropemaker Propco Ltd			Logged LW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.26	37.78		MADE GROUND: Black/dark grey tarmac.
				0.35	37.69		MADE GROUND: Yellowish grey sandy gravel underlain by a geotextile membrane. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone.
				0.36	37.68		Firm brown CLAY.
							End of pit at 0.36 m

Remarks: Position GPR cleared by specialist subcontractor prior to excavation. Ground surface broken via breaker. Hand excavated beneath the hardstanding to 0.36m bgl to facilitate a TRL.

Stability: Stable

AGS

Curtins

Trial Pit Log

Trialpit No
HP105
Sheet 1 of 1

Project Name: Ropemaker	Project No. B088474	Co-ords: 384994.51 - 395659.37 Level: 38.06	Date 12/02/2026
Location: Manchester		Dimensions (m): Depth 0.33 (0.2 x 0.2)	Scale 1:20
Client: Ropemaker Propco Ltd			Logged LW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.22	37.84		MADE GROUND: Black/dark grey tarmac.
				0.32	37.74		MADE GROUND: Yellowish grey sandy gravel underlain by a geotextile membrane. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone.
				0.33	37.73		MADE GROUND: Brown gravelly clay. Gravel is fine to coarse, subangular of brick, slate and ceramic.
							End of pit at 0.33 m

1
2
3
4

Remarks: Position GPR cleared by specialist subcontractor prior to excavation. Ground surface broken via breaker. Hand excavated beneath the hardstanding to 0.33m bgl to facilitate a TRL.

Stability: Stable

AGS

Curtins

RESULTS OF DYNAMIC CONE PENETROMETER (DCP) TESTING

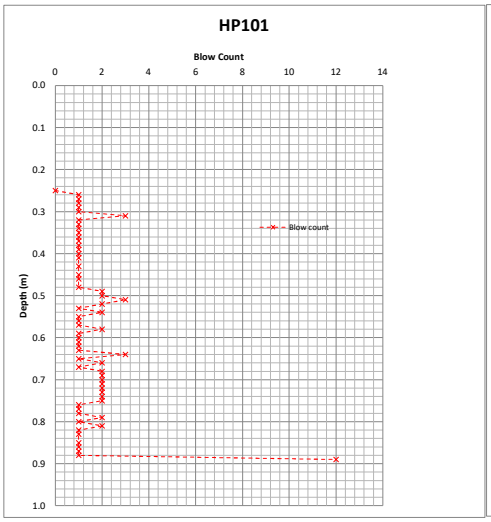
Project:	Ropemaker	**Date of Test:**	12-Feb-26
Project No.	B088474	**Soil type:**	GRAVEL
Test No.	HP101	**Soil condition**	Unsaturated
Test Depth (Top	0.25m bgl	**Operator:**	LW

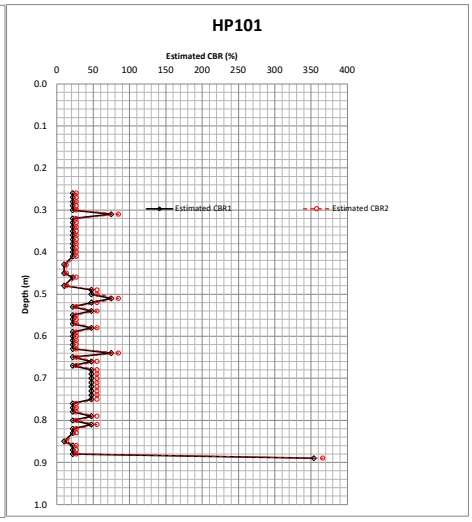
Blow count	Penetration (mm)	Penetration (m)	Penetration Index (DPI) mm/blow	log DPI	log CBR	Estimated CBR1 (%)[1]	log CBR	Estimated CBR2 (%)[2]
0	250	0.250						
1	260	0.260	10.0	1.000	1.340	22	1.423	26
1	270	0.270	10.0	1.000	1.340	22	1.423	26
1	280	0.280	10.0	1.000	1.340	22	1.423	26
1	290	0.290	10.0	1.000	1.340	22	1.423	26
1	300	0.300	10.0	1.000	1.340	22	1.423	26
3	310	0.310	3.3	0.523	1.874	75	1.927	85
1	320	0.320	10.0	1.000	1.340	22	1.423	26
1	330	0.330	10.0	1.000	1.340	22	1.423	26
1	340	0.340	10.0	1.000	1.340	22	1.423	26
1	350	0.350	10.0	1.000	1.340	22	1.423	26
1	360	0.360	10.0	1.000	1.340	22	1.423	26
1	370	0.370	10.0	1.000	1.340	22	1.423	26
1	380	0.380	10.0	1.000	1.340	22	1.423	26
1	390	0.390	10.0	1.000	1.340	22	1.423	26
1	400	0.400	10.0	1.000	1.340	22	1.423	26
1	410	0.410	10.0	1.000	1.340	22	1.423	26
1	430	0.430	20.0	1.301	1.003	10	1.105	13
1	450	0.450	20.0	1.301	1.003	10	1.105	13
1	460	0.460	10.0	1.000	1.340	22	1.423	26
1	480	0.480	20.0	1.301	1.003	10	1.105	13
2	490	0.490	5.0	0.699	1.677	48	1.741	55
2	500	0.500	5.0	0.699	1.677	48	1.741	55
3	510	0.510	3.3	0.523	1.874	75	1.927	85
2	520	0.520	5.0	0.699	1.677	48	1.741	55
1	530	0.530	10.0	1.000	1.340	22	1.423	26
2	540	0.540	5.0	0.699	1.677	48	1.741	55
1	550	0.550	10.0	1.000	1.340	22	1.423	26
1	560	0.560	10.0	1.000	1.340	22	1.423	26
1	570	0.570	10.0	1.000	1.340	22	1.423	26
2	580	0.580	5.0	0.699	1.677	48	1.741	55
1	590	0.590	10.0	1.000	1.340	22	1.423	26
1	600	0.600	10.0	1.000	1.340	22	1.423	26
1	610	0.610	10.0	1.000	1.340	22	1.423	26
1	620	0.620	10.0	1.000	1.340	22	1.423	26
1	630	0.630	10.0	1.000	1.340	22	1.423	26
3	640	0.640	3.3	0.523	1.874	75	1.927	85
1	650	0.650	10.0	1.000	1.340	22	1.423	26
2	660	0.660	5.0	0.699	1.677	48	1.741	55
1	670	0.670	10.0	1.000	1.340	22	1.423	26
2	680	0.680	5.0	0.699	1.677	48	1.741	55
2	690	0.690	5.0	0.699	1.677	48	1.741	55
2	700	0.700	5.0	0.699	1.677	48	1.741	55
2	710	0.710	5.0	0.699	1.677	48	1.741	55
2	720	0.720	5.0	0.699	1.677	48	1.741	55
2	730	0.730	5.0	0.699	1.677	48	1.741	55
2	740	0.740	5.0	0.699	1.677	48	1.741	55
2	750	0.750	5.0	0.699	1.677	48	1.741	55
1	760	0.760	10.0	1.000	1.340	22	1.423	26
1	770	0.770	10.0	1.000	1.340	22	1.423	26
1	780	0.780	10.0	1.000	1.340	22	1.423	26
2	790	0.790	5.0	0.699	1.677	48	1.741	55
1	800	0.800	10.0	1.000	1.340	22	1.423	26
2	810	0.810	5.0	0.699	1.677	48	1.741	55
1	820	0.820	10.0	1.000	1.340	22	1.423	26
1	830	0.830	10.0	1.000	1.340	22	1.423	26
1	850	0.850	20.0	1.301	1.003	10	1.105	13
1	860	0.860	10.0	1.000	1.340	22	1.423	26
1	870	0.870	10.0	1.000	1.340	22	1.423	26
1	880	0.880	10.0	1.000	1.340	22	1.423	26
12	890	0.890	0.8	-0.079	2.549	354	2.564	366
		0.000						
		0						

Notes:

1. CBR calculated based on Webster et al, 1992.
2. CBR calculated based on DMRB, 2008.

Reference: - Webster S, Grau R and Williams T. 1992. Description and Application of Dual Mass Dynamic Cone Penetrometer. Dept of Army Waterways Equipment Station, Instruction rpt GL-92-3.
- Highways Agency, 2008. Design Manual for Roads and Bridges (DMRB), Data for Pavement Assessment. HD29/08.





Curtins

RESULTS OF DYNAMIC CONE PENETROMETER (DCP) TESTING

Project:	Ropemaker	**Date of Test:**	12-Feb-26
Project No.	B088474	**Soil type:**	GRAVEL
Test No.	HP102	**Soil condition:**	Unsaturated
Test Depth (Top	0.29m bgl	**Operator:**	LW

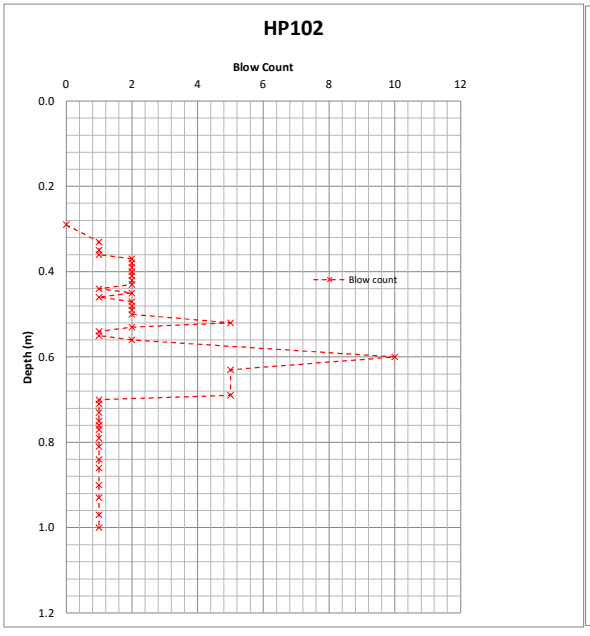
Blow count	Penetration (mm)	Penetration (m)	Penetration Index (DPI) mm/blow	log DPI	log CBR	Estimated CBR1 (%)[1]	log CBR	Estimated CBR2 (%)[2]
0	290	0.290						
1	330	0.330	40.0	1.602	0.666	5	0.787	6
1	350	0.350	20.0	1.301	1.003	10	1.105	13
1	360	0.360	10.0	1.000	1.340	22	1.423	26
2	370	0.370	5.0	0.699	1.677	48	1.741	55
2	380	0.380	5.0	0.699	1.677	48	1.741	55
2	390	0.390	5.0	0.699	1.677	48	1.741	55
2	400	0.400	5.0	0.699	1.677	48	1.741	55
2	410	0.410	5.0	0.699	1.677	48	1.741	55
2	420	0.420	5.0	0.699	1.677	48	1.741	55
2	430	0.430	5.0	0.699	1.677	48	1.741	55
1	440	0.440	10.0	1.000	1.340	22	1.423	26
2	450	0.450	5.0	0.699	1.677	48	1.741	55
1	460	0.460	10.0	1.000	1.340	22	1.423	26
2	470	0.470	5.0	0.699	1.677	48	1.741	55
2	480	0.480	5.0	0.699	1.677	48	1.741	55
2	490	0.490	5.0	0.699	1.677	48	1.741	55
2	500	0.500	5.0	0.699	1.677	48	1.741	55
5	520	0.520	4.0	0.602	1.786	61	1.844	70
2	530	0.530	5.0	0.699	1.677	48	1.741	55
1	540	0.540	10.0	1.000	1.340	22	1.423	26
1	550	0.550	10.0	1.000	1.340	22	1.423	26
2	560	0.560	5.0	0.699	1.677	48	1.741	55
10	600	0.600	4.0	0.602	1.786	61	1.844	70
5	630	0.630	6.0	0.778	1.588	39	1.657	45
5	690	0.690	12.0	1.079	1.251	18	1.339	22
1	700	0.700	10.0	1.000	1.340	22	1.423	26
1	710	0.710	10.0	1.000	1.340	22	1.423	26
1	730	0.730	20.0	1.301	1.003	10	1.105	13
1	750	0.750	20.0	1.301	1.003	10	1.105	13
1	760	0.760	10.0	1.000	1.340	22	1.423	26
1	770	0.770	10.0	1.000	1.340	22	1.423	26
1	790	0.790	20.0	1.301	1.003	10	1.105	13
1	810	0.810	20.0	1.301	1.003	10	1.105	13
1	840	0.840	30.0	1.477	0.806	6	0.919	8
1	860	0.860	20.0	1.301	1.003	10	1.105	13
1	900	0.900	40.0	1.602	0.666	5	0.787	6
1	930	0.930	30.0	1.477	0.806	6	0.919	8
1	970	0.970	40.0	1.602	0.666	5	0.787	6
1	1000	1.000	30.0	1.477	0.806	6	0.919	8

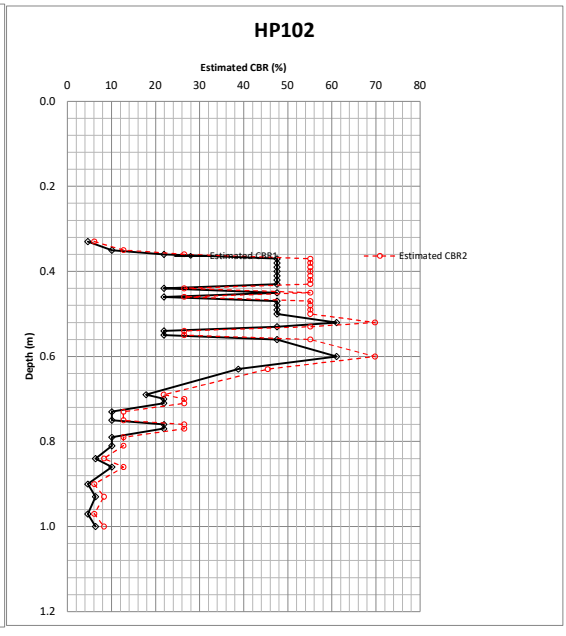
Notes:

1. CBR calculated based on Webster et al, 1992.
2. CBR calculated based on DMRB, 2008.

Reference:

- Webster S, Grau R and Williams T. 1992. Description and Application of Dual Mass Dynamic Cone Penetrometer. Dept of Army Waterways Equipment Station, Instruction rpt GL-92-3.
- Highways Agency, 2008. Design Manual for Roads and Bridges (DMRB), Data for Pavement Assessment. HD29/08.





Curtins

RESULTS OF DYNAMIC CONE PENETROMETER (DCP) TESTING

Project:	Ropemaker	**Date of Test:**	12-Feb-26
Project No.	B088474	**Soil type:**	CLAY
Test No.	HP103	**Soil condition:**	Unsaturated
Test Depth (Top	0.36m bgl	**Operator:**	LW

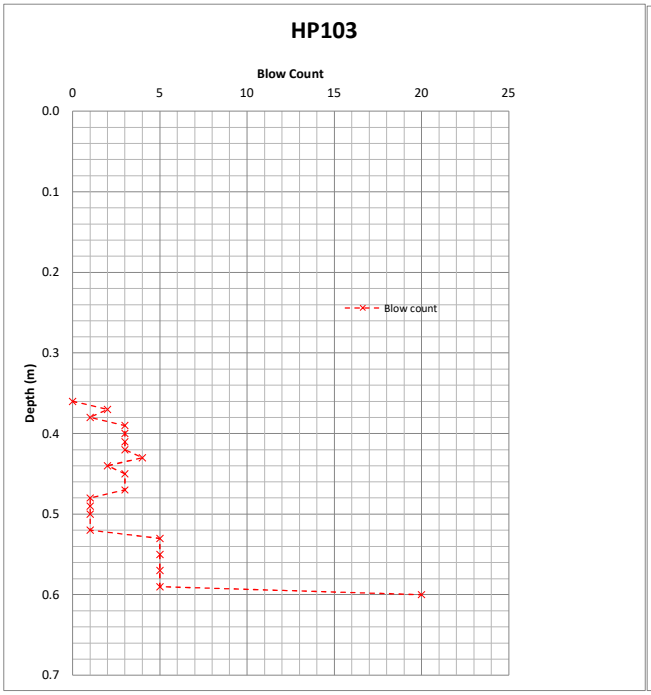
Blow count	Penetration (mm)	Penetration (m)	Penetration Index (DPI) mm/blow	log DPI	log CBR	Estimated CBR1 (%)[1]	log CBR	Estimated CBR2 (%)[2]
0	360	0.360						
2	370	0.370	5.0	0.699	1.677	48	1.741	55
1	380	0.380	10.0	1.000	1.340	22	1.423	26
3	390	0.390	3.3	0.523	1.874	75	1.927	85
3	400	0.400	3.3	0.523	1.874	75	1.927	85
3	410	0.410	3.3	0.523	1.874	75	1.927	85
3	420	0.420	3.3	0.523	1.874	75	1.927	85
4	430	0.430	2.5	0.398	2.014	103	2.059	115
2	440	0.440	5.0	0.699	1.677	48	1.741	55
3	450	0.450	3.3	0.523	1.874	75	1.927	85
3	470	0.470	6.7	0.824	1.537	34	1.609	41
1	480	0.480	10.0	1.000	1.340	22	1.423	26
1	490	0.490	10.0	1.000	1.340	22	1.423	26
1	500	0.500	10.0	1.000	1.340	22	1.423	26
1	520	0.520	20.0	1.301	1.003	10	1.105	13
5	530	0.530	2.0	0.301	2.123	133	2.162	145
5	550	0.550	4.0	0.602	1.786	61	1.844	70
5	570	0.570	4.0	0.602	1.786	61	1.844	70
5	590	0.590	4.0	0.602	1.786	61	1.844	70
20	600	0.600	0.5	-0.301	2.797	627	2.798	628

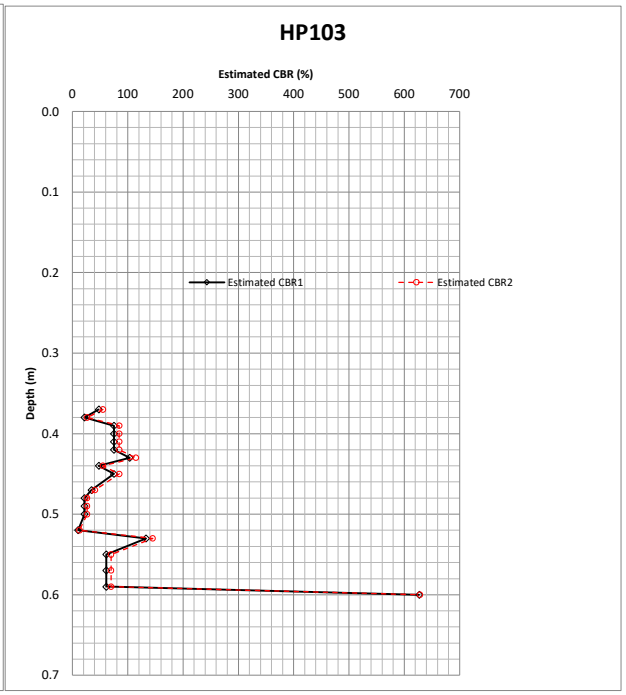
Notes:

1. CBR calculated based on Webster et al, 1992.
2. CBR calculated based on DMRB, 2008.

Reference:

- Webster S, Grau R and Williams T. 1992. Description and Application of Dual Mass Dynamic Cone Penetrometer. Dept of Army Waterways Equipment Station, Instruction rpt GL-92-3.
- Highways Agency, 2008. Design Manual for Roads and Bridges (DMRB), Data for Pavement Assessment. HD29/08.





Curtins

RESULTS OF DYNAMIC CONE PENETROMETER (DCP) TESTING

Project:	Ropemaker	**Date of Test:**	12-Feb-26
Project No.	B088474	**Soil type:**	CLAY
Test No.	HP104	**Soil condition:**	Unsaturated
Test Depth (Top	0.43m bgl	**Operator:**	LW

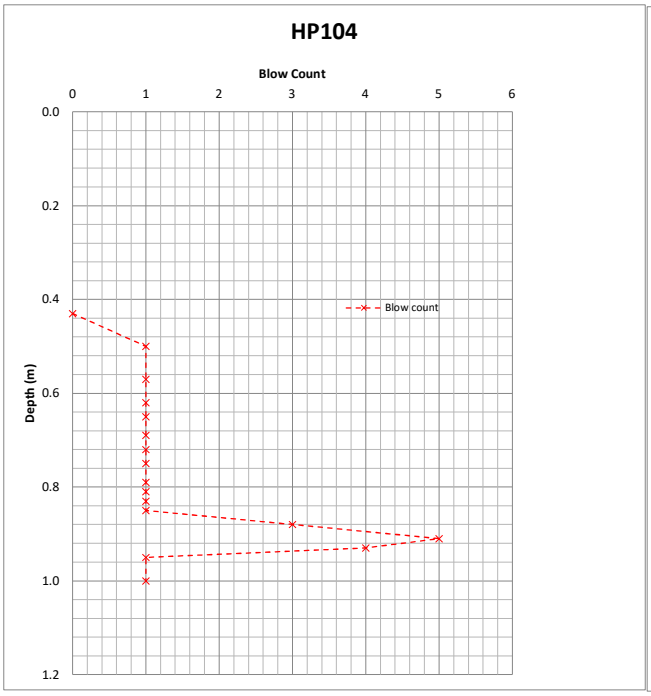
Blow count	Penetration (mm)	Penetration (m)	Penetration Index (DPI) mm/blow	log DPI	log CBR	Estimated CBR1 (%)[1]	log CBR	Estimated CBR2 (%)[2]
0	430	0.430						
1	500	0.500	70.0	1.845	0.393	2	0.530	3
1	570	0.570	70.0	1.845	0.393	2	0.530	3
1	620	0.620	50.0	1.699	0.557	4	0.684	5
1	650	0.650	30.0	1.477	0.806	6	0.919	8
1	690	0.690	40.0	1.602	0.666	5	0.787	6
1	720	0.720	30.0	1.477	0.806	6	0.919	8
1	750	0.750	30.0	1.477	0.806	6	0.919	8
1	790	0.790	40.0	1.602	0.666	5	0.787	6
1	810	0.810	20.0	1.301	1.003	10	1.105	13
1	830	0.830	20.0	1.301	1.003	10	1.105	13
1	850	0.850	20.0	1.301	1.003	10	1.105	13
3	880	0.880	10.0	1.000	1.340	22	1.423	26
5	910	0.910	6.0	0.778	1.588	39	1.657	45
4	930	0.930	5.0	0.699	1.677	48	1.741	55
1	950	0.950	20.0	1.301	1.003	10	1.105	13
1	1000	1.000	50.0	1.699	0.557	4	0.684	5

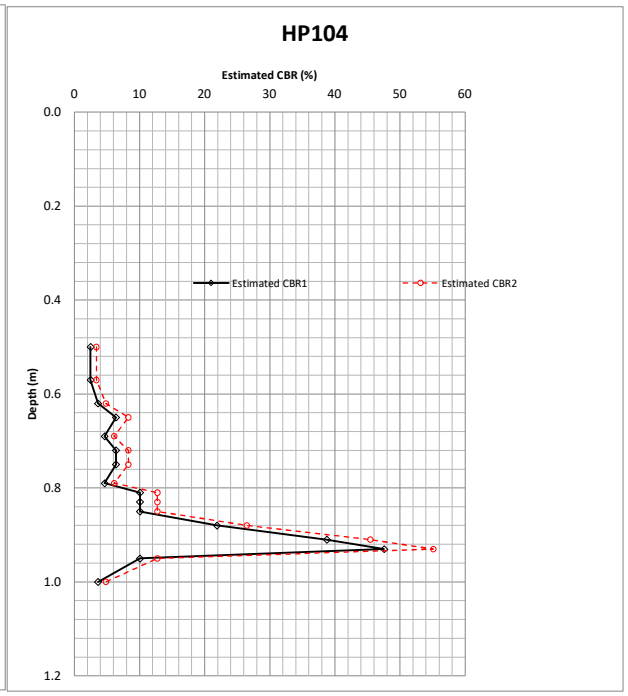
Notes:

1. CBR calculated based on Webster et al, 1992.
2. CBR calculated based on DMRB, 2008.

Reference:

- Webster S, Grau R and Williams T. 1992. Description and Application of Dual Mass Dynamic Cone Penetrometer. Dept of Army Waterways Equipment Station, Instruction rpt GL-92-3.
- Highways Agency, 2008. Design Manual for Roads and Bridges (DMRB), Data for Pavement Assessment. HD29/08.





Curtins

RESULTS OF DYNAMIC CONE PENETROMETER (DCP) TESTING

Project:	Ropemaker	**Date of Test:**	12-Feb-26
Project No.	B088474	**Soil type:**	CLAY
Test No.	HP105	**Soil condition:**	Unsaturated
Test Depth (Top	0.45m bgl	**Operator:**	LW

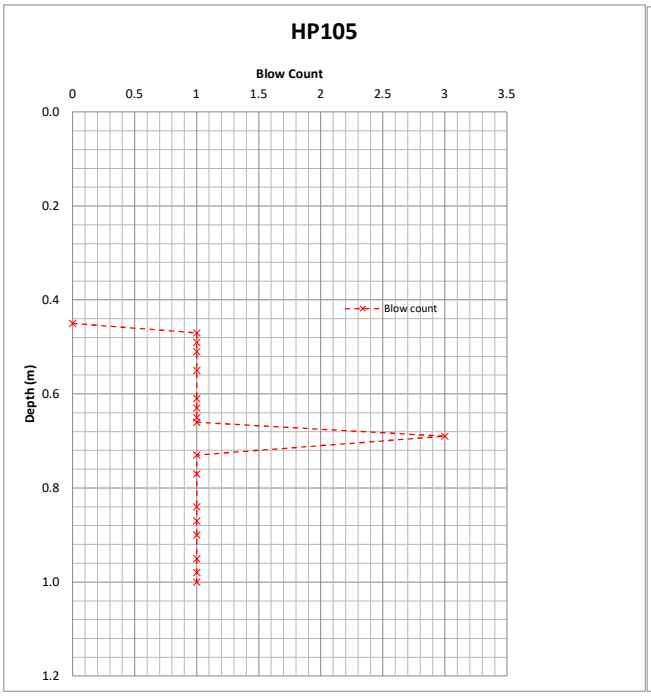
Blow count	Penetration (mm)	Penetration (m)	Penetration Index (DPI) mm/blow	log DPI	log CBR	Estimated CBR1 (%)[1]	log CBR	Estimated CBR2 (%)[2]
0	450	0.450						
1	470	0.470	20.0	1.301	1.003	10	1.105	13
1	490	0.490	20.0	1.301	1.003	10	1.105	13
1	510	0.510	20.0	1.301	1.003	10	1.105	13
1	550	0.550	40.0	1.602	0.666	5	0.787	6
1	610	0.610	60.0	1.778	0.468	3	0.600	4
1	630	0.630	20.0	1.301	1.003	10	1.105	13
1	650	0.650	20.0	1.301	1.003	10	1.105	13
1	660	0.660	10.0	1.000	1.340	22	1.423	26
3	690	0.690	10.0	1.000	1.340	22	1.423	26
1	730	0.730	40.0	1.602	0.666	5	0.787	6
1	770	0.770	40.0	1.602	0.666	5	0.787	6
1	840	0.840	70.0	1.845	0.393	2	0.530	3
1	870	0.870	30.0	1.477	0.806	6	0.919	8
1	900	0.900	30.0	1.477	0.806	6	0.919	8
1	950	0.950	50.0	1.699	0.557	4	0.684	5
1	980	0.980	30.0	1.477	0.806	6	0.919	8
1	1000	1.000	20.0	1.301	1.003	10	1.105	13

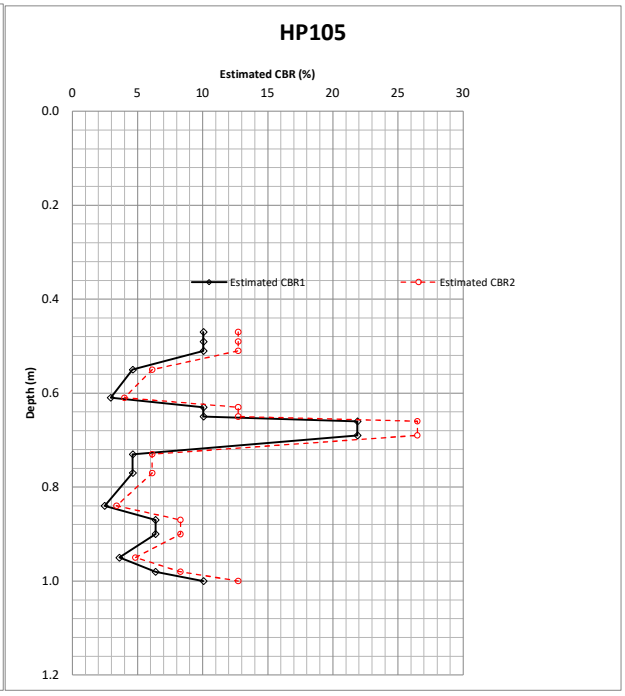
Notes:

1. CBR calculated based on Webster et al, 1992.
2. CBR calculated based on DMRB, 2008.

Reference:

- Webster S, Grau R and Williams T. 1992. Description and Application of Dual Mass Dynamic Cone Penetrometer. Dept of Army Waterways Equipment Station, Instruction rpt GL-92-3.
- Highways Agency, 2008. Design Manual for Roads and Bridges (DMRB), Data for Pavement Assessment. HD29/08.





Appendix C – Chemical Laboratory Test Results

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envirolab
Hattersley Science & Technology Park
Stockport Road, Hattersley, SK14 3QU

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 26/01810
Issue Number: 1 **Date:** 23 February, 2026

Client: Curtins Consulting (Manchester)
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: Jonathan Lord/Lucy Woods
Project Name: Ropemaker
Project Ref: B088474
Order No: 30051
Date Samples Received: 17/02/26
Date Instructions Received: 17/02/26
Date Analysis Completed: 23/02/26

[redacted]
Richard Wong
Client Manager

Envirolab Job Number: 26/01810

Client Project Name: Ropemaker

Client Project Ref: B088474

Lab Sample ID	26/01810/1	26/01810/2	26/01810/3	26/01810/4	26/01810/5	26/01810/6		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102A	WS103A	WS104B	WS106A	WS107				
Depth to Top	0.50	0.10	0.65	1.00	0.15	0.50				
Depth To Bottom										
Date Sampled	11-Feb-26	11-Feb-26	11-Feb-26	12-Feb-26	12-Feb-26	12-Feb-26				
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES				
Sample Matrix Code	5A	4AE	4A	5A	4AE	4AE				
% Moisture at <40C$_A$	17.0	29.3	15.1	17.8	12.8	9.6		% w/w	0.1	A-T-044
% Stones >10mm$_A$	19.6	2.2	12.8	<0.1	21.0	53.5		% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	8.04	6.45	8.22	7.70	7.31	8.49		pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$$^{M\#}$	0.08	0.02	0.13	0.07	0.02	0.08		g/l	0.01	A-T-026s
Cyanide (total)$_A$$^{M\#}$	<1	<1	<1	<1	<1	<1		mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		mg/kg	0.2	A-T-050s
Organic Matter$_D$$^{M\#}$	2.98	28.8	28.8	1.04	8.05	3.18		% w/w	0.14	A-T-032s
Arsenic$_D$$^{M\#}$	8	3	16	4	2	3		mg/kg	1	A-T-024s
Boron (water soluble)$_D$$^{M\#}$	<1.0	<1.0	1.2	<1.0	<1.0	<1.0		mg/kg	1	A-T-027s
Cadmium$_D$	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		mg/kg	1	A-T-024s
Copper$_D$$^{M\#}$	29	24	760	22	15	15		mg/kg	1	A-T-024s
Chromium$_D$$^{M\#}$	13	11	15	28	15	7		mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	<1	<1	<1	<1		mg/kg	1	A-T-040s
Lead$_D$$^{M\#}$	72	49	169	15	27	49		mg/kg	1	A-T-024s
Mercury$_D$	0.24	<0.17	0.38	<0.17	0.30	<0.17		mg/kg	0.17	A-T-024s
Nickel$_D$$^{M\#}$	15	11	161	43	12	8		mg/kg	1	A-T-024s
Selenium$_D$$^{M\#}$	<1	<1	<1	<1	<1	<1		mg/kg	1	A-T-024s
Zinc$_D$$^{M\#}$	49	57	146	51	40	50		mg/kg	1	A-T-024s

Envirolab Job Number: 26/01810

Client Project Name: Ropemaker

Client Project Ref: B088474

Lab Sample ID	26/01810/1	26/01810/2	26/01810/3	26/01810/4	26/01810/5	26/01810/6		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102A	WS103A	WS104B	WS106A	WS107				
Depth to Top	0.50	0.10	0.65	1.00	0.15	0.50				
Depth To Bottom										
Date Sampled	11-Feb-26	11-Feb-26	11-Feb-26	12-Feb-26	12-Feb-26	12-Feb-26				
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES				
Sample Matrix Code	5A	4AE	4A	5A	4AE	4AE				
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_{D}^{\#}$	NAD	NAD	NAD	NAD	NAD	NAD				A-T-045
Asbestos Matrix (visual)$_{D}$	-	-	-	-	-	-				A-T-045
Asbestos Matrix (microscope)$_{D}$	-	-	-	-	-	-				A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_{D}$	N/A	N/A	N/A	N/A	N/A	N/A				A-T-045

Envirolab Job Number: 26/01810

Client Project Name: Ropemaker

Client Project Ref: B088474

Lab Sample ID	26/01810/1	26/01810/2	26/01810/3	26/01810/4	26/01810/5	26/01810/6		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102A	WS103A	WS104B	WS106A	WS107				
Depth to Top	0.50	0.10	0.65	1.00	0.15	0.50				
Depth To Bottom										
Date Sampled	11-Feb-26	11-Feb-26	11-Feb-26	12-Feb-26	12-Feb-26	12-Feb-26				
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES				
Sample Matrix Code	5A	4AE	4A	5A	4AE	4AE				
PAH-16MS										
Acenaphthene$_A^{M\#}$	0.15	0.04	22.9	<0.10	0.12	0.21		mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	0.02	<0.01	<0.50	<0.10	<0.10	<0.10		mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	0.20	0.06	14.9	<0.20	<0.20	0.38		mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	1.51	0.14	30.3	<0.40	0.43	1.48		mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	1.31	0.12	18.2	<0.40	0.62	1.26		mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	1.42	0.14	19.6	<0.50	0.52	1.31		mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.71	0.07	6.21	<0.50	0.64	0.75		mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	0.53	<0.07	7.62	<0.70	<0.70	<0.70		mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	1.62	0.18	34.1	<0.60	0.83	1.76		mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	0.22	<0.04	<2.00	<0.40	<0.40	<0.40		mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	2.94	0.35	93.4	<0.80	0.86	3.09		mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	0.09	0.03	10.6	<0.10	<0.10	0.11		mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	0.84	0.12	7.44	<0.30	0.43	0.90		mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	0.04	<0.03	11.1	<0.30	<0.30	<0.30		mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	1.03	0.26	99.1	<0.30	0.71	1.66		mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	2.89	0.30	87.2	<0.70	0.87	3.34		mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	15.5	1.81	463	<0.80	6.03	16.2		mg/kg	0.01	A-T-019s

Envirolab Job Number: 26/01810

Client Project Name: Ropemaker

Client Project Ref: B088474

Lab Sample ID	26/01810/1	26/01810/2	26/01810/3	26/01810/4	26/01810/5	26/01810/6		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102A	WS103A	WS104B	WS106A	WS107				
Depth to Top	0.50	0.10	0.65	1.00	0.15	0.50				
Depth To Bottom										
Date Sampled	11-Feb-26	11-Feb-26	11-Feb-26	12-Feb-26	12-Feb-26	12-Feb-26				
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES				
Sample Matrix Code	5A	4AE	4A	5A	4AE	4AE				
TPH CWG with Clean Up										
Ali >C5-C6$_A$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
Ali >C6-C8$_A$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	<10	<1	<10	<10	<10	<10		mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	<10	<1	<10	<10	<10	<10		mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	<10	1	26	<10	<10	<10		mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	<10	6	32	<10	<10	<10		mg/kg	1	A-T-055s
Ali >C21-C35$_A^{M\#}$	46	40	164	47	393	48		mg/kg	1	A-T-055s
Total Aliphatics$_A$	46	47	222	47	393	55		mg/kg	1	Calc-As Recd
Aro >C5-C7$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
Aro >C7-C8$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	<10	1	14	<10	14	<10		mg/kg	1	A-T-055s
Aro >C10-C12$_A$	<10	1	165	<10	<10	<10		mg/kg	1	A-T-055s
Aro >C12-C16$_A$	<10	6	687	<10	<10	11		mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	14	14	1350	<10	18	44		mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	37	46	2490	16	144	129		mg/kg	1	A-T-055s
Total Aromatics$_A$	50	68	4690	16	176	192		mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C35)$_A$	97	115	4920	63	569	246		mg/kg	1	Calc-As Recd
BTEX - Benzene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
BTEX - Toluene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
MTBE$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s

Report Notes

General

•This report shall not be reproduced, except in full, without written approval from Envirolab.
•The client Sample No, Client Sample ID, Depth to top, Depth to Bottom and Date Sampled are all provided by the client and can affect the validity of results.
•The results reported herein relate only to the material supplied to the laboratory.
•The residue of any samples contained within this report, and any received within the same delivery, will be disposed of **four weeks** after the initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of **six months** after the initial Asbestos testing is completed.
•Analytical results reflect the quality of the sample at the time of analysis only.
•Opinions and Interpretations expressed are outside our scope of accreditation.
•A deviating sample report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
•If a sample is outside of the calibration range or affected by interferences then it may need diluting. This will result in the limit of detection (LOD) being raised.
•Subcontracted Analysis: Please see the appended report for any deviations, current LODs and accreditation status of the test.

Key

Superscript "#"	Accredited to ISO 17025
Superscript "M"	Accredited to MCertS
Superscript "U"	Individual result not accredited
None of the above symbols	Analysis unaccredited
Subscript "A"	Analysis performed on as-received Sample
Subscript "D"	Analysis performed on the dried sample, crushed to pass 2mm sieve.
Subscript "D" on Asbestos	Analysis performed on a dried aliquot of sample provided.
Subscript "^"	Analysis has dependant options against results. Details appear in the comments of your Sample receipt
IS	Insufficient Sample for analysis
US	Unsuitable Sample for analysis
NDP	No Determination Possible
NAD	No Asbestos Detected
Trace	Asbestos found not suitable for Gravimetric Quantification – not enough to accurately weigh.
N/A	Not applicable

Asbestos

Identification: Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis
"Trace Asbestos Identified" will be reported if there is not enough present to verify the type.

Assigned Matrix Codes

1	SAND	6	CLAY/LOAM	A	Contains Stones
2	LOAM	7	OTHER	B	Contains Construction Rubble
3	CLAY	8	Asbestos Bulk (Only Asbestos ID accredited)	C	Contains visible hydrocarbons
4	LOAM/SAND	9	Incinerator Ash (some Metals accredited)	D	Contains glass / metal
5	SAND/CLAY			E	Contains roots / twigs
Note: 7,8,9 matrices are not covered by our ISO 17025 or MCertS accreditation, unless stated above.					

Soil Chemical Analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH by method A-T-007:
For waters, free and visible oils are excluded from the sample used for analysis, so the reported result represents the dissolved phase only.
Results "with Clean up" indicates samples cleaned up with Silica during extraction.

EPH CWG (method A-T-055) from TPH CWG:
EPH CWG results have humics mathematically subtracted through instrument calculation.
Where these humic substances have been identified in any IDs from "TPH CWG with clean up" please note that the concentration is **NOT** included in the quantified results but present in the ID for information.

Electrical Conductivity of water by method A-T-037:
Results greater than 12900µS/cm @ 25^0C / 11550µS/cm @ 20^0C fall outside the calibration range and as such are unaccredited.

Please contact your client manager if you require any further information.

Envirolab Deviating Samples Report

Hattersley Science & Technology Park, Stockport Road, Hattersley, SK14 3QU
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG

Project: Ropemaker

Clients Project No: B088474

Project No: 26/01810

Date Received: 17/02/2026 (am)

Cool Box Temperatures (°C): 2.6

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	26/01810/1	26/01810/2	26/01810/3	26/01810/4	26/01810/5	26/01810/6
Client Sample No						
Client Sample ID/Depth	WS101 0.50m	WS102A 0.10m	WS103A 0.65m	WS104B 1.00m	WS106A 0.15m	WS107 0.50m
Date Sampled	11/02/26	11/02/26	11/02/26	12/02/26	12/02/26	12/02/26
A-T-019s	19/02/2026	19/02/2026	23/02/2026	19/02/2026	19/02/2026	19/02/2026
A-T-022s	19/02/2026	19/02/2026	19/02/2026	19/02/2026	19/02/2026	19/02/2026
A-T-024s	20/02/2026	20/02/2026	20/02/2026	20/02/2026	20/02/2026	20/02/2026
A-T-026s	20/02/2026	20/02/2026	20/02/2026	20/02/2026	20/02/2026	20/02/2026
A-T-027s	20/02/2026	20/02/2026	20/02/2026	20/02/2026	20/02/2026	20/02/2026
A-T-031s	20/02/2026	20/02/2026	20/02/2026	20/02/2026	20/02/2026	20/02/2026
A-T-032s	23/02/2026	23/02/2026	23/02/2026	23/02/2026	23/02/2026	23/02/2026
A-T-040s	20/02/2026	20/02/2026	20/02/2026	20/02/2026	20/02/2026	20/02/2026
A-T-042sTCN	19/02/2026	19/02/2026	19/02/2026	19/02/2026	19/02/2026	19/02/2026
A-T-044	18/02/2026	18/02/2026	18/02/2026	18/02/2026	18/02/2026	18/02/2026
A-T-045	18/02/2026	18/02/2026	18/02/2026	18/02/2026	18/02/2026	18/02/2026
A-T-050s	19/02/2026	19/02/2026	19/02/2026	19/02/2026	19/02/2026	19/02/2026
A-T-055s	20/02/2026	20/02/2026	20/02/2026	20/02/2026	20/02/2026	20/02/2026
Calc-As Recd	20/02/2026	20/02/2026	20/02/2026	20/02/2026	20/02/2026	20/02/2026

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

Appendix D – Geotechnical Laboratory Test Results

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TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022, cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022,cl 5.2 and 6

4041

Client:	Curtins	Client Reference:	B088474
Client Address:		Job Number:	26-007875-1
	17-19 Whitworth Street West, Manchester	Date Sampled:	11/02/2026
		Date Received:	16/02/2026
Contact:	Lucy Woods / Jonathan Lord	Date Tested:	26/02/2026
Site Address:	Ropemaker	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

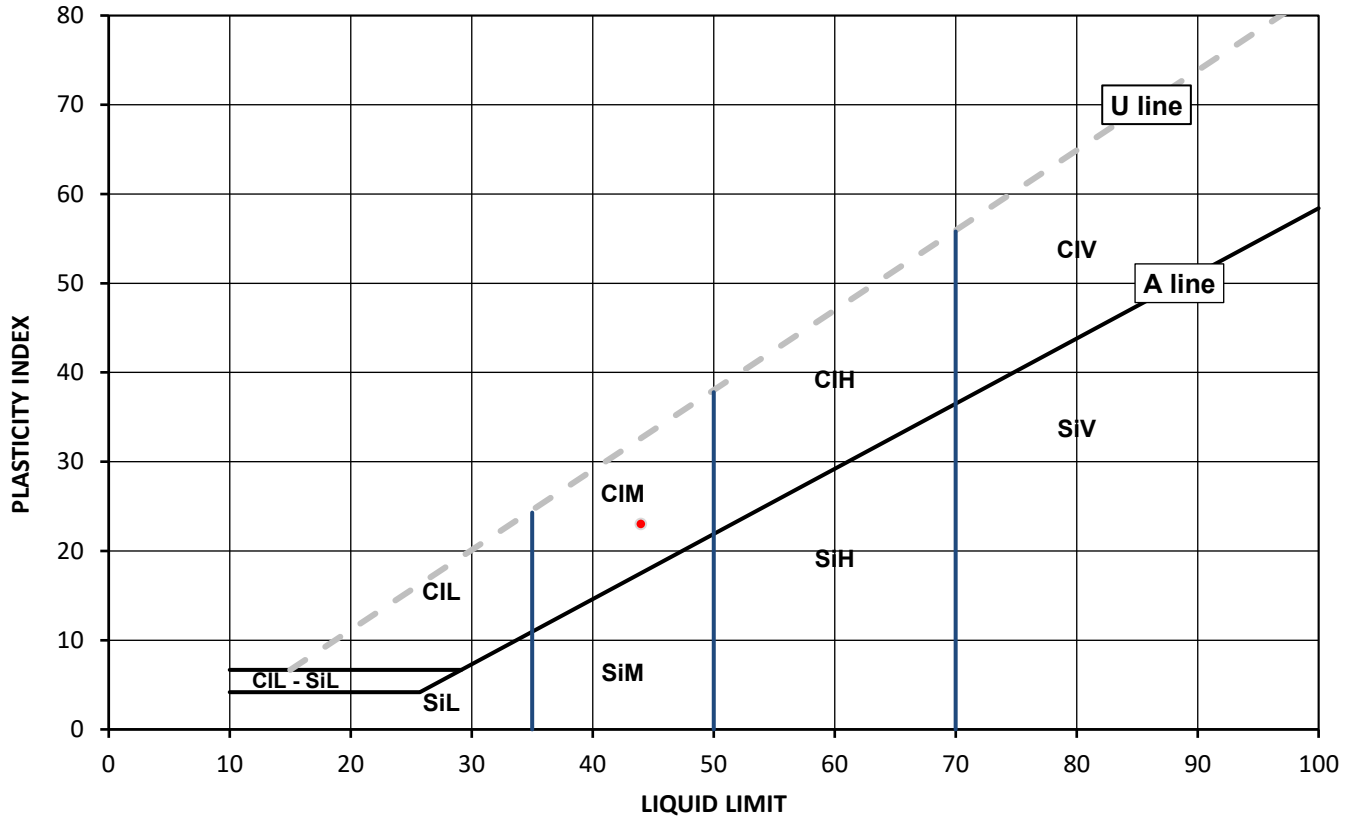
Test Results:

Laboratory Reference:	832727	Depth Top [m]:	2.00
Hole No.:	WS101	Depth Base [m]:	2.45
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brown slightly gravelly sandy CLAY		

Sample Preparation: Tested after >0.425mm removed by hand; The water content in the sample was increased

Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] #	Consistency Index [IC] #	% Passing 425µm BS Test Sieve
21.0	44	21	23	0.00	1.00	99



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN ISO 17892-1:2014+A1:2022, BS 1377-2:2022; # Non accredited

Remarks:

Signed: Katarzyna Koziel

Katarzyna Koziel
Geotechnical Reporting Team Leader
for and on behalf of i2 Analytical Ltd

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022, cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022,cl 5.2 and 6

4041

Client:	Curtins	Client Reference:	B088474
Client Address:		Job Number:	26-007875-1
	17-19 Whitworth Street West, Manchester	Date Sampled:	11/02/2026
		Date Received:	16/02/2026
Contact:	Lucy Woods / Jonathan Lord	Date Tested:	26/02/2026
Site Address:	Ropemaker	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

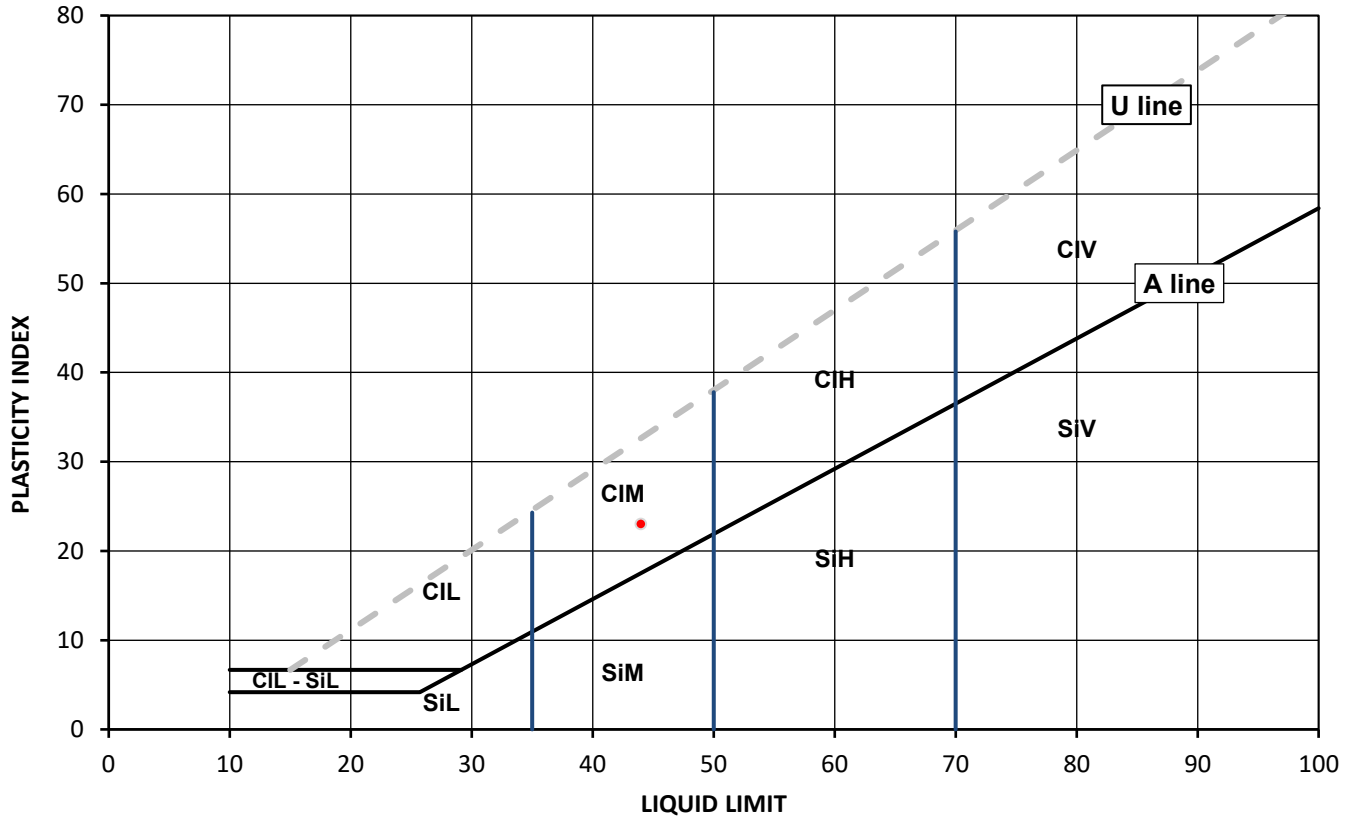
Test Results:

Laboratory Reference:	832728	Depth Top [m]:	3.00
Hole No.:	WS101	Depth Base [m]:	3.45
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brown slightly gravelly sandy CLAY		

Sample Preparation: Tested after >0.425mm removed by hand; The water content in the sample was increased

Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] #	Consistency Index [IC] #	% Passing 425µm BS Test Sieve
21.7	44	21	23	0.03	0.97	90



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN ISO 17892-1:2014+A1:2022, BS 1377-2:2022; # Non accredited

Remarks:

Signed:

Katarzyna Koziel
Geotechnical Reporting Team Leader
for and on behalf of i2 Analytical Ltd

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 Date Reported: 02/03/2026 **GF 337.17**

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022, cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022,cl 5.2 and 6

4041

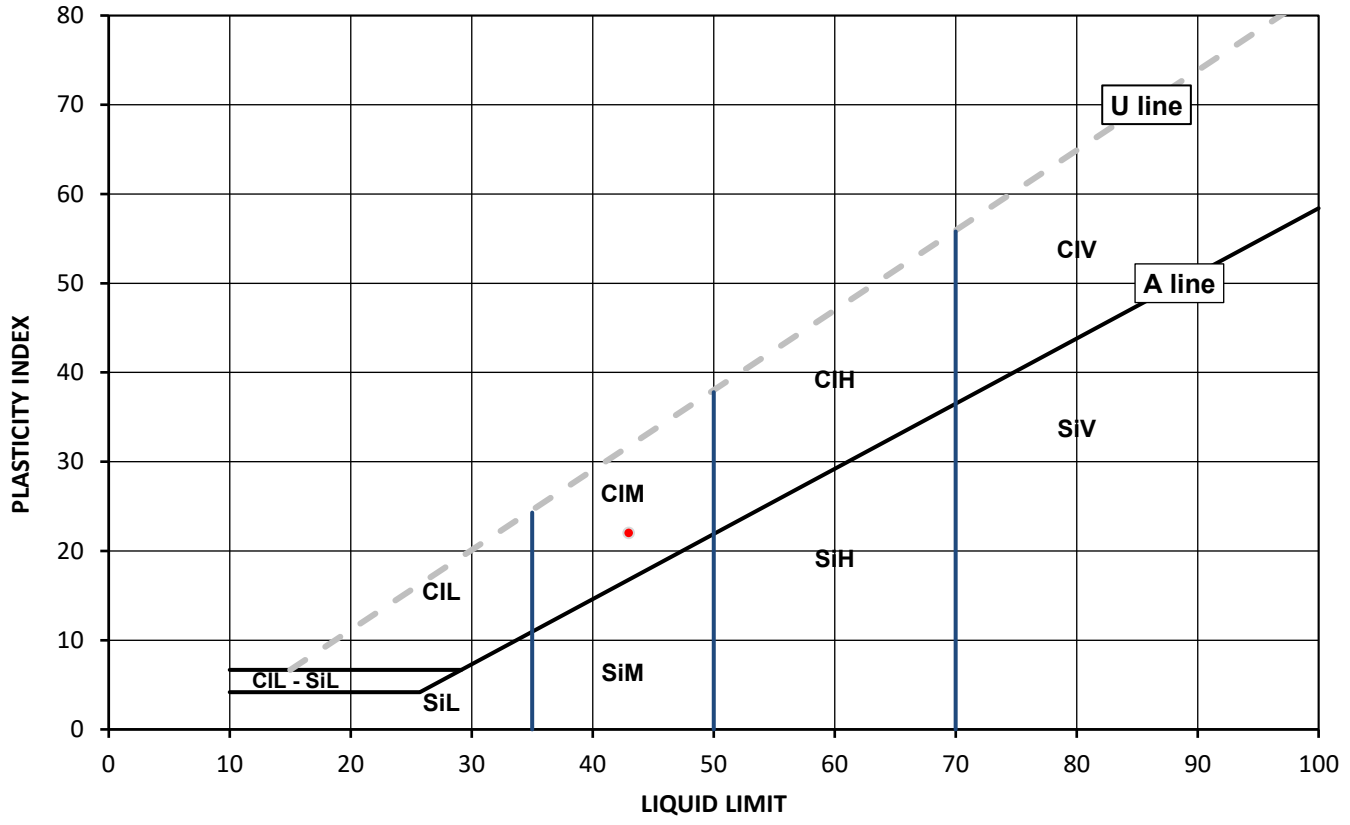
Client:	Curtins	Client Reference:	B088474
Client Address:		Job Number:	26-007875-1
	17-19 Whitworth Street West, Manchester	Date Sampled:	11/02/2026
		Date Received:	16/02/2026
Contact:	Lucy Woods / Jonathan Lord	Date Tested:	26/02/2026
Site Address:	Ropemaker	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	832729	Depth Top [m]:	2.00
Hole No.:	WS103C	Depth Base [m]:	2.45
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brownish grey slightly gravelly sandy CLAY		
Sample Preparation:	Tested after >0.425mm removed by hand; The water content in the sample was increased		
Cone Type:	80g/30deg		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] #	Consistency Index [IC] #	% Passing 425µm BS Test Sieve
15.2	43	21	22	-0.26	1.26	95



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN ISO 17892-1:2014+A1:2022, BS 1377-2:2022; # Non accredited

Remarks:

Signed: Katarzyna Koziel

Katarzyna Koziel
Geotechnical Reporting Team Leader
for and on behalf of i2 Analytical Ltd

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 Date Reported: 02/03/2026 **GF 337.17**

i2 Analytical Ltd, Unit 8, Harrowden Road, Brackmills Industrial Estate, Northampton, NN4 7EB

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022, cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022,cl 5.2 and 6

4041

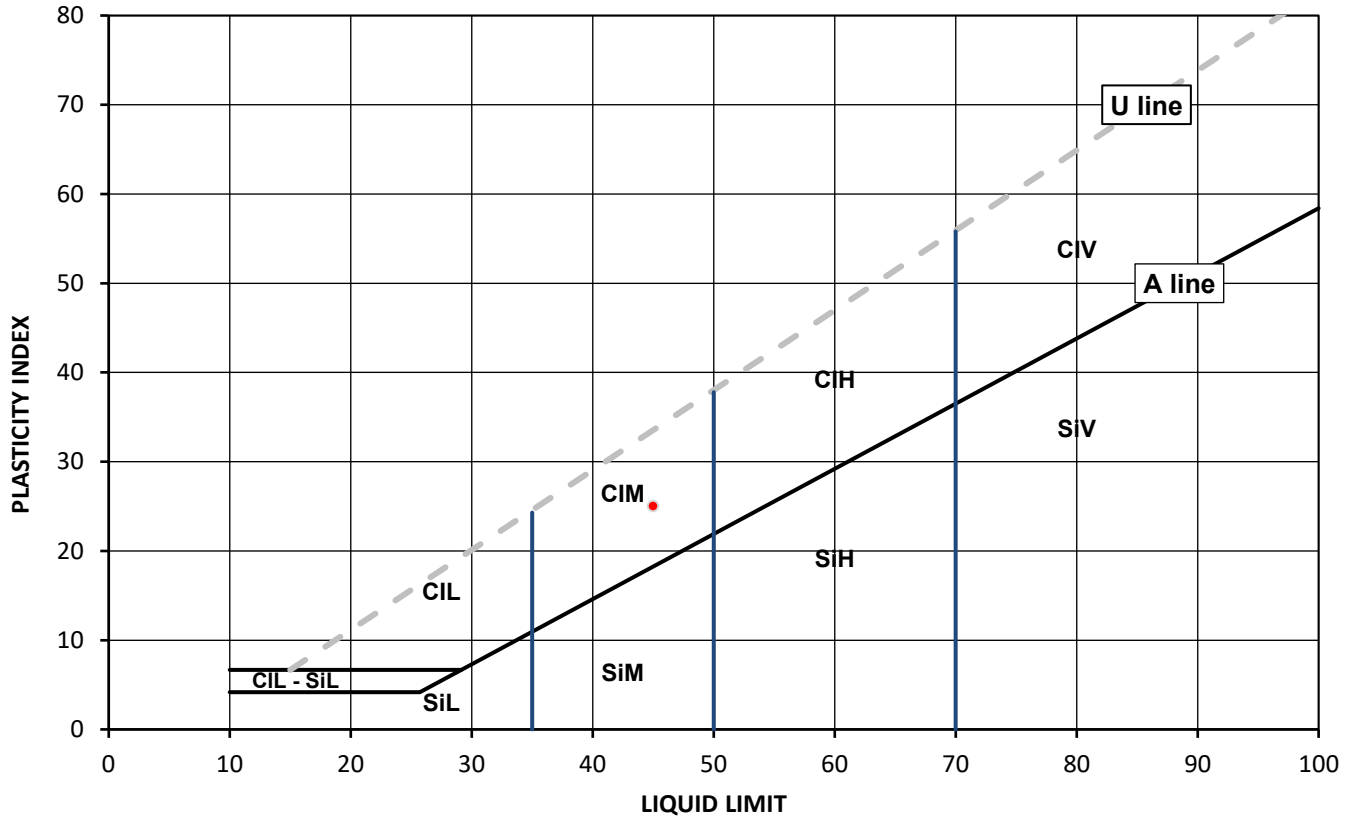
Client:	Curtins	Client Reference:	B088474
Client Address:		Job Number:	26-007875-1
	17-19 Whitworth Street West, Manchester	Date Sampled:	11/02/2026
		Date Received:	16/02/2026
Contact:	Lucy Woods / Jonathan Lord	Date Tested:	26/02/2026
Site Address:	Ropemaker	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	832730	Depth Top [m]:	4.00
Hole No.:	WS103C	Depth Base [m]:	4.45
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brown slightly gravelly slightly sandy CLAY		
Sample Preparation:	Tested after >0.425mm removed by hand; The water content in the sample was increased		
Cone Type:	80g/30deg		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] #	Consistency Index [IC] #	% Passing 425µm BS Test Sieve
20.4	45	20	25	0.02	0.98	91



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN ISO 17892-1:2014+A1:2022, BS 1377-2:2022; # Non accredited

Remarks:

Signed:

Katarzyna Koziel
Geotechnical Reporting Team Leader
for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022, cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022,cl 5.2 and 6

4041

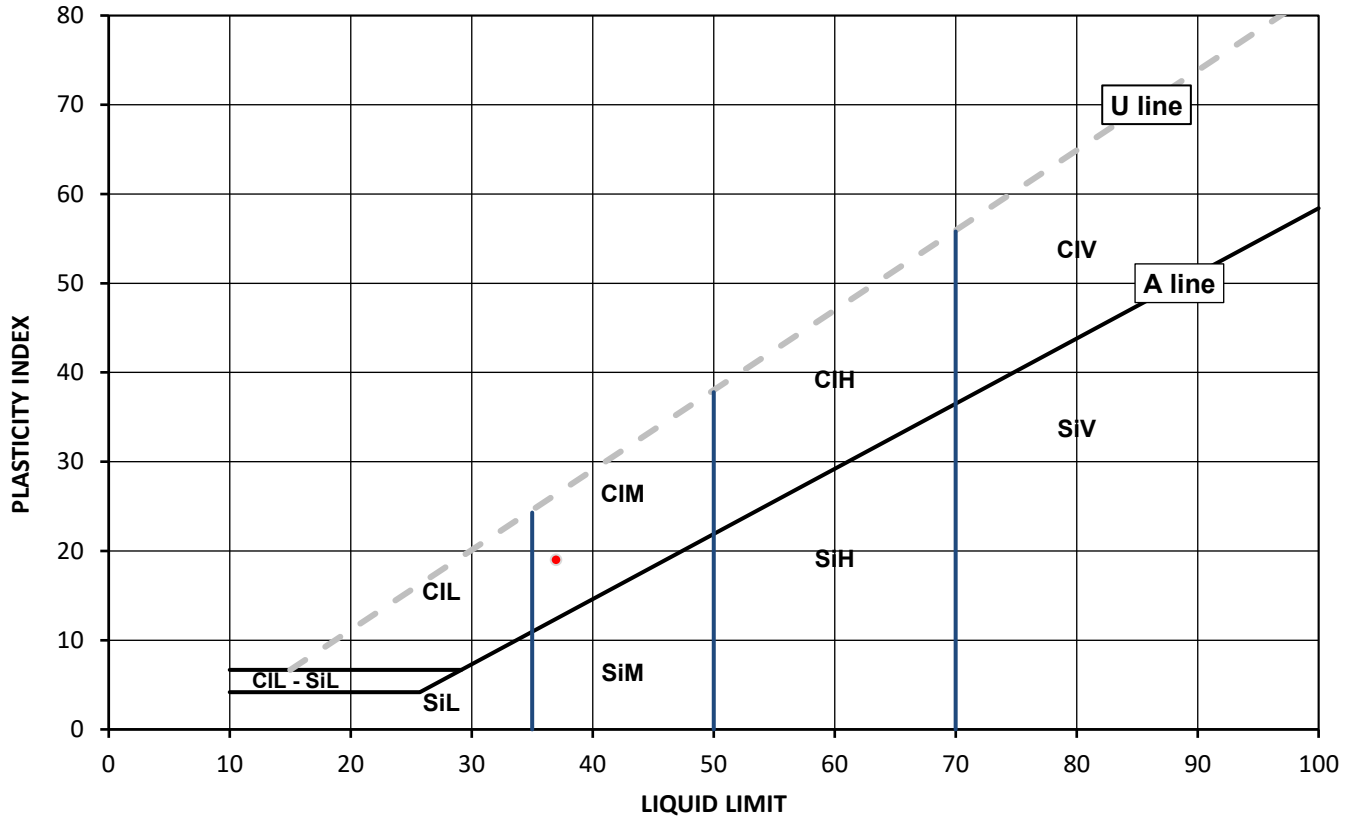
Client:	Curtins	Client Reference:	B088474
Client Address:		Job Number:	26-007875-1
	17-19 Whitworth Street West, Manchester	Date Sampled:	12/02/2026
		Date Received:	16/02/2026
Contact:	Lucy Woods / Jonathan Lord	Date Tested:	26/02/2026
Site Address:	Ropemaker	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	832731	Depth Top [m]:	4.00
Hole No.:	WS104B	Depth Base [m]:	4.45
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brown slightly gravelly sandy CLAY		
Sample Preparation:	Tested after >0.425mm removed by hand; The water content in the sample was increased		
Cone Type:	80g/30deg		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] #	Consistency Index [IC] #	% Passing 425µm BS Test Sieve
15.6	37	18	19	-0.13	1.13	97



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN ISO 17892-1:2014+A1:2022, BS 1377-2:2022; # Non accredited

Remarks:

Signed: Katarzyna Koziel

Katarzyna Koziel
Geotechnical Reporting Team Leader
for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022, cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022,cl 5.2 and 6

4041

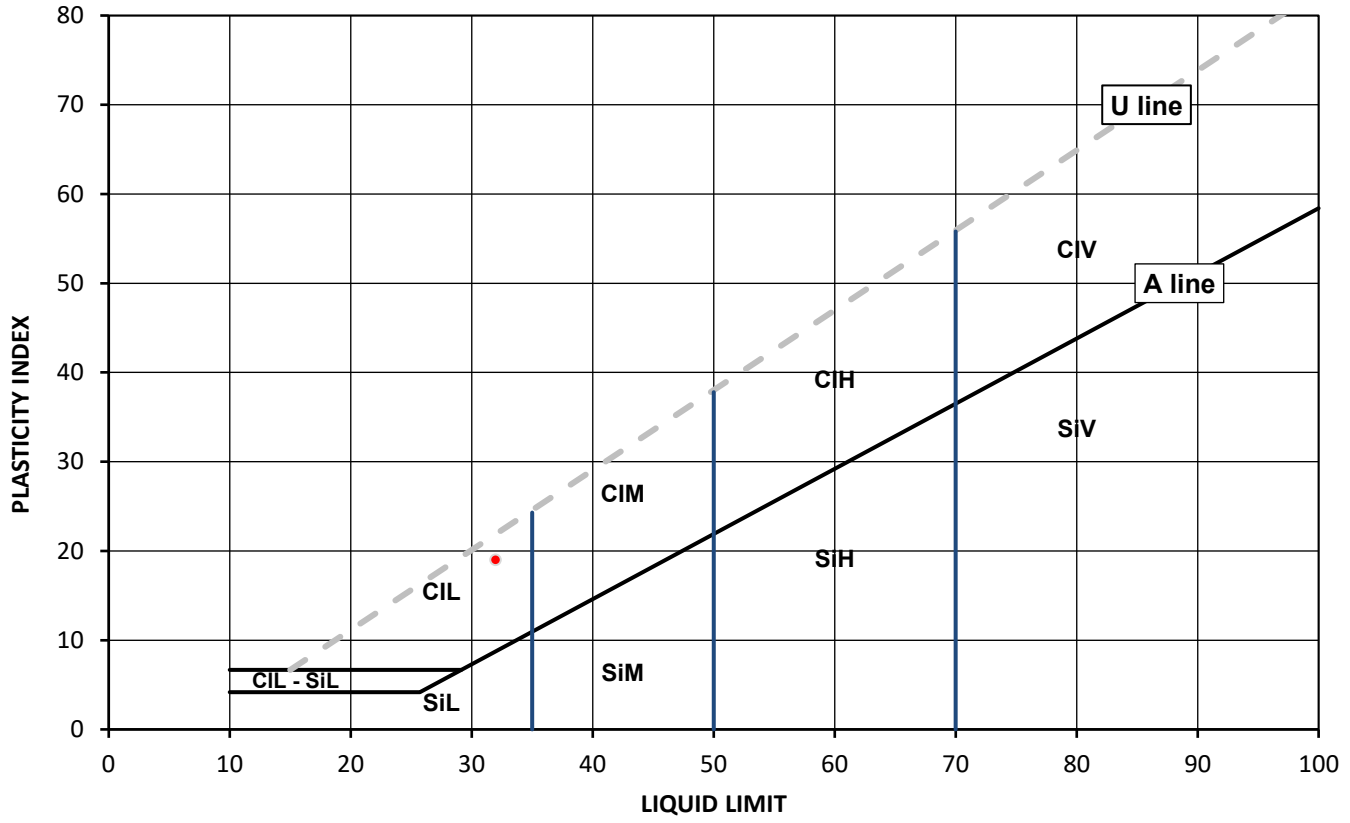
Client:	Curtins	Client Reference:	B088474
Client Address:		Job Number:	26-007875-1
	17-19 Whitworth Street West, Manchester	Date Sampled:	12/02/2026
		Date Received:	16/02/2026
Contact:	Lucy Woods / Jonathan Lord	Date Tested:	26/02/2026
Site Address:	Ropemaker	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	832732	Depth Top [m]:	5.00
Hole No.:	WS104B	Depth Base [m]:	5.45
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brown slightly gravelly very sandy CLAY		
Sample Preparation:	Tested after >0.425mm removed by hand; The water content in the sample was increased		
Cone Type:	80g/30deg		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] #	Consistency Index [IC] #	% Passing 425µm BS Test Sieve
11.6	32	13	19	-0.07	1.07	75



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN ISO 17892-1:2014+A1:2022, BS 1377-2:2022; # Non accredited

Remarks:

Signed:

Katarzyna Koziel
Geotechnical Reporting Team Leader
for and on behalf of i2 Analytical Ltd

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 Date Reported: 02/03/2026 **GF 337.17**

i2 Analytical Ltd, Unit 8, Harrowden Road, Brackmills Industrial Estate, Northampton, NN4 7EB

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022, cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022,cl 5.2 and 6

4041

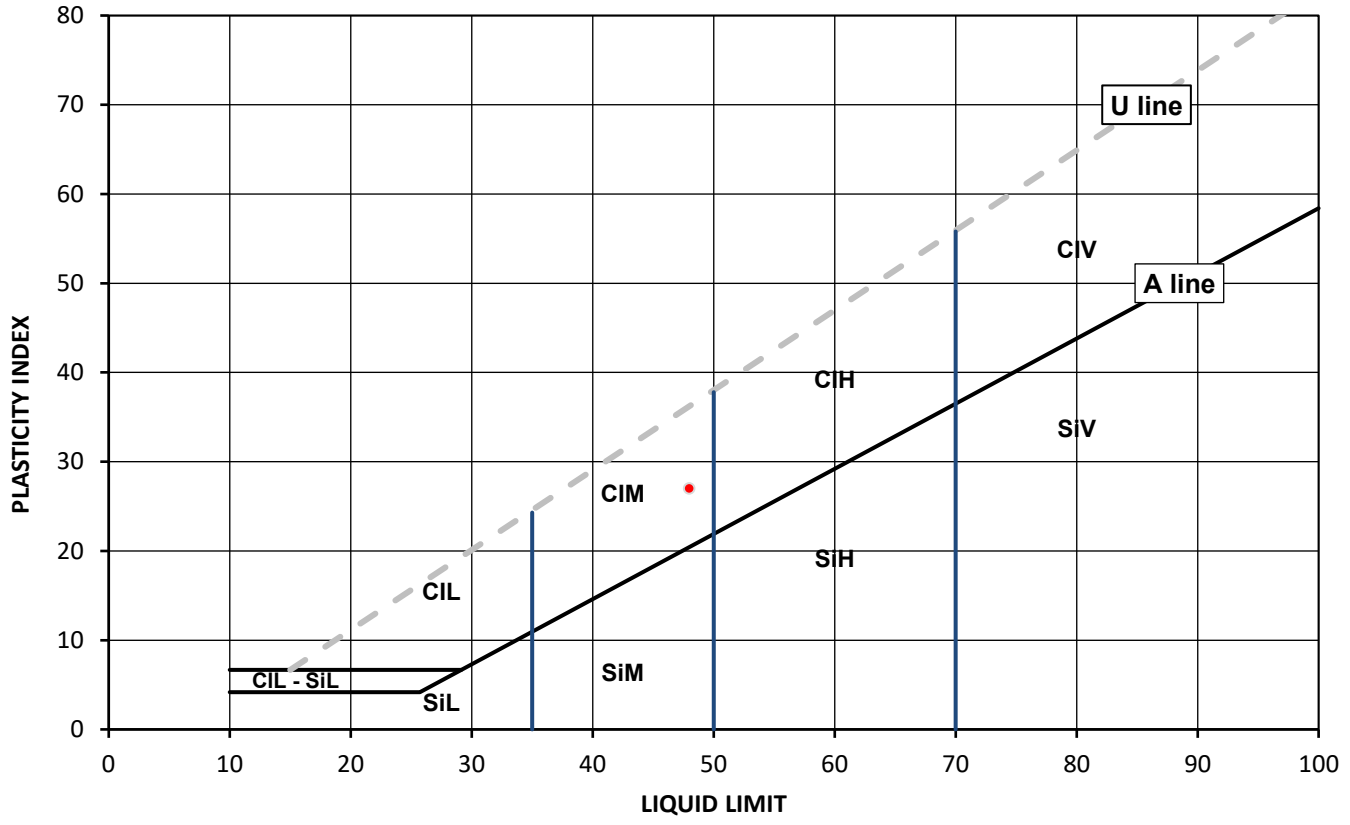
Client:	Curtins	Client Reference:	B088474
Client Address:		Job Number:	26-007875-1
	17-19 Whitworth Street West, Manchester	Date Sampled:	12/02/2026
		Date Received:	16/02/2026
Contact:	Lucy Woods / Jonathan Lord	Date Tested:	26/02/2026
Site Address:	Ropemaker	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	832733	Depth Top [m]:	1.20
Hole No.:	WS107	Depth Base [m]:	1.65
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brownish grey slightly gravelly slightly sandy CLAY		
Sample Preparation:	Tested after >0.425mm removed by hand; The water content in the sample was increased		
Cone Type:	80g/30deg		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] #	Consistency Index [IC] #	% Passing 425µm BS Test Sieve
22.3	48	21	27	0.05	0.95	92



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN ISO 17892-1:2014+A1:2022, BS 1377-2:2022; # Non accredited

Remarks:

Signed: Katarzyna Koziel

Katarzyna Koziel
Geotechnical Reporting Team Leader
for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022, cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022,cl 5.2 and 6

4041

Client:	Curtins	Client Reference:	B088474
Client Address:		Job Number:	26-007875-1
	17-19 Whitworth Street West, Manchester	Date Sampled:	12/02/2026
		Date Received:	16/02/2026
Contact:	Lucy Woods / Jonathan Lord	Date Tested:	26/02/2026
Site Address:	Ropemaker	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

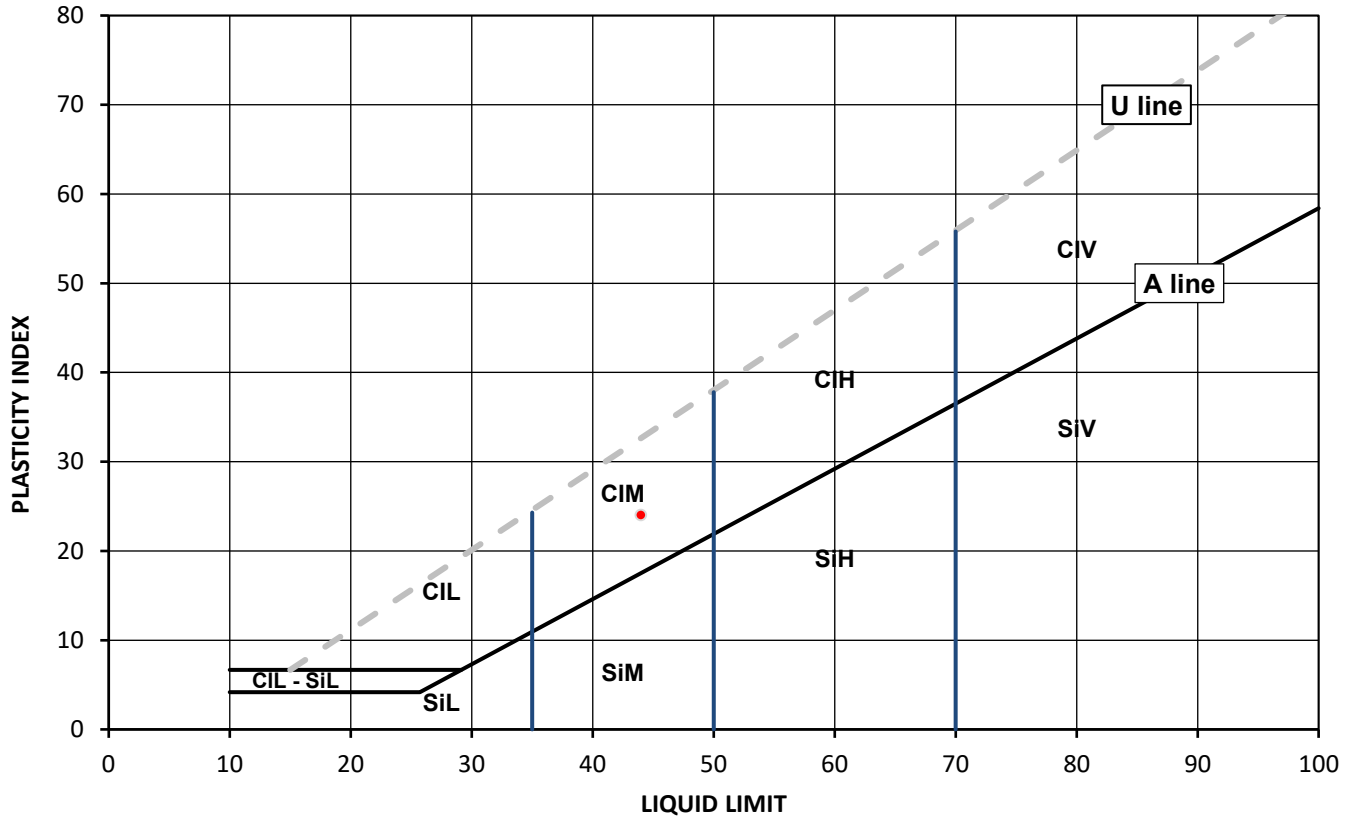
Test Results:

Laboratory Reference:	832734	Depth Top [m]:	3.00
Hole No.:	WS107	Depth Base [m]:	3.45
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brown slightly gravelly sandy CLAY		

Sample Preparation: Tested after >0.425mm removed by hand; The water content in the sample was increased

Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] #	Consistency Index [IC] #	% Passing 425µm BS Test Sieve
20.8	44	20	24	0.03	0.97	84



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN ISO 17892-1:2014+A1:2022, BS 1377-2:2022; # Non accredited

Remarks:

Signed: Katarzyna Koziel

Katarzyna Koziel
Geotechnical Reporting Team Leader
for and on behalf of i2 Analytical Ltd

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SUMMARY REPORT

SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with:

BS EN ISO 17892-12:2018+A2:2022 cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022, cl 5.2 and 6. W by BS EN ISO 17892-1:2014+A1:2022.

Normec i2 Analytical

4041

Client: Curtins

Client Address:

17-19 Whitworth Street West, Manchester

Contact: Lucy Woods / Jonathan Lord

Site Address: Ropemaker

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Client Reference: B088474
Job Number: 26-007875-1
Date Sampled: 11/02 - 12/02/2026
Date Received: 16/02/2026
Date Tested: 26/02/2026
Sampled By: Not Given

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	W	Liquid & Plastic Limit							Density		
		Reference	Depth Top m	Depth Base m	Type			%	% Passing 425um %	WL* %	Correlation Factor	Wp %	Ip %	Cone type	Sample Preparation	bulk Mg/m3	dry Mg/m3	PD Mg/m3
832727	WS101	Not Given	2.00	2.45	D	Brown slightly gravelly sandy CLAY	Atterberg 4 Point	21.0	99	44	-	21	23	80g/30 deg	R / I			
832728	WS101	Not Given	3.00	3.45	D	Brown slightly gravelly sandy CLAY	Atterberg 4 Point	21.7	90	44	-	21	23	80g/30 deg	R / I			
832729	WS103C	Not Given	2.00	2.45	D	Brownish grey slightly gravelly sandy CLAY	Atterberg 4 Point	15.2	95	43	-	21	22	80g/30 deg	R / I			
832730	WS103C	Not Given	4.00	4.45	D	Brown slightly gravelly slightly sandy CLAY	Atterberg 4 Point	20.4	91	45	-	20	25	80g/30 deg	R / I			
832731	WS104B	Not Given	4.00	4.45	D	Brown slightly gravelly sandy CLAY	Atterberg 4 Point	15.6	97	37	-	18	19	80g/30 deg	R / I			
832732	WS104B	Not Given	5.00	5.45	D	Brown slightly gravelly very sandy CLAY	Atterberg 4 Point	11.6	75	32	-	13	19	80g/30 deg	R / I			
832733	WS107	Not Given	1.20	1.65	D	Brownish grey slightly gravelly slightly sandy CLAY	Atterberg 4 Point	22.3	92	48	-	21	27	80g/30 deg	R / I			
832734	WS107	Not Given	3.00	3.45	D	Brown slightly gravelly sandy CLAY	Atterberg 4 Point	20.8	84	44	-	20	24	80g/30 deg	R / I			

Note: # Non accredited; NP - Non plastic; N - Tested in natural condition, R - Tested after >0,425mm removed by hand, WR - Tested after washing to remove >425mm; I - The water content in the sample was increased , D - The water content in the sample was decreased; * - One point liquid limit corrected as per the report Correlation Factor by Clayton C.R.I and Jukes A.W (1978)

Comments:

Signed:

Katarzyna Koziel
Geotechnical Reporting Team Leader
for and on behalf of i2 Analytical Ltd

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Date Reported: 02/03/2026 **GF 362.17**

SUMMARY REPORT

DETERMINATION OF WATER CONTENT

Tested in Accordance with: BS EN ISO 17892-1:2014+A1:2022, BS 1377-2: 2022, clause 4.1

4041

Client: Curtins

Client Address:

17-19 Whitworth Street West, Manchester

Contact: Lucy Woods / Jonathan Lord

Site Address: Ropemaker

Client Reference: B088474
Job Number: 26-007875-1
Date Sampled: 11/02 - 12/02/2026
Date Received: 16/02/2026
Date Tested: 26/02/2026
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	WC											
		Reference	Depth Top m	Depth Base m	Type			%											
832727	WS101	Not Given	2.00	2.45	D	Brown slightly gravelly sandy CLAY		21.0											
832728	WS101	Not Given	3.00	3.45	D	Brown slightly gravelly sandy CLAY		21.7											
832729	WS103C	Not Given	2.00	2.45	D	Brownish grey slightly gravelly sandy CLAY		15.2											
832730	WS103C	Not Given	4.00	4.45	D	Brown slightly gravelly slightly sandy CLAY		20.4											
832731	WS104B	Not Given	4.00	4.45	D	Brown slightly gravelly sandy CLAY		15.6											
832732	WS104B	Not Given	5.00	5.45	D	Brown slightly gravelly very sandy CLAY		11.6											
832733	WS107	Not Given	1.20	1.65	D	Brownish grey slightly gravelly slightly sandy CLAY		22.3											
832734	WS107	Not Given	3.00	3.45	D	Brown slightly gravelly sandy CLAY		20.8											

Comments:

Signed:

Katarzyna Koziel
Geotechnical Reporting Team Leader
for and on behalf of i2 Analytical Ltd

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Date Reported: 02/03/2026

GF 126.20

Curtins
17-19 Whitworth Street West
Manchester

t:

e: lucy.woods@curtins.com, jonathan.lord@curtins.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: info-i2analytical@normecgroup.com

Analytical Report Number : 26-007874

Project / Site name:	Ropemaker	**Samples received on:**	16/02/2026
Your job number:	B088474	**Samples instructed on/ Analysis started on:**	16/02/2026
Your order number:	30052 BRE/20053 GEOTECH	**Analysis completed by:**	26/02/2026
Report Issue Number:	1	**Report issued on:**	02/03/2026
Samples Analysed:	8 soil samples		

[redacted]

Signed:

Anna Goc
PL Head of 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
air	- once the analysis is complete

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Retention period for records and reports is minimum 6 years from the date of issue of the final report.
Some records may be kept for longer according to other legal/best practice requirements.

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.

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 26-007874
Project / Site name: Ropemaker
Your Order No: 30052 BRE/20053 GEOTECH

Lab Sample Number				832719	832720	832721	832722	832723
Sample Reference				WS101	WS101	WS103C	WS103C	WS104B
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A	N/A	N/A
Depth (m)				2.00-2.45	3.00-3.45	2.00-2.45	4.00-4.45	4.00-4.45
Date Sampled				11/02/2026	11/02/2026	11/02/2026	11/02/2026	12/02/2026
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	16	17	24	16	15
Total mass of sample received	kg	0.1	NONE	0.2	0.2	0.2	0.2	0.2
General Inorganics								
pH (L099)	pH Units	N/A	MCERTS	8.2	8.4	8.1	8.4	8.3
Total Sulphate as SO_4	%	0.005	MCERTS	0.03	0.038	0.029	0.036	0.033
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	110	150	230	170	160
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	57.1	75.1	116	84.6	77.5
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	4	4.4	15	9.4	4.2
Total Sulphur	mg/kg	50	MCERTS	200	170	140	240	260
Total Sulphur	%	0.005	MCERTS	0.02	0.017	0.014	0.024	0.026
Water Soluble Nitrate (2:1) as NO_3	mg/kg	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Water Soluble Nitrate (2:1) as NO_3 (leachate equivalent)	mg/l	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Heavy Metals / Metalloids								
Magnesium (leachate equivalent)	mg/l	2.5	NONE	18	21	16	22	20
Magnesium (water soluble)	mg/kg	5	NONE	35	42	33	45	41

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 26-007874
Project / Site name: Ropemaker
Your Order No: 30052 BRE/20053 GEOTECH

Lab Sample Number				832724	832725	832726
Sample Reference				WS104B	WS107	WS107
Sample Number				None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A
Depth (m)				5.00-5.45	1.20-1.65	3.00-3.45
Date Sampled				12/02/2026	12/02/2026	12/02/2026
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status			
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	11	20	16
Total mass of sample received	kg	0.1	NONE	0.2	0.2	0.3
General Inorganics						
pH (L099)	pH Units	N/A	MCERTS	9.2	7.3	8.3
Total Sulphate as SO_4	%	0.005	MCERTS	0.041	0.015	0.03
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	170	110	120
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	85.5	57.1	59.6
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	9.4	2.5	3.2
Total Sulphur	mg/kg	50	MCERTS	470	100	170
Total Sulphur	%	0.005	MCERTS	0.047	0.01	0.017
Water Soluble Nitrate (2:1) as NO_3	mg/kg	2	NONE	< 2.0	< 2.0	< 2.0
Water Soluble Nitrate (2:1) as NO_3 (leachate equivalent)	mg/l	5	NONE	< 5.0	< 5.0	< 5.0
Heavy Metals / Metalloids						
Magnesium (leachate equivalent)	mg/l	2.5	NONE	15	13	18
Magnesium (water soluble)	mg/kg	5	NONE	30	25	37

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number : 26-007874
Project / Site name: Ropemaker

* 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 *
832719	WS101	None Supplied	2.00-2.45	Brown clay and sand with vegetation
832720	WS101	None Supplied	3.00-3.45	Brown clay and loam
832721	WS103C	None Supplied	2.00-2.45	Brown clay and loam
832722	WS103C	None Supplied	4.00-4.45	Brown clay and sand with gravel
832723	WS104B	None Supplied	4.00-4.45	Brown clay and loam with gravel
832724	WS104B	None Supplied	5.00-5.45	Brown clay and loam with gravel
832725	WS107	None Supplied	1.20-1.65	Brown clay and sand
832726	WS107	None Supplied	3.00-3.45	Brown clay and sand with gravel

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Analytical Report Number : 26-007874
Project / Site name: Ropemaker

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters Heating/Cooling (PrW) DI Process Water (DI PrW)
Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Moisture Content (Wet Weight)	Moisture content (% wet weight), determined gravimetrically (up to 30°C)	In-house-procedure based on BS EN 12880:2000	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES	In-house method based on TRL 447	L038B	D	NONE
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES	In-house method	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	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	L038B	D	MCERTS
Water Soluble Nitrate (leachate equivalent)	Determination of nitrate by reaction with sodium salicylate and colorimetry	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction	L078-PL	W	NONE
Nitrate, water soluble, in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser	In-house method	L082B	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
Soil Descriptions	Textural classification	In-house method	L019B	W	NONE

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL' or 'B' 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.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Quality control parameter failure associated with individual result applies to calculated sum of individuals.
The result for sum should be interpreted with caution

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Appendix E – Ground Gas Monitoring Results

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GAS MONITORING LOG SHEET

Project:	Ropemaker	**Date:**	18/02/2026
Job Number:	B088474	**Visit:**	1
Client:	Ropemaker Propco Ltd	**Weather:**	Overcast
Barometric State:	Falling	**Ground Conditions:**	Dry

Borehole Reference	Borehole level m AOD	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
			Max	SS	Max	SS	Max	SS						
WS101	38.11	1000	93.6	0.0	0.0	0.0	0.4	0.4	20.1	0	0	1.49	4.17	1
WS103C	38.42	1000	-0.1	0.0	0.0	0.0	0.1	0.1	20.3	0	0	1.53	1.54	2
WS104B	38.05	1000	0.0	0.0	0.0	0.0	0.1	0.1	20.3	0	0	3.78	4.97	
WS107	38.04	1000	0.0	0.0	0.0	0.0	0.5	0.5	19.8	0	0	2.50	3.12	
MAX			93.6	0.0	0.0	0.0	0.5	0.5	20.3	0	0			

Notes

Logged by JP

1 Steady state gas flow rate of 0 achieved after 5 minutes
2 Steady state gas flow rate of 0 achieved instantly

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

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GAS MONITORING LOG SHEET

Project:	Ropemaker	**Date:**	10/03/2026
Job Number:	B088474	**Visit:**	2
Client:	Ropemaker Propco Ltd	**Weather:**	Light Rain
Barometric State:	Falling	**Ground Conditions:**	Damp

Borehole Reference	Borehole level m AOD	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
			Max	SS	Max	SS	Max	SS						
WS101	38.11	1005	0.0	0.0	0.0	0.0	0.3	0.3	20.20	0	0	1.03	4.20	1
WS103C	38.42	1005	0.0	0.0	0.0	0.0	0.0	0.0	19.90	0	0	1.50	1.53	1
WS104B	38.05	1006	0.0	0.0	0.0	0.0	0.0	0.0	20.20	0	0	2.05	4.95	1
WS107	38.04	1007	0.0	0.0	0.0	0.0	0.0	0.0	20.10	0	0	1.55	3.13	1
MAX			0.0	0.0	0.0	0.0	0.3	0.3	20.2	0	0			

Notes

Logged by **RT**

1 Steady state flow achieved instantly.

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

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GAS MONITORING LOG SHEET

Project:	Ropemaker	**Date:**	20/03/26
Job Number:	B088474	**Visit:**	3
Client:	Ropemaker Propco Ltd	**Weather:**	Overcast
Barometric State:	Steady	**Ground Conditions:**	Dry

Borehole Reference	Borehole level m AOD	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
			Max	SS	Max	SS	Max	SS						
WS101	38.11	1014	0.0	0.0	0.8	0.0	0.6	0.5	20.1	0	0	0.96	4.18	1
WS103C	38.42	1014	0.0	0.0	0.0	0.0	0.0	0.0	20.3	0	0	1.53	1.54	
WS104B	38.05	1014	0.0	0.0	0.0	0.0	0.0	0.0	20.5	0	0	1.87	4.93	
WS107	38.04	1015	0.0	0.0	0.0	0.0	0.0	0.0	19.8	0	0	1.54	3.11	
MAX			0.0	0.0	0.8	0.0	0.6	0.5	20.5	0	0			

Notes

Logged by **LW**

1 Steady state methane achieved after 5 seconds.

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

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GAS MONITORING LOG SHEET

Project:	Ropemaker	**Date:**	31/03/26
Job Number:	B088474	**Visit:**	4
Client:	Ropemaker Propco Ltd	**Weather:**	Overcast
Barometric State:	Rising	**Ground Conditions**	Damp

Borehole Reference	Borehole level m AOD	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
			Max	SS	Max	SS	Max	SS						
WS101	38.11	1024	0.0	0.0	0.0	0.0	0.1	0.1	19.9	0	0	1.03	4.21	
WS103C	38.42	1023	0.0	0.0	0.0	0.0	0.0	0.0	20.2	0	0	1.52	1.54	
WS104B	38.05	1023	0.0	0.0	0.0	0.0	0.1	0.1	20.2	0	0	1.75	4.95	
WS107	38.04	1024	0.0	0.0	0.0	0.0	0.0	0.0	19.9	0	0	1.47	3.14	
MAX			0.0	0.0	0.0	0.0	0.1	0.1	20.2	0	0			

Notes

Logged by **RBJ**

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

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GAS MONITORING LOG SHEET

Project:	Ropemaker	**Date:**	15/04/26
Job Number:	B088474	**Visit:**	5
Client:	Ropemaker Propco Ltd	**Weather:**	Overcast
Barometric State:	Falling	**Ground Conditions:**	Damp

1

Borehole Reference	Borehole level m AOD	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
			Max	SS	Max	SS	Max	SS						
WS101	38.11	1002	0.0	0.0	0.0	0.0	0.0	0.0	20.8	0	0	1.02	4.19	
WS103C	38.42	1002	0.0	0.0	0.0	0.0	0.0	0.0	20.4	0	0	1.52	1.53	
WS104B	38.05	1003	1.2	0.0	0.0	0.0	0.0	0.0	20.6	0	0	1.69	4.95	1
WS107	38.04	1003	0.0	0.0	0.0	0.0	0.1	0.1	19.7	0	0	1.47	3.12	
MAX			1.2	0.0	0.0	0.0	0.1	0.1	20.8	0	0			

Notes

Logged by **JP**

1 Steady state gas flow achieved instantly

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

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GAS MONITORING LOG SHEET

Project:	Ropemaker	**Date:**	28/04/26
Job Number:	B088474	**Visit:**	6
Client:	Ropemaker Propco Ltd	**Weather:**	Overcast
Barometric State:	Falling	**Ground Conditions:**	Dry

Borehole Reference	Borehole level m AOD	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
			Max	SS	Max	SS	Max	SS						
WS101	38.11	1023	0.0	0.0	0.0	0.0	0.0	0.0	19.8	0	0	1.02	4.21	
WS103C	38.42	1023	0.0	0.0	0.0	0.0	0.0	0.0	20.4	0	0	Dry	1.54	
WS104B	38.05	1024	0.0	0.0	0.0	0.0	0.1	0.1	20.1	0.0	0.0	1.6	4.95	
WS107	38.04	1022	0.0	0.0	0.0	0.0	0.1	0.1	18.7	0.0	0.0	1.4	3.14	
MAX			0.0	0.0	0.0	0.0	0.1	0.1	20.4	0	0			

Notes

Logged by RBJ

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

Appendix F - GAC Screening Thresholds

- ***Human Health GQRA Rationale and Hierarchy***
- ***Curtins GACs 1%, 2.5% and 6% SOM with Accompanying Notes***

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Human Health GQRA Rationale and Hierarchy

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Background

Detailed guidance on human health risk assessment is available within several documents, published by both the Environment Agency, Defra, CL:AIRE, LQM/CIEH and Public Health England as referenced below (references a-h).

A Generic Quantitative Risk Assessment (GQRA) is carried out for the Potential Contaminant Linkages (PCLs) investigated by screening of soil contamination data against relevant Generic Assessment Criteria where available.

Generic Assessment Criteria are available for a range of different land use scenarios, soil organic matter (SOM) and soil types. Curtins have adopted available GACs for a sandy loam soil at 1%, 2.5% and 6% SOM using various sources.

GAC Hierarchy

A summary of and hierarchy for adopted GACs is identified below:

i) **Category 4 Screening Levels (C4SLs):** In March 2014 Defra published C4SLs for arsenic, benzene, benzo(a)pyrene, cadmium, hexavalent chromium, and lead as part of the 'Phase 1 Project'. These values were derived to support the revised Part 2A Statutory Guidance issued in 2012 in which four categories of contaminated land are included, ranging from Category 1 (significant/high risk) to Category 4 (low risk). In 2018 the 'Phase 2 Project' commenced which aims to develop C4SLs for a range of further contaminants. Currently available Phase 2 C4SLs include vinyl chloride, trichloroethene, tetrachloroethene, naphthalene, cis-1,2 dichloroethene, trans 1, 2 dichloroethene and per / polyfluoroalkyl substances (PFAS) . Where contaminant concentrations do not exceed C4SLs, there is no risk that the land poses a significant possibility of significant harm (SPoSH) or the level of risk is low, as such land can be demonstrated to be in Category 4 and cannot be determined as contaminated land. The C4SLs are proposed to be more pragmatic (whilst still strongly precautionary) in comparison with SGVs and S4UL's outlined below.

ii) **Suitable for Use Levels (S4ULs):** In 2015 LQM and the Chartered Institute of Environmental Health published generic assessment criteria for 89 substances including metals, BTEX, TPH, polycyclic aromatic hydrocarbons, phenols, chlorinated solvents and other volatile organic compounds. The S4ULs represent a minimal risk to long term human health, derived using health criteria values. The methodology for deriving the S4ULs is based on the Environment Agency CLEA model with consideration of developments in UK human health exposure assessment, in particular the additional land uses and exposure assumptions.

iii) **Other Supplementary Screening Criteria:** In addition to those developed by LQM/CIEH (outlined above), other third party organisations have derived SSVs for a wider range of contaminants and land uses using the CLEA Model. Curtins have adopted these numbers where applicable, including those developed EIC/AGS/CL:AIRE and SoBRA published thresholds.

Alternative Assessment Approaches

PAH – Benzo(a)pyrene Surrogate Marker Assessment

In September 2017 Public Health England (PHE) (Ref. h) published guidance for the use of a surrogate marker approach to assess the risk posed by soil contamination with the genotoxic polycyclic aromatic hydrocarbons (PAHs). The guidance indicates that the use of a marker compound, such as Benzo(a)pyrene, provides a consistent indicator of the amount of 7 other genotoxic PAHs commonly tested for in soil including benz(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, indeno(123cd)pyrene and benzo(ghi)perylene.

Where PAH concentrations of these 8 no. PAHs are present within pre-determined ratios in soil, provided in the guidance, this approach is used, comparing soil concentrations of the marker compound with a Category 4 Screening Level, or site specific assessment criteria. An individual compound assessment is carried out for other PAH compounds not considered in the PHE guidance.

An individual compound assessment is carried out for all PAH compounds where pre-determined ratios are not met for the surrogate marker approach.

Notes

Curtins Generic Assessment Criteria provide further information and notes to be read in conjunction with this assessment rationale.

Human Health GQRA Rationale and Hierarchy

Curtins

References

a) Environmental Agency. (2009) Contaminated Land Exposure Assessment (CLEA) v1.071 model.

b) Environment Agency. (2009) Human Health Toxicological Assessment of Contaminants in Soil (report no. SC050021/SR2).

c) Environment Agency. (2009) Updated Technical Background to the CLEA Model (report no.SC050021/SR3).

d) Environment Agency (2005) The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils Science Report P5-080/TR3.

e) Department of Environment Food and Rural Affairs (DEFRA). (2012) Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance (report no. PB13735).

f) CL:AIRE (2014) Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination, SP1010 Rev 2.

g) LQM & CIEH (2015) S4ULs for Human Health Risk Assessment.

h) Public Health England (2017) Contaminated Land Information Sheet: Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons (PAHs

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Adopted Soil Generic Assessment Criteria
Sandy loam with 1% SOM

*Refer to Note 13 where Solubility and Vapour Saturation Limits are Exceeded. These values are not GAC and are not to be used as GAC.

Contaminants	Residential with Home Grown Produce	Residential Without Home Grown Produce	Allotments	Commercial	Public open space (Residential)	Public park POS$_{park}$	Solubility Saturation Limit (mg/kg)	Vapour Satuation Limit (mg/kg)
Metals, Semi-Metals & non-metals								
Antimony	-	550	-	7500	-	-		
Arsenic	37	40	49	640	79	170		
Beryllium	1.7	1.7	35	12	2.2	63		
Boron	290	11000	45	240000	21000	46000		
Cadmium	22	150	3.9	410	220	880		
Chromium III	910	910	18000	8600	1500	33000		
Chromium VI	21	21	170	49	21	250		
Copper	2400	7100	520	68000	12000	44000		
Lead	200	310	80	2300	630	1300		
Mercury (elemental)	1.2	1.2	21	58	16	30		25.8
Mercury (inorganic)	40	56	19	1100	120	240		
Methylmercury	11	15	6	320	40	68		
Nickel	130	180	53	980	230	800		
Selenium	250	430	88	12000	1100	1800		
Vanadium	410	1200	91	9000	2000	5000		
Zinc	3700	40000	620	730000	81000	170000		
Inorganic Compounds								
Cyanide	24	24	24	1400	24	24		
Organic contaminants								
Aliphatic Risk Banded Hydrocarbons - TPH CWG method								
Aliphatic EC5 - EC6 TPHs	42	42	730	3200	570000	95000	304	
Aliphatic EC>6 - EC8 TPHs	100	100	2300	7800	600000	150000	144	
Aliphatic EC>8 - EC10 TPHs	27	27	320	2000	13000	14000	78	
Aliphatic EC>10-EC12 TPHs	130	130	2200	9700	13000	21000	48	
Aliphatic EC>12-EC16 TPHs	1100	1100	11000	59000	13000	25000	24	
Aliphatic EC>16 - EC35 TPHs	65000	65000	260000	1600000	250000	450000	8.48	
Aliphatic EC>35 - EC44 TPHs	65000	65000	260000	1600000	250000	450000	8.48	
Aromatic Risk Banded Hydrocarbons - TPH CWG method								
Aromatic EC5 - EC7 TPHs	70	370	13	26000	56000	76000	1220	
Aromatic EC>7 - EC8 TPHs	130	860	22	56000	56000	87000		869
Aromatic EC>8 - EC10 TPHs	34	47	8.6	3500	5000	7200		613
Aromatic EC10 - EC12 TPHs	74	250	13	16000	5000	9200	364	
Aromatic EC12 - EC16 TPHs	140	1800	23	36000	5100	10000	169	
Aromatic EC>16 - EC21 TPHs	260	1900	46	28000	3800	7600		
Aromatic EC>21 - EC35 TPHs	1100	1900	370	28000	3800	7800		
Aromatic EC>35 - EC44 TPHs	1100	1900	370	28000	3800	7800		
Long Chain Aliphatic and Aromatic Hydrocarbons								
Aliphatic and Aromatic EC >44-70	1600	1900	1200	28000	3800	7800		
Aromatic Hydrocarbons								
Benzene	0.2	0.89	0.039	27	140	190		
Ethyl benzene	47	83	16	5700	24000	17000		518
Toluene	130	880	22	56000	56000	87000		869
Xylene	56	79	28	5900	41000	17000	478 (o-xylene) 576 (p-xylene)	625 (m-xylene)
MTBE	49	73	23	7900			20400	
Phenol	280	750	66	760	760	760		
Polycyclic Aromatic Hydrocarbons (PAH) - Benzo(a)pyrene Surrogate Marker Approach, with reference to C4SL PAH Surrogate Marker Check Sheet where appropriate								
Benzo(a)Pyrene (C4SL Surrogate Marker Approach)	5	5.3	5.7	77	10	21		
Naphthalene	15	15	65	1600	11000	800	76.4	
Acenaphthylene	170	2900	28	83000	15000	29000	86.1	
Acenaphthene	210	3000	34	84000	15000	29000	57	
Fluorene	170	2800	27	63000	9900	20000	30.9	
Phenanthrene	95	1300	15	22000	3100	6200	36	
Anthracene	2400	31000	380	520000	74000	150000		1.17
Fluoranthene	280	1500	52	23000	3100	6300		
Pyrene	620	3700	110	54000	7400	15000		
Polycyclic Aromatic Hydrocarbons (PAH) - Individual Compound Assessment								
Naphthalene	15	15	65	1600	11000	800	76.4	
Acenaphthylene	170	2900	28	83000	15000	29000	86.1	
Acenaphthene	210	3000	34	84000	15000	29000	57	
Fluorene	170	2800	27	63000	9900	20000	30.9	
Phenanthrene	95	1300	15	22000	3100	6200	36	
Anthracene	2400	31000	380	520000	74000	150000		1.17
Fluoranthene	280	1500	52	23000	3100	6300		
Pyrene	620	3700	110	54000	7400	15000		
Benzo(a)anthracene	7.2	11	2.9	170	29	49		
Chrysene	15	30	4.1	350	57	93		
Benzo(b)fluoranthene	2.6	3.9	0.99	44	7.1	13		
Benzo(k)fluoranthene	77	110	37	1200	190	370		
Benzo(a)pyrene (only)	2.2	3.2	0.97	35	5.7	11		
Indeno(123cd)pyrene	27	45	9.5	500	82	150		
Dibenzo(ah)anthracene	0.24	0.31	0.14	3.5	0.57	1.1		
Benzo(ghi)perylene	320	360	290	3900	640	1400		
Chlorinated Aliphatic Hydrocarbons								
Chloroethene (Vinyl chloride)	0.0064	0.015	0.0017	1.1	7.8	18		
1,1-Dichloroethene (DCE)	0.23	0.23	2.8	26			2230	
Cis 1,2, Dichloroethene (DCE)	0.46	0.5	0.89	38	3800	2800	3940	
Trans 1,2, Dichloroethene (DCE)	0.9	0.93	3.7	69	13000	5600	3420	
Trichloroethene (TCE)	0.0093	0.0097	0.032	0.73	76	41		
Tetrachlorethene (PCE)	0.31	0.32	2	24	3200	1400		
1,1,1,2 Tetrachlorethane	1.2	1.5	0.79	110	1400	1500		
1,1,1 Trichlorethane	8.8	9	48	660	140000	57000		1425
1,2-Dichloroethane (Ethylene Dichloride)	0.11	0.16	0.054	12	300	300		
Tetrachloromethane	0.026	0.026	0.45	2.9	890	190		
Trichloromethane (Chloroform)	0.91	1.2	0.42	99	2500	2600		
Per- and Polyfluoroalkyl Substances (PFAS)								
Perfluorooctanoic Acid (PFOA)	0.0076	0.041	0.0014	0.6	0.079	0.17		
Perfluorononanoic Acid (PFNA)	0.013	0.041	0.0027	0.6	0.079	0.17		
Perfluorohexane Sulfonic Acid (PFHxS)	0.0081	0.041	0.0015	0.6	0.079	0.17		
Perfluorooctane Sulfonic Acid (PFOS)	0.0073	0.041	0.0013	0.6	0.079	0.17		

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Adopted Soil Generic Assessment Criteria
Sandy loam with 2.5% SOM

*Refer to Note 13 where Solubility and Vapour Saturation Limits are Exceeded. These values are not GAC and are not to be used as GAC.

Contaminants	Residential with Home Grown Produce	Residential Without Home Grown Produce	Allotments	Commercial	Public open space (Residential)	Public park POS$_{park}$	Solubility Saturation Limit (mg/kg)	Vapour Satuation Limit (mg/kg)
Metals, Semi-Metals & non-metals								
Antimony		550		7500				
Arsenic	37	40	49	640	79	170		
Beryllium	1.7	1.7	35	12	2.2	63		
Boron	290	11000	45	240000	21000	46000		
Cadmium	22	150	3.9	410	220	880		
Chromium III	910	910	18000	8600	1500	33000		
Chromium VI	21	21	170	49	21	250		
Copper	2400	7100	520	68000	12000	44000		
Lead	200	310	80	2300	630	1300		
Mercury (elemental)	1.2	1.2	21	58	16	30		25.8
Mercury (inorganic)	40	56	19	1100	120	240		
Methylmercury	11	15	6	320	40	68		
Nickel	130	180	53	980	230	800		
Selenium	250	430	88	12000	1100	1800		
Vanadium	410	1200	91	9000	2000	5000		
Zinc	3700	40000	620	730000	81000	170000		
Inorganic Compounds								
Cyanide	24	24	24	1400	24	24		
Organic contaminants								
Aliphatic Risk Banded Hydrocarbons - TPH CWG method								
Aliphatic EC5 - EC6 TPHs	78	78	1700	5900	590000	130000	558	
Aliphatic EC>6 - EC8 TPHs	230	230	5600	17000	610000	220000	322	
Aliphatic EC>8 - EC10 TPHs	65	65	770	4800	13000	18000		190
Aliphatic EC>10-EC12 TPHs	330	330	4400	23000	13000	23000		118
Aliphatic EC>12-EC16 TPHs	2400	2400	13000	82000	13000	25000	59	
Aliphatic EC>16 - EC35 TPHs	92000	92000	270000	1700000	250000	480000	21	
Aliphatic EC>35 - EC44 TPHs	92000	92000	270000	1700000	250000	480000	21	
Aromatic Risk Banded Hydrocarbons - TPH CWG method								
Aromatic EC5 - EC7 TPHs	140	690	27	46000	56000	84000	2260	
Aromatic EC>7 - EC8 TPHs	290	1800	51	110000	56000	95000	1920	
Aromatic EC>8 - EC10 TPHs	83	110	21	8100	5000	8500		1500
Aromatic EC10 - EC12 TPHs	180	590	31	28000	5000	9700	899	
Aromatic EC12 - EC16 TPHs	330	2300	57	37000	5100	10000	419	
Aromatic EC>16 - EC21 TPHs	540	1900	110	28000	3800	7700		
Aromatic EC>21 - EC35 TPHs	1500	1900	820	28000	3800	7800		
Aromatic EC>35 - EC44 TPHs	1500	1900	820	28000	3800	7800		
Long Chain Aliphatic and Aromatic Hydrocarbons								
Aliphatic and Aromatic EC >44-70	1800	1900	2100	28000	3800	7800		
Aromatic Hydrocarbons								
Benzene	0.17	0.7	0.034	47	72	100		
Ethyl benzene	110	190	39	13000	24000	22000		1220
Toluene	290	1900	51	110000	56000	95000		1920
Xylene	130	180	67	14000	42000	23000	1120	1470
MTBE	84	120	44	13000			33100	
Phenol	550	1300	140	1500	1500	1500		
Polycyclic Aromatic Hydrocarbons (PAH) - Benzo(a)pyrene Surrogate Marker Approach, with reference to C4SL PAH Surrogate Marker Check Sheet where appropriate								
Benzo(a)Pyrene (C4SL Surrogate Marker Approach)	5	5.3	5.7	77	10	21		
Naphthalene	36	36	130	3700	15000	1200	183	
Acenaphthylene	420	4600	69	97000	15000	30000	212	
Acenaphthene	510	4700	85	97000	15000	30000	141	
Fluorene	400	3800	67	68000	9900	20000	76.5	
Phenanthrene	220	1500	38	22000	3100	6200		
Anthracene	5400	35000	950	540000	74000	150000		
Fluoranthene	560	1600	130	23000	3100	6300		
Pyrene	1200	3800	270	54000	7400	15000		
Polycyclic Aromatic Hydrocarbons (PAH) - Individual Compound Assessment								
Naphthalene	36	36	130	3700	15000	1200	183	
Acenaphthylene	420	4600	69	97000	15000	30000	212	
Acenaphthene	510	4700	85	97000	15000	30000	141	
Fluorene	400	3800	67	68000	9900	20000	76.5	
Phenanthrene	220	1500	38	22000	3100	6200		
Anthracene	5400	35000	950	540000	74000	150000		
Fluoranthene	560	1600	130	23000	3100	6300		
Pyrene	1200	3800	270	54000	7400	15000		
Benzo(a)anthracene	11	14	6.5	170	29	56		
Chrysene	22	31	9.4	350	57	110		
Benzo(b)fluoranthene	3.3	4	2.1	44	7.2	15		
Benzo(k)fluoranthene	93	110	75	1200	190	410		
Benzo(a)pyrene (only)	2.7	3.2	2	35	5.7	12		
Indeno(123cd)pyrene	36	46	21	510	82	170		
Dibenzo(ah)anthracene	0.28	0.32	0.27	3.6	0.57	1.3		
Benzo(ghi)perylene	340	360	470	4000	640	1500		
Chlorinated Aliphatic Hydrocarbons								
Chloroethene (Vinyl chloride)	0.01	0.019	0.0031	1.4	7.8	19		
1,1-Dichloroethene (DCE)	0.4	0.41	5.6	46			3940	
Cis 1,2, Dichloroethene (DCE)	0.78	0.84	1.7	64	3800	2400	6610	
Trans 1,2, Dichloroethene (DCE)	1.6	1.7	0.75	120	13000	7000	6170	
Trichloroethene (TCE)	0.02	0.02	0.072	1.5	78	54		
Tetrachlorethene (PCE)	0.7	0.71	4.8	55	3300	1900		
1,1,1,2 Tetrachlorethane	2.8	3.5	1.9	250	1400	1800		
1,1,1 Trichlorethane	18	18	110	1300	140000	76000		2915
1,2-Dichloroethane (Ethylene Dichloride)	0.18	0.24	0.1	17	210	330		
Tetrachloromethane	0.056	0.056	1	6.3	920	270		
Trichloromethane	1.7	2.1	0.83	170	2500	2800		
PFAS								
Perfluorooctanoic Acid (PFOA)	0.0076	0.041	0.0014	0.6	0.079	0.17		
Perfluorononanoic Acid (PFNA)	0.013	0.041	0.0027	0.6	0.079	0.17		
Perfluorohexane Sulfonic Acid (PFHxS)	0.0081	0.041	0.0015	0.6	0.079	0.17		
Perfluorooctane Sulfonic Acid (PFOS)	0.0073	0.041	0.0013	0.6	0.079	0.17		

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Adopted Soil Generic Assessment Criteria
Sandy loam with 6% SOM

*Refer to Note 13 where Solubility and Vapour Saturation Limits are Exceeded. These values are not GAC and are not to be used as GAC.

Contaminants	Residential with Home Grown Produce	Residential Without Home Grown Produce	Allotments	Commercial	Public open space (Residential)	Public park POS_{park}	Solubility Saturation Limit (mg/kg)	Vapour Satuation Limit (mg/kg)
Metals, Semi-Metals & non-metals								
Antimony		550		7500				
Arsenic	37	40	49	640	79	170		
Beryllium	1.7	1.7	35	12	2.2	63		
Boron	290	11000	45	240000	21000	46000		
Cadmium	22	150	3.9	410	220	880		
Chromium III	910	910	18000	8600	1500	33000		
Chromium VI	21	21	170	49	21	250		
Copper	2400	7100	520	68000	12000	44000		
Lead	200	310	80	2300	630	1300		
Mercury (elemental)	1.2	1.2	21	58	16	30		25.8
Mercury (inorganic)	40	56	19	1100	120	240		
Methylmercury	11	15	6	320	40	68		
Nickel	130	180	53	980	230	800		
Selenium	250	430	88	12000	1100	1800		
Vanadium	410	1200	91	9000	2000	5000		
Zinc	3700	40000	620	730000	81000	170000		
Inorganic Compounds								
Cyanide	24	24	24	1400	24	24		
Organic Compounds								
Aliphatic Risk Banded Hydrocarbons - TPH CWG method								
Aliphatic EC5 - EC6 TPHs	160	160	3900	12000	600000	180000	1150	
Aliphatic EC>6 - EC8 TPHs	530	530	13000	40000	620000	320000	736	
Aliphatic EC>8 - EC10 TPHs	150	150	1700	11000	13000	21000		451
Aliphatic EC>10-EC12 TPHs	760	770	7300	47000	13000	24000		283
Aliphatic EC>12-EC16 TPHs	4300	4400	13000	90000	13000	26000	142	
Aliphatic EC>16 - EC35 TPHs	110000	110000	270000	1800000	250000	490000		
Aliphatic EC>35 - EC44 TPHs	110000	110000	270000	1800000	250000	490000		
Aromatic Risk Banded Hydrocarbons - TPH CWG method								
Aromatic EC5 - EC7 TPHs	300	1400	57	86000	56000	92000	4710	
Aromatic EC>7 - EC8 TPHs	660	3900	120	180000	56000	100000		4360
Aromatic EC>8 - EC10 TPHs	190	270	51	17000	5000	9300		3580
Aromatic EC10 - EC12 TPHs	380	1200	74	34000	5000	10000	2150	
Aromatic EC12 - EC16 TPHs	660	2500	130	38000	5000	10000		
Aromatic EC>16 - EC21 TPHs	930	1900	260	28000	3800	7800		
Aromatic EC>21 - EC35 TPHs	1700	1900	1600	28000	3800	7900		
Aromatic EC>35 - EC44 TPHs	1700	1900	1600	28000	3800	7900		
Long Chain Aliphatic and Aromatic Hydrocarbons								
Aliphatic and Aromatic EC >44-70	1900	1900	3000	28000	3800	7900		
Aromatic Hydrocarbons								
Benzene	0.87	3.3	0.18	98	140	230		
Ethyl benzene	260	440	91	27000	25000	27000		2840
Toluene	690	3900	120	180000	56000	100000		4360
Xylene	310	430	160	30000	43000	31000	2620	
MTBE	160	220	90	24000			62700	
Phenol	420	2300	280	3200	3200	3200		
Polycyclic Aromatic Hydrocarbons (PAH) - Benzo(a)pyrene Surrogate Marker Approach, with reference to C4SL PAH Surrogate Marker Check Sheet where appropriate								
Benzo(a)Pyrene (C4SL Surrogate Marker Approach)	5	5.3	5.7	77	10	21		
Naphthalene	85	85	200	8400	17000	1900	432	
Acenaphthylene	920	6000	160	100000	15000	30000	506	
Acenaphthene	1100	6000	200	100000	15000	30000	336	
Fluorene	860	4500	160	71000	9900	20000	183	
Phenanthrene	440	1500	90	23000	3100	6300		
Anthracene	11000	37000	2200	540000	74000	150000		
Fluoranthene	890	1600	290	23000	3100	6400		
Pyrene	2000	3800	620	54000	7400	15000		
Polycyclic Aromatic Hydrocarbons (PAH) - Individual Compound Assessment								
Naphthalene	85	85	200	8400	17000	1900	432	
Acenaphthylene	920	6000	160	100000	15000	30000	506	
Acenaphthene	1100	6000	200	100000	15000	30000	336	
Fluorene	860	4500	160	71000	9900	20000	183	
Phenanthrene	440	1500	90	23000	3100	6300		
Anthracene	11000	37000	2200	540000	74000	150000		
Fluoranthene	890	1600	290	23000	3100	6400		
Pyrene	2000	3800	620	54000	7400	15000		
Benzo(a)anthracene	13	15	13	180	29	62		
Chrysene	27	32	19	350	57	120		
Benzo(b)fluoranthene	3.7	4	3.9	45	7.2	16		
Benzo(k)fluoranthene	100	110	130	1200	190	440		
Benzo(a)pyrene (only)	3	3.2	3.5	36	5.7	13		
Indeno(123cd)pyrene	41	46	39	510	82	180		
Dibenzo(ah)anthracene	0.3	0.32	0.43	3.6	0.58	1.4		
Benzo(ghi)perylene	350	360	640	4000	640	1600		
Chlorinated Aliphatic Hydrocarbons								
Chloroethene (Vinyl chloride)	0.017	0.029	0.0058	2.2	7.8	19		
1,1-Dichloroethene (DCE)	0.82	0.82	12	92			7940	
Cis 1,2, Dichloroethene (DCE)	1.5	1.6	3.6	120	3900	3100	12900	
Trans 1,2, Dichloroethene (DCE)	3.3	3.4	16	260	13000	9100	12600	
Trichloroethene (TCE)	0.043	0.045	0.16	3.4	79	69		
Tetrachlorethene (PCE)	1.6	1.6	11	130	3400	2500		
1,1,1,2 Tetrachlorethane	6.4	8.2	4.4	560	1400	2100		
1,1,1 Trichlorethane	39	40	240	3000	140000	100000		6392
1,2-Dichloroethane (Ethylene Dichloride)	0.31	0.41	0.19	29	310	380		
Tetrachloromethane	0.13	0.13	2.4	14	950	400		
Trichloromethane	3.4	4.2	1.7	350	2500	3100		
PFAS								
Perfluorooctanoic Acid (PFOA)	0.0076	0.041	0.0014	0.6	0.079	0.17		
Perfluorononanoic Acid (PFNA)	0.013	0.041	0.0027	0.6	0.079	0.17		
Perfluorohexane Sulfonic Acid (PFHxS)	0.0081	0.041	0.0015	0.6	0.079	0.17		
Perfluorooctane Sulfonic Acid (PFOS)	0.0073	0.041	0.0013	0.6	0.079	0.17		

Notes

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1) All Values are in mg/kg, reported to 2 significant figures.
2) Numbers in bold are C4SLs, Numbers in italics are S4ULs, Numbers underlined are EIC/AGS/CL:AIRE GACs, Numbers in red are SoBRA Acute Generic Assessment Criteria.
3) Assumptions and key notes made when deriving the Generic Assessment Criteria are contained within the relevant guidance documents, references:
   a) Contaminated Land: Applications in Real Environments (2014) SP1010 - Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination, Final Project Report (Revision 2b)
   b) Land Quality Management Ltd. (2015) The LQM/CIEH S4ULs for Human Health Risk Assessment.
   c) CL:AIRE, EIC, AGS (2010) Soil Generic Assessment Criteria for Human Health Risk Assessment.
   d) Society of Brownfield Risk Assessment (2020) Development of Acute Generic Assessment Criteria for Assessing Risks to Human Health from Contaminants in Soil.
   e) Environment Agency (2009) Human Health Toxicological Assessment of Contaminants in Soil, Science Report - SC050021/SR2.
4) Generic Assessment Criteria listed in the following order of preference: C4SLs, S4ULs, CL:AIRE/AGS/EIC Generic Assessment Criteria, Other relevant Generic Assessment Criteria where GACS associated with the prioritised GACs are not available as outlined further in Curtins Rationale and Hierarchy notes.
5) To use Benzo(a)pyrene as a surrogate marker for PAH contamination, the assumptions set out in the relevant C4SL documentation must be met. A C4SL PAH surrogate marker checklist is appended.
6) Naphthalene is a volatile PAH. The C4SL values are derived on the basis of chronic exposure and risks to human health, and do not explicitly account for acute risks (e.g. a one off ingestion of a significant amount of soil by a young child) where the inhalation pathway is the main risk driver. Further consideration of the acute risk may be required in external settings (POS_{park} and POS_{resi}) where the GAC is substantially greater than the residential equivalent, to account for the possibility of acute exposure to the ingestion of naphthalene. The theoretical solubility saturation limit of naphthalene in soil is substantially lower than the GAC value, and therefore it is likely that free phase contamination would be present where the GAC is exceeded. In such a situation, it is unlikely that the product would remain in-situ untreated, and consideration of remediation / mitigation methods would be required.
7) Where the C4SL surrogate marker checklist indicates the PAH ratios are not suitable, individual PAH compounds must be assessed individually against the relevant contaminant specific assessment criteria.
8) Risk associated with additive effects of TPH contamination needs to be assessed in addition to the individual bandings, using the following equation:

$$HI = \sum HQ\ Fi = \sum \frac{Measured\ concentration, Fi\ (mg/kg)}{Relevant\ GAC\ (mg/kg)} Fi$$

   Where:

   HI = Hazard Index

   HQ = Hazard Quotient

   Fi = Fraction i

   Where the HI > 1, there may be a risk to human health.
9) Exposure to all xylene isomers to be considered together. Values detailed in this table are the lowest (most conservative) of o-, m- and p- xylene isomers.
10) PFAS assessment also uses a hazard index approach to ensure the total exposure from all four PFAS compounds combined does not exceed the $LLTC_{oral}$. Where the hazard index exceeds 1, further consideration or assessment of the risk is required, even where none of the individual C4SL values are exceeded.
11) PFAS C4SL values are interim. The C4SL has been derived using the sum of the four PFAS compounds as the basis of the low level of toxicological concern. The term interim reflects concerns raised by the Committee on Toxicity (COT) and the fact that further work by the COT and others may results in the need for the LLTC to be updated.
12) Generic Assessment Criteria assume no free phase contamination is present. Where free phase contamination is present, further assessment may be required.
13) Solubility Saturation Limit and Vapour Saturation Limit are provided in accordance with relevant guidance documents. Where these values are exceeded, and the vapour pathway is an important contributing pathway to exposure, then the following should be considered:
   - Free phase contamination may be present
   - Exposure from vapour pathways will be over predicted.
   - Where the vapour pathway is >90% of exposure then it is unlikely that the relevant HCV will be exceeded at soul concentrations at least a factor of ten higher than the relevant HCV.

   Additional assessment should be undertaken where this is the case, with consideration that:
   - Exposure is unlikely to reach the relevant HCV and the risk based on the assumed conceptual model is likely to be negligible.
   - Vapour pathway exposure should be calculated using algorithms suitable for free phase or NAPL sources
   - Screening could be considered using the lower saturation limit, which is the approach adopted by the USEPA. However, this may not be practical in many cases because of very low limits and is in any case highly conservative.

   Where the vapour pathway is the only exposure pathway considered then effective assessment criteria should be derived manually in accordance with guidance outlined in CLEA Science Report SC050021/SR4

Appendix G – Risk Assessment Rationale

The site-specific risk assessment, presented in this report, follows the principle of establishing whether there is a viable linkage between a contaminant source to a potential receptor, via an exposure pathway.

The risk assessment corresponds with the total site area and incorporates both descriptive (qualitative) and, where available, numerical (quantitative) lines of evidence.

Risk assessment is the process of collating known information on a hazard or set of hazards to estimate actual or potential risk to receptors. The receptor may be humans, a water resource, a sensitive local ecosystem, or future construction materials. Receptors can be connected to the source by one or several exposure pathways such as direct contact for example. Risks are managed by isolating the receptor or intercepting the exposure pathway or by isolating or removing the hazard.

Without the three essential components of a source, pathway, and receptor there can be no risk. Therefore, the presence of contaminant source on a site does not necessarily mean there is a risk.

The risk assessment considers the likelihood of a particular event taking place (accounting for the presence of the source and receptor and the viability of the exposure pathway) in conjunction with the severity of the potential consequence (accounting for the potential severity of the hazard and the sensitivity of the receptor).

In the risk assessment the consequence of the hazard has been classified as severe, medium, mild, or minor and the probability (likelihood) of the circumstances occurring classified as high likelihood or low likelihood or unlikely.

The consequences and probabilities are subsequently cross correlated to give a qualitative estimation of the risk using Department of the Environment risk classifications as detailed in the table below and as referenced in CIRIA C552.

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability (Likelihood)	**High Likelihood**	Very High Risk	High Risk	Moderate Risk	Moderate/Low Risk
	Likely	High Risk	Moderate Risk	Moderate/Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate/Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate/Low Risk	Low Risk	Very Low Risk	Very Low Risk

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In accordance with DoE guidance, the following categorisation of **consequence** has been developed.

Classification	Definition	Examples
Severe	Short-term (acute) risk to human health likely to result in "significant harm" as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution of sensitive water resource. Catastrophic damage to buildings/property. A short-term risk to an ecosystem or organisation forming part of such ecosystem.	High concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site into controlled water. Explosion, causing building collapse (can also equate to a short-term human health risk if buildings are occupied).
Medium	Chronic damage to Human Health. Pollution of sensitive water resources. A significant change in an ecosystem or organism forming part of such ecosystem.	Concentration of a contaminant from site exceeds the generic or site-specific assessment criteria. Leaching of contaminants from a site to a Principal or Secondary A aquifer. Death of a species within a designated nature reserve. Lesser toxic and asphyxiate effects
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures, and services. Damage to sensitive buildings/structures/services or the environment.	Pollution of non-classified groundwater (Inc. Secondary B aquifers). Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor	Harm, although not necessarily significant harm, which may result in a financial loss or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective clothing, etc). Easily repairable effects of damage to buildings, structures, and services.	The presence of contaminants at such concentrations that protective equipment is required during site works. The loss of plants in a landscaping scheme. Discoloration of concrete.

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In accordance with DoE guidance, the following categorisation of **probability** has been developed.

Classification	Definition
High Likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and over the long term.
Low Likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place and is less likely in the shorter term.
Unlikely	There is a pollution linkage, but circumstances are such that it is improbable that an event would occur even in the very long term.

In accordance with DoE guidance, the following categorisation of **risk** has been developed.

Classification	Definition
Very High Risk	There is a *high probability* that *severe harm* could arise to a designated receptor from an identified hazard at the site without appropriate further action.
High Risk	*Harm* is *likely to arise* to a designated receptor from an identified hazard at the site without appropriate further action.
Moderate Risk	*It is possible* that without appropriate further action *harm could arise* to a designated receptor. It is relatively *unlikely* that any such harm would be *severe,* and if any harm were to occur it is *more likely* that such harm would be *relatively mild.*
Low Risk	*It is possible* that *harm could arise* to a designated receptor from an identified hazard. It is *likely* that, at worst, if any harm was realised any effects would be *mild.*
Negligible Risk	The presence of an identified hazard does not give rise to the potential to cause harm to a designated receptor.

The term ‘risk’ in this instance refers to the risk that the source, pathway, receptor linkage for a given source of contamination is complete. It does not refer to immediate risk to individuals or features present on the site from potential contaminants and is intended to be used as a tool to assess the necessity of further investigation.

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