

HALSNEAD FARM

PHASE 2 GROUND INVESTIGATION REPORT

Curtins Ref: 087052-CUR-XX-XX-T-GE-00003

Revision: P03

Issue Date: 10 April 2026

Client Name: Starship Group & Onward Homes

Client Address: Starship Hub, Hythe, Tower Road, Birkenhead, Wirral, CH41 1AA

Site Address: Halsnead Farm, Fox's Bank Lane, Whiston, L35 3SU

Rev	Description	Issued by	Checked	Date
P01	First Issue	LW	NF	17 October 2025
P02	Updated Client Information	JL	NF	30 October 2025
P03	Updates following Planning Consultation Response	LW	NF	10 April 2026

This report has been prepared for the sole benefit, use, and information for the client. The liability of Curtins Consulting Limited with respect to the information contained in the report will not extend to any third party.

Author	Signature	Date
L Woods BSc (Hons) MSc Geo-Environmental Engineer		17 October 2025

Reviewed	Signature	Date
J Lord BSc (Hons) MSc Senior Geo-Environmental Engineer		17 October 2025
R Mayne BSc (Hons), CGeol, EurGeol, FGS Principal Geotechnical Engineer		17 October 2025

Authorised	Signature	Date
N Farnworth BSc (Hons) MCIWEM C.WEM Principal Geo-Environmental Engineer		17 October 2025

EXECUTIVE SUMMARY

Appointment	Curtins were instructed by Starship Group to undertake an intrusive site investigation at Halsnead Farm, Fox's Bank Lane, Whiston, L35 3SU. The site is approximately centred on National Grid Reference 347620, 389610 and covers an area of approximately 3.43 Ha. The development proposals comprise of up to 90 dwellings, with appropriate soft landscaping and infrastructure.
Current Site Status	The site is located within Whiston, Widnes and comprises of Halsnead Farm, 2 No. barns used as a horse boarding stable, and associated fields and yard area with a single dwelling located in the south-eastern corner of the site, with an access track running north to south along the eastern boundary. A pylon is located in the central-north of the site, with overhead power lines crossing the north of the site from east to west. The site is also located approximately 25m south of the M62 motorway. The site slopes gently from the north-west to the south-east.
Summary of Phase 1	Earliest mapping shows the site as undeveloped agricultural fields, with a forested area in the north-east, and a pond located in the north-east. Two small buildings are recorded on mapping from 1937 in the south-east of the site, and by 1959 large agricultural buildings were constructed in the north-east. The agricultural buildings were demolished and replaced by two rectangular structures in 1975, with overhead electrical cables and pylons installed along the northern site boundary. The immediate surrounding area in early mapping comprised of undeveloped agricultural land. By the 1890s, a farmhouse was constructed immediately south-west of the site, with a road present at the sites southern and eastern boundary (now recorded as Fox's Bank Lane). By 1927, the Cronton Colliery was recorded 200m south of the site, with three shafts located 215m, 235m and 260m south of the site boundary. The Colliery was expanded northwards (towards site) in 1937, with a "baths" and sewage works with filter beds located 100m of the site. Between the 1960s and 1980s, the M62 Motorway was constructed immediately north of the site, running east to west. During the 1980s, works at the Cronton Colliery ceased and the site was demolished during the 1990s and left vacant until 2022 where a Yodel Logistics Unit was constructed, with further works ongoing. BGS maps indicate the site to be underlain by Glacial Till covering the majority of the site, Alluvium along the eastern edge of the site, underlain by the Kinnerton Sandstone Formation. The Glacial Till is classified as a Secondary Undifferentiated Aquifer, with the Alluvium classified as Secondary A Aquifers, whereas the Kinnerton Sandstone Formation deposits are classified as a Principal Aquifer.
Fieldworks Undertaken	Intrusive site investigation works were undertaken between the 8th and 11th of July 2025, and comprised 12 No. window samples, 3 No. machine excavated trial pits for soakaways and 10 No. machine excavated trial pits. Ground gas and groundwater monitoring standpipes were installed in each cable percussive and window sample boreholes. 6 No. return gas and groundwater monitoring visits have been undertaken between the 24th of July and 30th of September 2025.
Encountered Ground Conditions	Topsoil was encountered within all 12 No. window samples, 3 No. soakaway and 10 No. trial pit locations, encountered from ground level (43.70m – 37.31m AOD) with encountered thicknesses of between 0.32m and 0.95m. Granular Topsoil generally comprised of dark brown/dark greyish brown slightly to very clayey, slightly gravelly sand, with gravel comprising of subrounded to subangular sandstone. Cohesive Topsoil generally comprised of dark brown sandy, slightly gravelly clay, with gravel comprising of subrounded to subangular sandstone. Superficial deposits indicative of Glacial Till was encountered in 12 No. locations, immediately underlying the Topsoil, from depths of 0.32m to 0.95m bgl (43.19m – 36.77m AOD) with thicknesses ranging between 0.19m (WS02) and 2.63m (WS01). The cohesive deposits typically comprised of firm – stiff, reddish brown/brown/brown mottled grey, sandy, slightly gravelly clay, with gravel comprising of subrounded sandstone. The granular deposits typically comprised of brown, slightly to very clayey, slightly gravelly sand, with gravel comprising of subrounded sandstone. Granular soils indicative of weathered bedrock of the Kinnerton Sandstone Formation were encountered within 22 No. locations immediately underlying the Topsoil or Glacial Till deposits encountered from depths of 0.37m to 2.55m bgl (43.29m – 35.61m AOD), with encountered thicknesses ranging between 0.15m and 1.83m; typically described as reddish brown/orangish brown, slightly to very clayey, slightly gravelly sand, with gravel comprising of subrounded sandstone. Bedrock deposits indicative of the Kinnerton Sandstone Formation were encountered within 20 No. locations, immediately underlying weathered bedrock in the majority of positions, underlying Glacial Till in WS01 and WS12, and underlying Topsoil within TP111; described as very weak to moderately strong reddish brown/orangish brown/purple/cream/yellow sandstone.

Environmental Laboratory Testing and Ground Gas Monitoring Results	With respect to the proposed end use of (Residential with Plant Uptake end-use) Tier 1 thresholds for human health were not exceeded in any of the samples. All soil samples were screened for asbestos. No Asbestos Containing Materials were detected. Methane was recorded at below the limit of detection of the monitoring instrument (<0.1% v/v) in every borehole position during each monitoring visit. Maximum carbon dioxide concentrations of 2.0% v/v were recorded in WS05 on the sixth visit. Carbon dioxide generally remained below <1.0% v/v in the majority of monitoring well installations throughout the monitoring period. Carbon Monoxide and Hydrogen Sulphide were recorded below the limit of detection (<1 ppm) in all wells throughout the monitoring period. Evaluation of the 'borehole' scenario records a maximum Q_{hg} of 0.002 l/hr for carbon dioxide, indicating a Characteristic Situation 1 (CS-1), where no gas protection measures are required for the development.
Ground Contamination and Ground Gas Assessment	A Low risk rating is identified to site end-users and construction workers from contamination in Made Ground soils from direct contact, dermal uptake, soil and dust ingestion and inhalation. There were no exceedances of Residential with Plant Uptake GACs and no asbestos containing materials have been encountered. Construction workers should be provided with appropriate PPE and sanitary facilities with respect to the environmental testing results enclosed herein. A Low risk rating is identified to controlled waters (Groundwater and Surface Waters) as the ground investigation encountered no olfactory, visual or gross contamination. A Low risk rating is identified to site end users from ground gases following the monitoring visits, with a CS-1 assigned to the site, the development requires no ground protection measures.
Geotechnical Assessment	The limited Glacial Till deposits encountered on site are considered to be an unsuitable founding stratum. The presence of granular Weathered Bedrock at shallow depths may enable a shallow foundation solution at the site, depending on the proposed loads. A presumed safe bearing capacity of 150kPa is likely to be achievable in the medium dense to very dense granular Weathered Bedrock. Trench Fill may be required where the depth to weathered bedrock is greater than 1.50m bgl. If proposed structures are located in the vicinity of WS01, in the north-west of the site, where an approximate minimum excavation of 3.05m is required following the Cut and Fill, further confirmation of the depth to weathered bedrock is required to determine if shallow/trench fill foundations are suitable. Ground bearing floor slabs are likely to be suitable for the development, founding wholly on a single strata. 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-2z.
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. • Following confirmation of the building loads, the foundation solution should be confirmed. Following any changes to the cut & fill, the implication on likely foundation solution should be reviewed. • In anticipation of a cut and fill, an Earthworks Specification is likely to be required. • Post-demolition intrusive ground investigation can be undertaken following demolition of the northern buildings and associated hardstanding along with the dwelling in the south of the site. However, consideration will need to be given to working in the vicinity of overhead powerlines and utilizing appropriate techniques and machinery.

CONTENTS

1 Introduction	1
1.1 Project Background	1
1.2 Scope of Services	1
2 Phase 1 Preliminary Site Assessment Summary	2
2.1 Current Setting	2
2.2 Previous Site Use	3
2.3 Published Geology	3
2.3.1 Made Ground Deposits	3
2.3.2 Superficial Deposits	3
2.3.3 Bedrock Deposits	3
2.3.4 Mining and Quarrying	4
2.3.5 Other Pertinent Existing Geological Records	4
2.4 Hydrogeology and Hydrology	4
2.5 Landfill & Pollution	4
2.6 Ground Gas Sources	4
2.7 Unexploded Ordnance (UXO) Risk Assessment	5
2.8 Summary of Phase 1 PCSM	5
2.9 Coal Mining Risk Assessment Summary	6
2.9.1 Coal Mining Hazard Rating	6
3 Phase 2 Investigation Scope of Works	8
3.1 Soil Logging and Sampling	8
3.2 Monitoring Well Installations	9
3.3 Post Investigation Monitoring	9
3.3.1 Ground Gas and Groundwater Monitoring	9
4 Laboratory Analysis	10
4.1 Environmental Chemical Analysis	10
4.2 Groundwater Analysis	10
4.3 Geotechnical Analysis	11
5 Ground Conditions	12
5.1 General	12
5.2 Topsoil	12
5.3 Glacial Till	12
5.4 Kinnerton Sandstone Formation	13
5.4.1 Weathered Bedrock	13
5.4.2 Competent Bedrock	13
5.5 Obstructions Encountered	13

5.6 Groundwater	13
5.7 Observed Potential Contamination	13
6 Ground Model	14
6.1 Topsoil	14
6.2 Glacial Till Deposits	14
6.2.1 Glacial Till deposits: Granular	14
6.2.2 Glacial Till deposits: Cohesive	15
6.3 Kinnerton Sandstone Formation	16
6.3.1 Weathered Bedrock	16
6.3.2 Kinnerton Sandstone Formation	16
6.4 Aggressive Ground Conditions	22
7 Ground Contamination Assessment	23
7.1 Human Health GQRA	23
7.1.1 Adopted Soil Human Health GACs Screening Methodology	23
7.1.2 Generic Assessment Criteria Screening of Soil Laboratory Results	23
8 Ground Gas Assessment	24
8.1 Ground Gas Monitoring Results	24
8.2 Ground Gas Assessment	25
9 Revised Conceptual Site Model	27
10 Summary of Potential Pollutant Linkages	29
11 Engineering Assessment and Recommendations	30
11.1 Introduction	30
11.2 Summary of Ground Conditions	30
11.3 Excavations	30
11.4 Earthworks	30
11.5 Soakaways	32
11.6 Foundation Design	32
11.7 Ground Floor Slabs	32
11.8 Volume Change Potential in Cohesive Glacial Till	32
11.9 Chemical Attack on Buried Concrete	32
11.10 Existing Utilities	33
12 Conclusion and Recommendations	34
12.1 Geotechnical	34
12.2 Ground Contamination	34
12.2.1 Ground Contamination	34
12.3 Recommendations	34
13 References	35

14 Appendices**37****FIGURES**

Figure 1 – Site Location Plan, site boundary shown in pink, 250m buffer in purple.	2
Figure 2 – Particle Size Distribution Chart	18
Figure 3 – SPT 'N60' Values (corrected) vs. m AOD	19
Figure 4 – Atterberg Limit Results	20
Figure 5 – Estimated Undrained Shear Strength	21
Figure 6 – Extract of Historical Barometric Pressure readings for Liverpool (Ref. 28).	24

TABLES

Table 1 – Surrounding Area	2
Table 2 – Summary of Phase 1 PCSM	5
Table 3 – Summary of Mining Risks	6
Table 4 – Scope of Works	8
Table 5 – Monitoring Well Response Zones	9
Table 6 – Environmental Chemistry Analysis Suite: Soils	10
Table 7 – Geotechnical Testing Soils	11
Table 8 – Summary of Ground Conditions Encountered	12
Table 9 – Summary of Geotechnical Test Results – Topsoil	14
Table 10 – Summary of Geotechnical Test Results – Glacial Till Deposits: Granular	14
Table 11 – Summary of Geotechnical Test Results – Glacial Till Deposits: Cohesive	15
Table 12 – Summary of Geotechnical Test Results – Weathered Bedrock	16
Table 13 – Summary of Geotechnical Test Results – Kinnerton Sandstone Formation	16
Table 14 – Summary of Testing Results	22
Table 15 – Aggressive Chemical Environment for Concrete (ACEC) Site Classification	22
Table 16 – Summary of Ground Gas Monitoring Results	25
Table 17 – Cut and Fill Details based on Surveyed Exploratory Hole Locations and the Proposed Levels drawing	31

APPENDICES

Appendix A – Drawings
Appendix B – Exploratory Hole 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 Rationale

1 INTRODUCTION

1.1 Project Background

Curtins were instructed by Starship Group and Onward Homes to undertake an intrusive site investigation at Halsnead Farm, Fox's Bank Lane, Whiston, L35 3SU. The site is approximately centred on National Grid Reference 347620, 389610 and covers an area of approximately 3.43 Ha.

The development proposals comprise of up to 90 dwellings with appropriate soft landscaping and infrastructure.

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 development comprising up to 90 dwellings, with appropriate soft landscaping and infrastructure.

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

2 PHASE 1 PRELIMINARY SITE ASSESSMENT SUMMARY

This section presents a summary of the current site setting, history, geology, and hydrogeology/hydrology, previously detailed in the Phase 1 Preliminary Risk Assessment Report (Ref. 1). As such, it is advised that this report is read in conjunction with the Phase 1 Preliminary Risk Assessment Report (Ref. 1). A summary of the pertinent Phase 1 Preliminary 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 6.0) and geo-environmental risk assessments (refer to Section 7.0).

2.1 Current Setting

The site is located within Whiston, Widnes and comprises Halsnead Farm, 2 No. barns used as a horse boarding stable, and associated fields and yard area with a single dwelling located in the south-eastern corner of the site, with an access track running north to south along the eastern boundary.

A pylon is located in the central-north of the site, with overhead power lines crossing the north of the site from east to west. The site is also located approximately 25m south of the M62 motorway.

The site slopes gently from the north-west to the south-east.

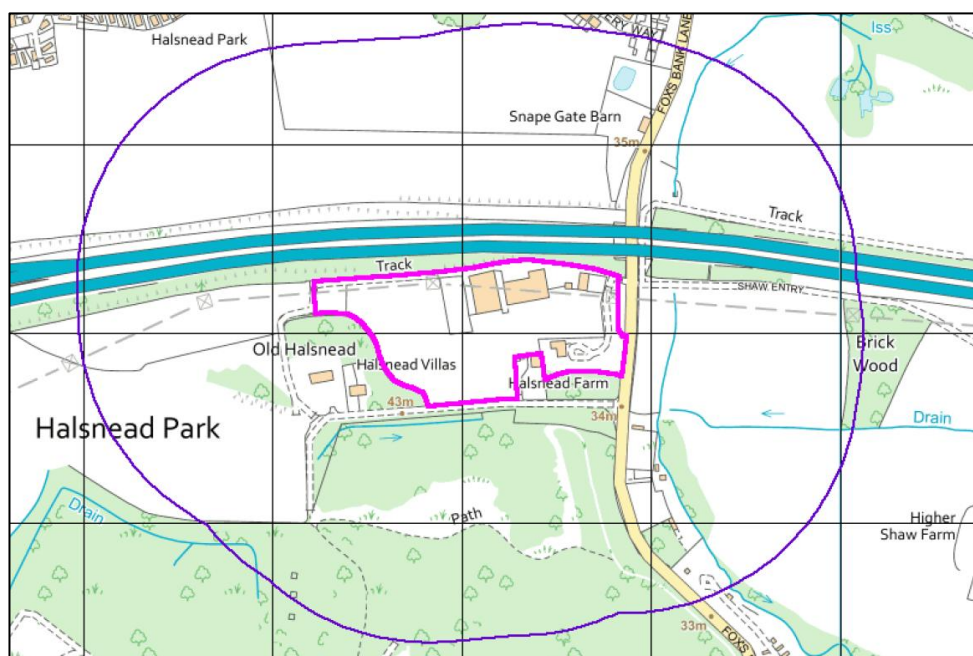


Figure 1 – Site Location Plan, site boundary shown in pink, 250m buffer in purple.
(Ref. Envirocheck)

The site surrounding land use is summarised in Table 1.

Table 1 – Surrounding Area

Surrounding Area	N	M62 Motorway
	E	Fox's Bank Lane
	S	Four residential properties and a newly constructed Yodel logistics hub
	W	Agricultural land

2.2 Previous Site Use

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

Earliest available mapping from 1849 shows the site as undeveloped agricultural fields, with a forested area in the north-east of site. By the 1890s a pond is located in the north-east of the site. By 1937, two small buildings are recorded in the south-east of the site, and by 1959 the site has been partially developed with large agricultural buildings constructed in the north-east of the site. A road was present along the sites southern boundary, with a path running north to south. By 1975, the agricultural buildings in the north-east of the site were demolished and replaced by two rectangular structures, an overhead electrical cable with two pylons is noted in the north of the site, with cables running west to east. By 1981, the pond had been infilled and a tank recorded in the north-east (assumed for agricultural use), the Halsnead Farmhouse was constructed in the south-east of the site. The site has remained largely unchanged since the 1980s.

The immediate surrounding area in early mapping comprised largely of undeveloped agricultural land. Sour Hey Pit and Ravenhurst Pit were recorded 500m and 600m south-west of the site respectively, with Potter Pit located 500m west of the site. It is possible that these pits were associated with the opencast extraction of coal. By the 1890s, a farmhouse was constructed immediately south-west of the site, with a road present at the sites southern and eastern boundary (now recorded as Fox's Bank Lane).

In 1927, Cronton Colliery was recorded 200m south of the site, comprising four large structures with several smaller associated buildings and chimneys. Three shafts are located in the centre of the colliery by 1927 mapping, located 215m, 235m and 260m south of the site boundary. Railway sidings are located at Cronton Colliery 250m south of the site. By 1937, the colliery was expanded northwards (towards site) with a building recorded as baths and a sewage works with filter beds located 100m south of the site. A large slag heap associated with the colliery was recorded 250m south of the site by 1951.

Between the 1960s and 1980s, the M62 Motorway was constructed immediately north of the site, running east to west. During the 1980s, works at the Cronton Colliery ceased and the site was demolished during the 1990s and left vacant until 2022 with the construction of a Yodel Logistics Unit, with other construction works ongoing.

2.3 Published Geology

A review of British Geological Survey (BGS) map, 1:50,000 Scale, Bedrock and Superficial Editions, Runcorn, Sheet 097, indicates the following geological sequence:

- Glacial Till (majority of the site);
- Alluvium (eastern edge of the site);
- Kinnerton Sandstone Formation.

2.3.1 Made Ground Deposits

The BGS maps not indicate Made Ground on site, however, due to the site history it is considered likely that Made Ground will be present.

2.3.2 Superficial Deposits

Superficial deposits are recorded as Glacial Till in the majority of the site, comprising a heterogenous mixture of clay, sand, gravel and boulders varying widely in size and shape. Alluvium is noted in the eastern edge of the site, comprising unconsolidated material with clay, silt, sand and gravel.

Based on the closest available BGS borehole log (15m north of the site), superficial soils are expected from ground level.

2.3.3 Bedrock Deposits

Bedrock deposits are indicated to comprise the Kinnerton Sandstone Formation, comprising red-brown to yellow sandstone.

Based on the closest available BGS borehole logs (60m north and 15m north of the site respectively), bedrock is expected from between 1.40m to 3.50m bgl.

2.3.4 Mining and Quarrying

The site is situated within a Coal Mining Reporting Area, however, is not located in a Development High Risk Area.

Review of the Mining Remediation Authorities interactive mapping does not indicate the presence of shallow coal mine workings, probable shallow coal mine workings or coal outcrops located on site. Deep coal mining has been recorded beneath the site at a depth of 397m bgl. The interactive map does note a coal outcrop approximately 150m southwest of the site which is recorded to be a location of probable shallow coal mine workings. Deep coal mining has been recorded beneath the site at a depth of 397m bgl. However, the coal outcrop is noted to be dipping south-west, away from the site. Mining Remediation Authority Interactive mapping records three mine entries located approximately 250m south of the site, which are noted to have been treated and grouted in January 2025.

The closest BGS recorded (non-coal) mineral site was 'The Old Delf' located 612m west of the site where Sandstone of the Pennine Middle Coal Measures Formation was extracted. Based on the foregoing commentary the likelihood of encountering relic non-coal mining features on-site is unlikely and, therefore, the risk to the proposed development of non-coal mining features is **Low**.

2.3.5 Other Pertinent Existing Geological Records

There is a fault line, the Eccleston West Fault, located approximately 50m west of the site.

Ground stability hazards are generally of no hazard to very low hazard on site, a moderate potential for compressible ground is noted east of the site, likely associated with Alluvium soils noted on BGS mapping.

2.4 Hydrogeology and Hydrology

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

"Secondary Undifferentiated Aquifers are aquifers where it is not possible to apply either a Secondary A or B definition due to the variable characteristics of the strata, these aquifers only have a minor value."

The Alluvium deposits are classified as a Secondary A Aquifer, defined as:

"Secondary A Aquifers comprise permeable layers that can support local water supplies and may form an important source of base flow to rivers."

The Kinnerton Sandstone Formation deposits are classed as a Principal Aquifer, defined as:

"Strategically important rock units that have high permeability and a high water storage capacity."

The nearest surface water feature is recorded to be an unnamed stream located approximately 37m south-west of the site.

2.5 Landfill & Pollution

There are no Historical or BGS Recorded Landfill sites located within 500m of the site.

There are no licenced waste management facilities within 500m of the site boundary.

There are no active Local Authority Pollution Prevention and Control Permits located within 500m of the site.

2.6 Ground Gas Sources

There is 1 No. record of potentially infilled land (non-water) recorded within 250m of the site. This feature is located 241m south and is likely associated with Cronton Colliery.

There is 1 No. record of potentially infilled land (water) recorded within 250m site. This feature is located on site and is likely the pond feature discussed in *Section 2.2*.

The Envirocheck report referenced in the Curtins Phase 1 Preliminary Risk Assessment (Ref. 1) indicates that the site is located within a low to intermediate probability radon area (<1% to 3% of homes are estimated to be at or above the radon action level). The radon online interactive maps (Ref. 2) places the site within an elevated 10-30% radon area, however the Envirocheck report is based within a smaller scale and therefore more accurate. No radon protection measures are likely to be required. Should the new development include construction of a basement the advice of a specialist radon assessor must be obtained.

2.7 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 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 **Low-Risk** within the site. Areas designated as Low-Risk are those that shows a bombing density of 10 bombs per 1000 acre or fewer. A review of historical mapping records did not indicate any ruins, or buildings that were no longer recorded in post-WWII mapping, on or surrounding the site.

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.

2.8 Summary of Phase 1 PCSM

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

Table 2 – Summary of Phase 1 PCSM

Potential Source	Pathway	Receptor	Risk
Made Ground of unknown composition from uncontrolled deposition of materials onsite and immediately offsite during the construction of the Farmhouse and agricultural buildings.	Direct contact, ingestion, inhalation (dust and vapours).	End User of Site (Residents)	Moderate/Low
		Construction Workers	Moderate/Low
Buildings were constructed and maintained during a period when asbestos containing materials may have been used, and may be encountered in Made Ground soils.	Vertical migration through superficial deposits.	Controlled Waters (Groundwater)	Low
Uncontrolled deposition of Made Ground during nearby construction of the M62 Motorway, Colliery and Mineral Railway.	Horizontal migration over and through superficial deposits.	Controlled Waters (Surface Water)	Low
Onsite and offsite soils with the potential to generate ground gases. Potential for ground gas due to infilled pond noted on historical mapping.	Vertical and horizontal migration through existing service corridors and the underlying superficial deposits.	End User of Site (Residents)	Moderate/Low

Mine gas sources within potential unrecorded mine workings close to the site.			
---	--	--	--

Potential contaminants of concern associated with the sources identified within the Conceptual Site Model include but are not limited to: broad range aliphatic and aromatic hydrocarbons present within any fuel oils; polycyclic aromatic hydrocarbons (PAHs); inorganic compounds including heavy metals; asbestos present in discarded building materials and Made Ground.

Potential contaminants associated with the airborne dust/particulates include but are not limited to: polycyclic aromatic hydrocarbons and inorganic compounds including toxic metals that are also accounted for by potential onsite contaminants of concern.

The qualitative risk assessment determined the above risks associated with the proposed development of the site warrant further investigation.

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*.

2.9 Coal Mining Risk Assessment Summary

Pennine Middle Coal Measures are recorded c. 50m west of the site on BGS Geological Mapping. A cross-section shows that coal measures are present beneath the Kinnerton Sandstone Formation bedrock underlying the site, displaced by the Ecclestone West Fault.

The Phase 1 Preliminary Risk Assessment with Preliminary CMRA Report (Ref. 1) states that the Mining Remediation Authority indicates that the site is not situated within a Development High Risk Area, there are no recorded shallow coal mine workings or potentially unrecorded shallow coal mine workings beneath the site. Deep coal mining was recorded beneath the site at a depth of 397m below ground level within the Rushy Park seam. Any collapse of coal mine workings at this depth would not propagate to the surface due to sufficient rock cover, and therefore the risk to site from deep coal mining was assessed as low.

There are 3 No. mine entries located between 215m to 260m south-west from the site boundary in the historic Cronton Colliery. Mine Gas remedial works have been carried out on the three mine shafts, with Knowsley Council Planning Portal confirming that Mine Shaft Treatment and Grouting of the mine shafts and colliery have taken place, mitigating the risk from Mine Gases migrating on-site.

It is unlikely that mine gas emissions sourced from unrecorded worked coal seams beneath the site will occur during future drilling or construction. Coal measures formation bedrock is located at depth beneath the site, underlying the Kinnerton Sandstone Formation, due to vertical displacement caused by the Ecclestone West Fault located west of the site.

A review of Mining Remediation Authority guidance “Coal seams with a history of spontaneous combustion” published in 2015 indicates that seams may have a history of spontaneous combustion where roof coal has been left in place.

2.9.1 Coal Mining Hazard Rating

A summary of mining risks at the development site identified in the Phase 1 Preliminary Risk Assessment Report (Ref. 1) are presented in Table 3.

Table 3 – Summary of Mining Risks

Scenario	Risk	Proposed Action
Deep Mining (Shafts)	Low	No further action required.
Deep Mining (Voids, broken ground)	Low	
Shallow Mining (Voids, broken ground)	Low	No further action required.
Mine Gases	Low	Ground Investigation is unlikely to penetrate Pennine Coal Measures bedrock given the proposed development (Residential), however, ground gas monitoring wells should be installed during intrusive works.
Spontaneous Combustion	Moderate/Low	Although no named nearby coal seams have a history of spontaneous combustion, spontaneous combustion may occur where roof coal is left in place in Lancashire. No further action required.

3 PHASE 2 INVESTIGATION SCOPE OF WORKS

Site investigation works were undertaken between the 8th and 11th of July 2025.

The scope of the ground investigation was designed in general accordance with current UK guidance including 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 4*.

Table 4 – Scope of Works

Exploratory Hole Type	Exploratory Hole Reference	Exploratory Hole Depth (m bgl)	Rationale
Window Sample Boreholes	WS01	3.30	Confirm shallow ground conditions. Collect soil samples for chemical and geotechnical testing. Undertake in-situ testing. Install boreholes for gas and groundwater monitoring in 8 No. boreholes.
	WS02	2.00	
	WS03	2.80	
	WS04	1.31	
	WS05	1.22	
	WS06	1.80	
	WS07	1.30	
	WS08	1.30	
	WS09	1.62	
	WS10	2.50	
	WS11	2.90	
	WS12	2.70	
Machine Excavated Trial Pits	TP01	2.20	Confirm shallow ground conditions. Collect soil samples for chemical and geotechnical testing.
	TP02	3.00	
	TP03	2.10	
	TP04	2.10	
	TP05	2.60	
	TP06	2.40	
	TP07	2.10	
	TP08	2.80	
	TP09	2.10	
	TP10	2.80	
	TP11	1.80	
Soakaways in Machine Excavated Trial Pits	SA01	2.70	Confirm shallow ground conditions. Conduct soakaway testing.
	SA02	1.70	

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

It should be noted that no ground investigation was undertaken within the agricultural buildings located in the north of the site, or beneath their associated hardstanding due to these being in-use at the time of ground investigation; within an area not proposed to have any houses constructed; and due to the presence of overhead powerlines over these buildings. Similarly, no ground investigation was undertaken within the dwelling located in the south of the site. Should further investigation be required to further inform ground conditions, this should be undertaken post-demolition.

3.1 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 BS5930:2015 (Ref. 7) including recording observed visual and olfactory indications of contamination. Exploratory hole logs are provided in *Appendix B*.

3.2 Monitoring Well Installations

Ground gas and groundwater monitoring slotted 50 mm diameter pipes were installed within 8 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 5* below.

Table 5 – Monitoring Well Response Zones

Exploratory Hole Ref	Response Zone(s) m bgl (m AOD)	Strata Description
WS01	2.00 – 3.00	Slightly sandy, slightly gravelly CLAY.
WS02	1.00 – 2.00	Slightly gravelly SAND. (Weathered Bedrock)
WS05	0.50 – 1.00	Slightly clayey, slightly gravelly SAND. (Weathered Bedrock)
WS06	1.00 – 1.60	Clayey, slightly gravelly SAND. (Weathered Bedrock)
WS08	0.50 – 1.20	Clayey, slightly gravelly SAND. (Weathered Bedrock)
WS10	0.50 – 2.00	Slightly sandy, slightly gravelly CLAY.
WS11	1.00 – 2.00	Slightly sandy, slightly gravelly CLAY.
WS12	0.50 – 1.50	Slightly clayey, slightly gravelly SAND.

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

3.3 Post Investigation Monitoring

3.3.1 Ground Gas and Groundwater Monitoring

Six gas and groundwater level monitoring visits have been undertaken between the 24th of July and 30th of September 2025 to assess the groundwater and gas conditions as identified in the Preliminary Conceptual Site Model in *Section 2.8*.

4 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 laboratories selected by Curtins for chemical analysis was Envirolab (UKAS and MCERTS accredited), and for geotechnical analysis was i2 Analytical (UKAS and MCERTS 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.

4.1 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 6.

Table 6 – Environmental Chemistry Analysis Suite: Soils

Suite Ref	Analyte	LOD
Soils Suite A	Asbestos Screen, pH and Soil Organic Matter (SOM)	% w/w, pH, % w/w
	Arsenic, Chromium, Chromium VI, Copper, Lead, Selenium, Zinc, Nickel	1 mg/kg
	Boron (water soluble)	1 mg/kg
	Cadmium	1 mg/kg
	Mercury	0.17 mg/kg
	Cyanide (total)	1 mg/kg
	Phenols (screen)	0.2 mg/kg
	PAHs (USEPA 16)	0.01 to 0.08 mg/kg
	TPH (Aro/Ali Split)	0.01 to 1 mg/kg
	BTEX	0.01 mg/kg
	Water Soluble 2:1 Sulphate	0.01 g/l

9 No. samples of Topsoil, 3 No. samples of Glacial Till and 4 No. samples of weathered bedrock were obtained from site and tested for Soils Suite A.

4.2 Groundwater Analysis

The Preliminary CSM (Ref. 1) has shown a Low risk to controlled waters.

Due to no evidence of gross contamination in soil or groundwater encountered during the site investigation, no groundwater samples were taken.

4.3 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 7.

Table 7 – Geotechnical Testing Soils

Test Type.	Quantity	Standard
In Situ Testing		
Standard Penetration Test	21	BS 5930: 2015+2020, (Clause 41).
Super Heavy Dynamic Probe	12	-
Laboratory Testing		
pH	9	BS1377 1990, Part 3 (Clause 9.4 & 9.5).
Water Soluble Sulphate 2:1 SO ₄	9	BS1377 1990, Part 3 (Clause 5.3 & 5.5).
Moisture Content	5	BS EN ISO 17892-1:2014+A1:2022, BS 1377-2: 2022, (Clause 4.1).
Atterberg 4 Point	4	BS EN ISO 17892-12:2018+A2:2022 (Clause 5.3 and 5.5), Fall Cone Method, 4 Pt Test, BS 1377-2:2022, (Clause 5.2 and 6). W by BS EN ISO 17892-1:2014+A1:2022.
Particle Size Distribution	5	BS EN ISO 17892-4:2016, BS 1377-2:2022 (Clause 10).

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*.

5 GROUND CONDITIONS

The ground conditions across the site, determined during the Curtins 2025 ground investigation works, generally comprises a thin layer of Topsoil underlain by granular weathered bedrock, underlain by competent sandstone bedrock.

5.1 General

A summary of the ground conditions encountered during the site investigation works is presented in Table 8, with detailed information presented in the exploratory hole logs included in *Appendix B*.

Table 8 – Summary of Ground Conditions Encountered

Strata	Depth to Top of Strata	Recorded Thickness (m)		Description
	m bgl (m AOD)	Min	Max	
Topsoil	0.00 (43.70 – 37.21)	0.32	0.95	Dark brown, sandy, slightly gravelly CLAY. Dark brown/greyish brown, clayey, slightly gravelly SAND.
Glacial Till	0.32 – 0.95 (43.19 – 36.77)	0.19	2.63	Brown, slightly – very clayey, slightly gravelly SAND. Firm – stiff, reddish brown//brown/brown mottled grey, sandy, slightly gravelly CLAY.
Weathered Bedrock	0.37 – 2.55 (43.29 – 35.61)	0.15	1.83	Completely weathered SANDSTONE recovered as reddish brown clayey, slightly gravelly SAND.
Kinnerton Sandstone Formation Bedrock*	0.40 – 2.95 (42.43 – 34.96)	0.05	1.40	Very weak – weak reddish brown/cream/yellow/orangish brown SANDSTONE.

*Base of stratum not encountered.

5.2 Topsoil

Topsoil was encountered within all 12 No. window samples, 3 No. soakaway and 10 No. trial pit locations, encountered from ground level (43.70m – 37.31m AOD) with encountered thicknesses of between 0.32m and 0.95m.

Granular Topsoil generally comprised of dark brown/dark greyish brown slightly to very clayey, slightly gravelly sand, with gravel comprising of subrounded to subangular sandstone.

Cohesive Topsoil generally comprised of dark brown sandy, slightly gravelly clay, with gravel comprising of subrounded to subangular sandstone.

5.3 Glacial Till

Superficial deposits indicative of Glacial Till was encountered in 12 No. locations, immediately underlying the Topsoil, from depths of 0.32m to 0.95m bgl (43.19m – 36.77m AOD) with thicknesses ranging between 0.19m (WS02) and 2.63m (WS01).

The cohesive deposits were encountered within WS01, WS03, WS10, WS11, WS12, SA01, TP02, TP04 and TP10, and typically comprised of firm – stiff, reddish brown/brown/brown mottled grey, sandy, slightly gravelly clay, with gravel comprising of subrounded sandstone. In WS11 between 1.25m and 2.55m bgl (37.44m – 36.14m AOD) clay was described as soft.

The granular deposits were encountered within WS02, WS11, WS12, TP01 and TP09, and typically comprised of brown, slightly to very clayey, slightly gravelly sand, with gravel comprising of subrounded sandstone.

5.4 Kinnerton Sandstone Formation

5.4.1 Weathered Bedrock

Granular soils indicative of weathered bedrock of the Kinnerton Sandstone Formation was encountered within 22 No. locations immediately underlying the Topsoil or Glacial Till deposits encountered from depths of 0.37m to 2.55m bgl (43.29m – 35.61m AOD), with encountered thicknesses ranging between 0.15m and 1.83m.

These soils were typically described completely weathered sandstone recovered as reddish brown/orangish brown, slightly to very clayey, slightly gravelly sand, with gravel comprising of subrounded sandstone.

5.4.2 Competent Bedrock

Bedrock deposits indicative of the Kinnerton Sandstone Formation were encountered within 20 No. locations, immediately underlying weathered bedrock in the majority of positions, underlying Glacial Till in WS01 and WS12, and underlying Topsoil within TP11.

This stratum was described as very weak – weak, reddish brown/orangish brown/ cream/yellow sandstone.

5.5 Obstructions Encountered

No obstructions were encountered during this ground investigation.

5.6 Groundwater

No groundwater strikes were encountered during the ground investigation.

During return monitoring perched water was encountered within WS01 only, ranging between 2.26m and 2.86m bgl (40.86m – 40.26m AOD).

5.7 Observed Potential Contamination

No olfactory or visual evidence of contamination was encountered during the site investigation.

6 GROUND MODEL

6.1 Topsoil

Topsoil was encountered in all exploratory locations, from ground level (43.70m – 37.21m AOD). The results from limited geotechnical and chemical tests are summarised in Table 9.

Table 9 – Summary of Geotechnical Test Results – Topsoil

Parameter	No. of Tests	Results	
		Min	Max
Water Content (%) ¹	9	5.4	13.1
pH ¹	9	4.95	7.03
Water Soluble Sulphate (mg/l) ¹	9	<10	

(1) Results included from Environmental Testing

6.2 Glacial Till Deposits

Glacial Till deposits of both a granular and cohesive nature were encountered underlying the Topsoil in 12 No. locations, from depths of 0.32m to 0.95m bgl (43.19m – 36.77m AOD).

6.2.1 Glacial Till deposits: Granular

Granular Glacial Till deposits were encountered within WS02, WS11, WS12, TP01 and TP09 only.

The limited geotechnical test results recorded within the granular Glacial Till Deposits are summarised in Table 10.

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

Parameter	No. of Tests	Results	
		Min	Max
In Situ Tests			
SPT N ₆₀	1	5	
Laboratory Tests – General			
Water Content (%) ¹	3	5.2	12
pH ¹	3	5.68	7.5
Water Soluble Sulphate (mg/l) ¹	3	7.17	<10

(1) 2 No. results included from Environmental Testing

One SPT 'N₆₀' value of 5 is recorded within granular Glacial Till (WS12), indicating loose material. The SPT 'N₆₀' result is presented on Figure 3.

The Angle of Shearing Resistance (ϕ') in granular soils can be determined from SPT N₆₀ after Peck, Hanson and Thornburn (1963). Based on this relationship for an SPT N₆₀ value of 5 a characteristic ϕ' of 29° is determined.

A characteristic Weight Density (γ_k) of 17kN/m³ is recommended based on a loose sand above the groundwater table (BS 8004:2015+A1:2020).

6.2.2 Glacial Till deposits: Cohesive

Cohesive Glacial Till deposits were encountered within WS01, WS03, WS10, WS11, WS12, SA01, TP02, TP04 and TP10. The geotechnical test results from the cohesive Glacial Till deposits are summarised in Table 11.

Table 11 – Summary of Geotechnical Test Results – Glacial Till Deposits: Cohesive

Parameter		No. of Tests	Results	
			Min	Max
In Situ Tests				
SPT N ₆₀		8	7	46*
Laboratory Tests – General				
Atterberg Tests	Liquid Limit (%) ¹	4	20	32
	Plastic Limit (%) ¹	4	11	14
	Plasticity Index (%) ¹	4	9	18
	Modified Plasticity Index (%) ²	4	8	16
Water Content (%)		2	9.2	10.4
pH		2	5.71	7.4
Water Soluble Sulphate (mg/l)		2	5.13	<10

(1) Excludes non-plastic test results.

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

(3) 1 No. result included from Environmental Testing

*Excluding the 2 No. refusals (SPT N₆₀ >50).

The SPT N₆₀ results for cohesive Glacial Till deposits indicate a variable stratum, with N₆₀ values ranging between 7 and 46 (discounting 2 No. refusals >50 on suspected cobbles). The SPT N₆₀ results are presented on Figure 3. No correlation of SPT N₆₀ values with elevation is visible and the results suggest highly variable strengths.

A total of four Atterberg Tests were undertaken within the cohesive Glacial Till deposits and the results suggest that the clay is of low plasticity and has a low volume change potential in accordance with guidance from NHBC Standards Chapter 4.2 (Ref. 9). The results of the Atterberg Limits are presented on Figure 4.

The undrained shear strength (c_u) of the cohesive Glacial Till has been determined by laboratory testing and estimated through the relationship between SPT N₆₀ Values and Plasticity Indices (after Stroud, 1975, Ref. 10) as presented in Equation 1:

$$c_u = \text{SPT } N_{60} \cdot f_1 \quad [\text{Equation 1}]$$

Where:

SPT N₆₀ is Characteristic Corrected Standard Penetration Test Value

f_1 is the Stroud factor

A Stroud factor f_1 value of 5.8 was chosen for an average PI of 13.5. Therefore, for SPT N₆₀ values between 7 and 46, estimated c_u values range between 41 kPa (low strength) and 267 kPa (very high strength). The relationship between clay strength and elevation is presented in Figure 5. No increase in strength is visible, suggesting high variability in clay strength across the site.

A conservative, characteristic c_u of 40kPa is recommended.

The results of geotechnical testing are presented within *Appendix D*.

Based on the strength of the clay, conservative Weight Densities (γ_k) of 16kN/m³ (above the groundwater table) and 18kN/m³ (below the groundwater table) are recommended based on BS 8004:2015+A1:2020.

6.3 Kinnerton Sandstone Formation

6.3.1 Weathered Bedrock

Weathered Bedrock of a granular nature was encountered within 22 No. locations, from depths of 0.37m to 2.55m bgl (43.29m – 35.61m AOD).

The geotechnical test results from the granular Weathered Bedrock are summarised in Table 12.

Table 12 – Summary of Geotechnical Test Results – Weathered Bedrock

Parameter	No. of Tests	Results	
		Min	Max
In Situ Tests			
SPT N ₆₀	5	22	60 (Refusal)
Super Heavy Dynamic Probe (SHDP)	3	50 (Refusal)	
Laboratory Tests – General			
Particle Size Distribution Tests	5	See <i>Figure 2</i>	
Water Content (%) ¹	10	2.6	8.5
pH ¹	10	5.57	8.9
Water Soluble Sulphate (mg/l) ¹	10	4.69	14.6

(1) 4 No. results included from Environmental Testing

The SPT N₆₀ results for granular Weathered Bedrock indicate medium dense to very dense material, with results ranging between 22 and 60 (refusal). The SPT N₆₀ results are presented on Figure 3.

As mentioned in earlier sections the Angle of Shearing Resistance (ϕ') in granular soils can be determined from SPT N₆₀ after Peck, Hanson and Thornburn (1963). Based on the lowest SPT N₆₀ value of 22 (very dense), a characteristic Angle of Shearing Resistance of 34° is recommended.

6.3.2 Kinnerton Sandstone Formation

Competent rock of the Kinnerton Sandstone Formation was encountered within 20 No. locations, from depths of 0.40m to 2.95m bgl (42.43m – 34.96m AOD).

The limited geotechnical test results from the Kinnerton Sandstone Formation are summarised in Table 13.

Table 13 – Summary of Geotechnical Test Results – Kinnerton Sandstone Formation

Parameter	No. of Tests	Results	
		Min	Max
In Situ Tests			
SPT N ₆₀	7	60 (Refusal)	

Parameter	No. of Tests	Results	
		Min	Max
Super Heavy Dynamic Probe (SHDP)	9	50 (Refusal)	
Laboratory Tests – General			
Water Content (%)	1	2.1	
pH	1	8.7	
Water Soluble Sulphate (mg/l)	1	4.43	

The SPT N₆₀ results for the Kinnerton Sandstone Formation all returned refusals (SPT 'N' >60). The SPT N₆₀ results are presented on Figure 3.

Estimated rock strength classifications can be determined from SPT N₆₀ after Clayton (1995). Based on SPT N₆₀ values of 60, a characteristic rock strength classification of 'Very Weak' is assigned.

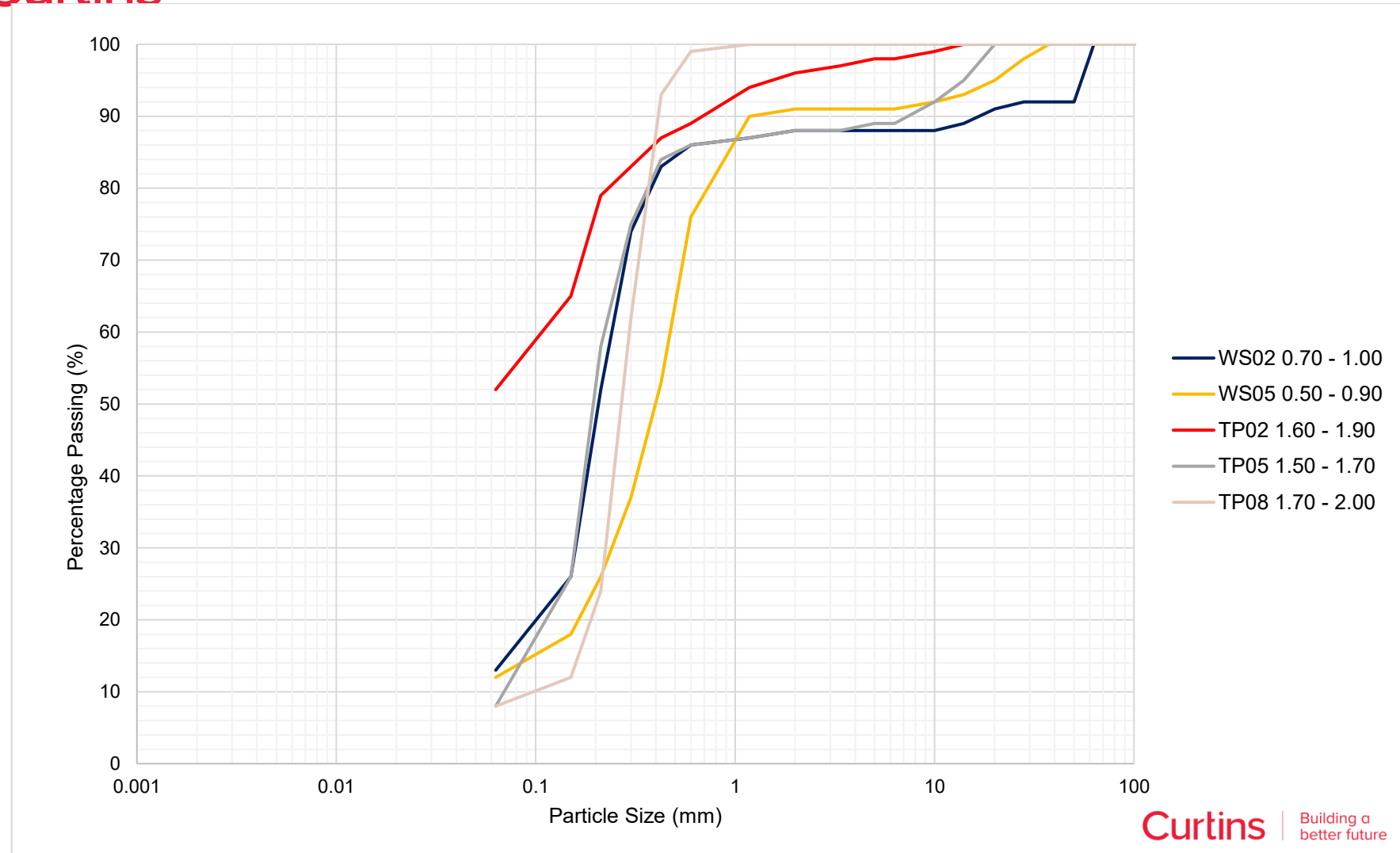


Figure 2 – Particle Size Distribution Chart

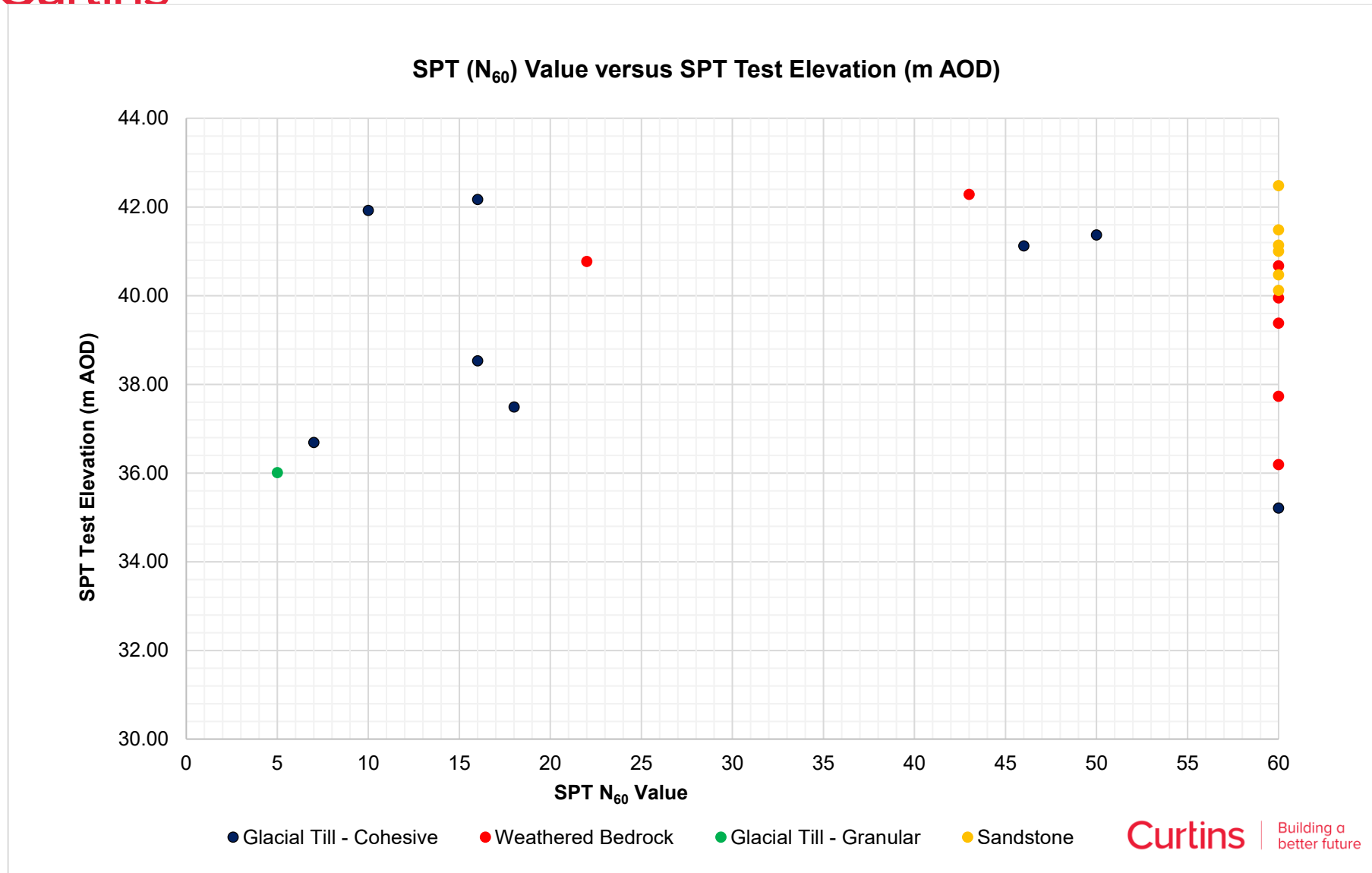


Figure 3 – SPT ' N_{60} ' Values (corrected) vs. m AOD

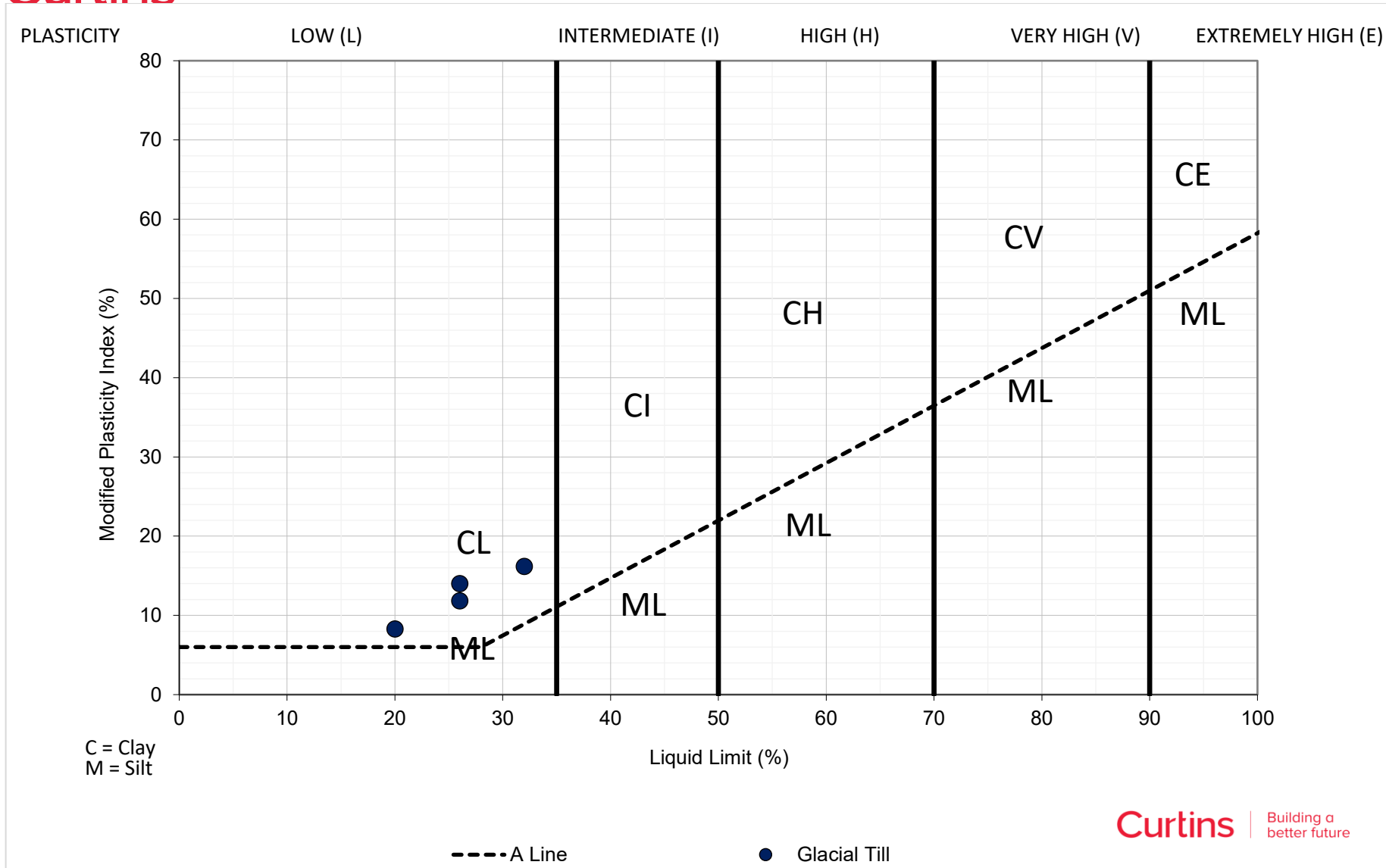
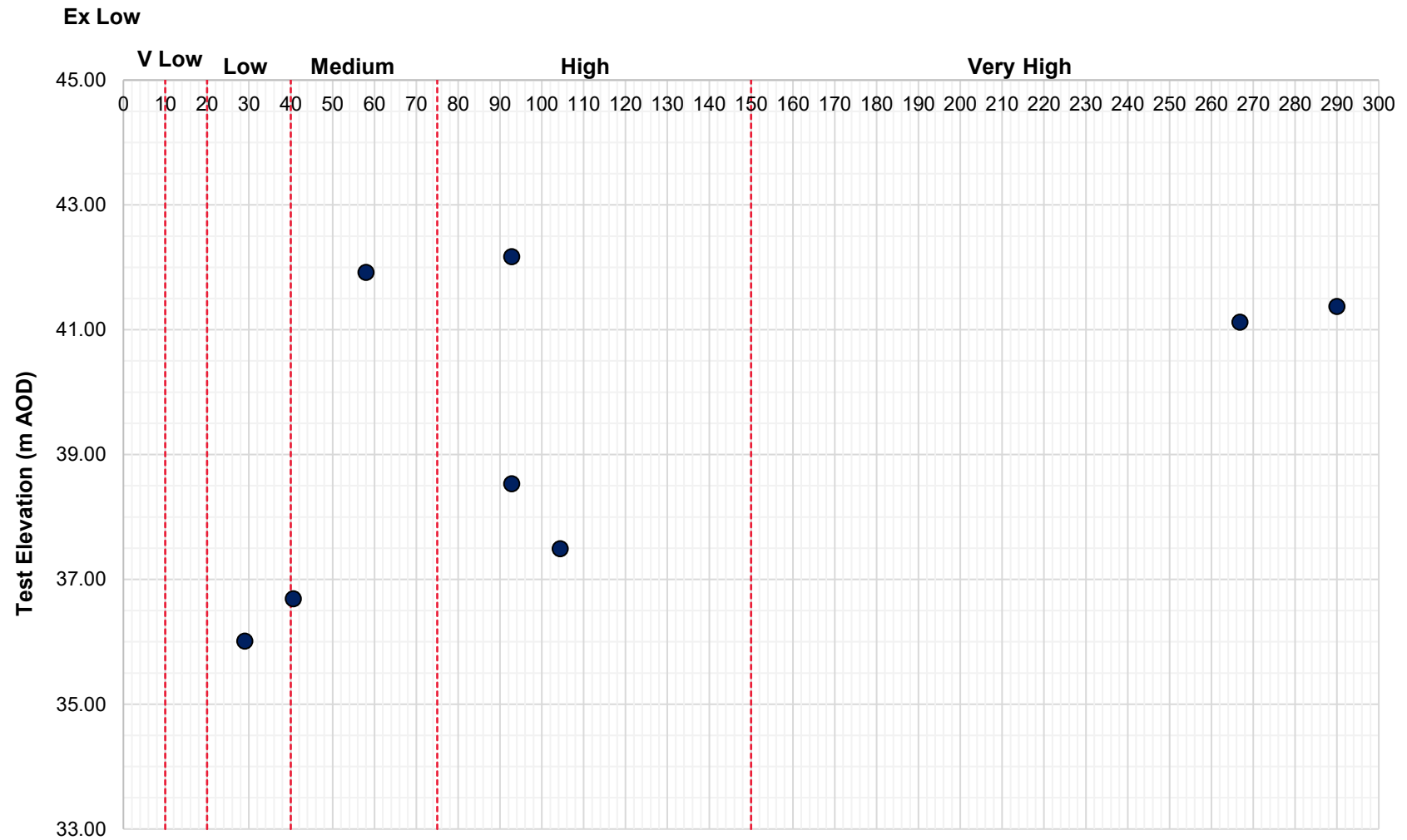


Figure 4 – Atterberg Limit Results



Strength classification in
accordance with
BS5930:2015+A1:2020

Estimated Undrained Shear Strength (c_u) (kPa)

● Estimated from SPT N Value

Curtins | Building a better future

Figure 5 – Estimated Undrained Shear Strength

6.4 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 14, and Table 15 details the classification.

Table 14 – Summary of Testing Results

Stratum	Quantity	Range
Topsoil	pH	4.95 – 7.03
	Water Soluble Sulphate (mg/l)	<10
Glacial Till	pH	5.68 – 7.5
	Water Soluble Sulphate (mg/l)	5.13 – 7.17
Weathered Bedrock	pH	5.57 – 8.9
	Water Soluble Sulphate (mg/l)	4.69 – 14.6
(Competent) Kinnerton Sandstone Formation	pH	8.7
	Water Soluble Sulphate (mg/l)	4.43

Table 15 – Aggressive Chemical Environment for Concrete (ACEC) Site Classification

Stratum	Design Sulphate Class	ACEC Class ⁽¹⁾
Topsoil	DS-1	AC-3z
Glacial Till	DS-1	AC-2z
Weathered Bedrock	DS-1	AC-2z
(Competent) Kinnerton Sandstone Formation	DS-1	AC-1

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

7 GROUND CONTAMINATION ASSESSMENT

This section of the report includes the assessment of the potential contamination, solid and gas, 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 is determined through an assessment of pollutant linkages between a source of contamination (within the ground 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. 14).

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 Phase 1 PRA Report (Ref. 1), in conjunction with observations made during the 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 9.0 of this report.

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

7.1 Human Health GQRA

7.1.1 Adopted Soil Human Health GACs Screening Methodology

The proposed use of the site is most analogous with a '*Residential with 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 0.34% to 3.78%. Consideration of the geometric mean results in a calculated value of 1.76%.

As such a comparison against Tier 1 thresholds for a SOM of 1% for all the samples has been adopted for *Residential with Plant Uptake* end-use.

A review of the chemical analysis results determined that concentrations of benzo(a)pyrene were recorded below the laboratories limit of detection in 13 No. samples, therefore, it is not possible to assess the genotoxic PAHs using a surrogate marker approach in accordance with Public Health guidance. Rather, samples have been assessed against individual PAH compounds, utilising relevant C4SL or S4UL Generic Assessment Criteria for these soil types.

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

7.1.2 Generic Assessment Criteria Screening of Soil Laboratory Results

The results of the environmental testing can be referred to in *Appendix E*, with testing undertaken on a total of sixteen soil samples across the site.

With respect to the proposed '*Residential with Plant Uptake*' end use, soil chemical analysis results did not record any exceedances when compared against GAC screening thresholds.

All soil samples were screened for asbestos, with no asbestos containing materials detected.

8 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 BS8485:2015 (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 Phase 1 PRA Report (Ref. 1) and thereafter validating this conceptual model with the ground gas data, the semi-quantitative risk assessment.

8.1 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 8 No. window sample boreholes as detailed in Section 3.2.

Six ground gas monitoring visits have been undertaken between the 24th of July and 30th of September 2025, with barometric pressure recorded between 996mb and 1021mb. Rising barometric pressures were recorded on the first, second and fifth visits, with steady barometric pressures recorded on the third and sixth visits and falling barometric pressure on the fourth visit.

Barometric pressures were determined using online sources (Ref. 28 and 29), historical data tracking from the period of monitoring has been presented in Figure 6 below.

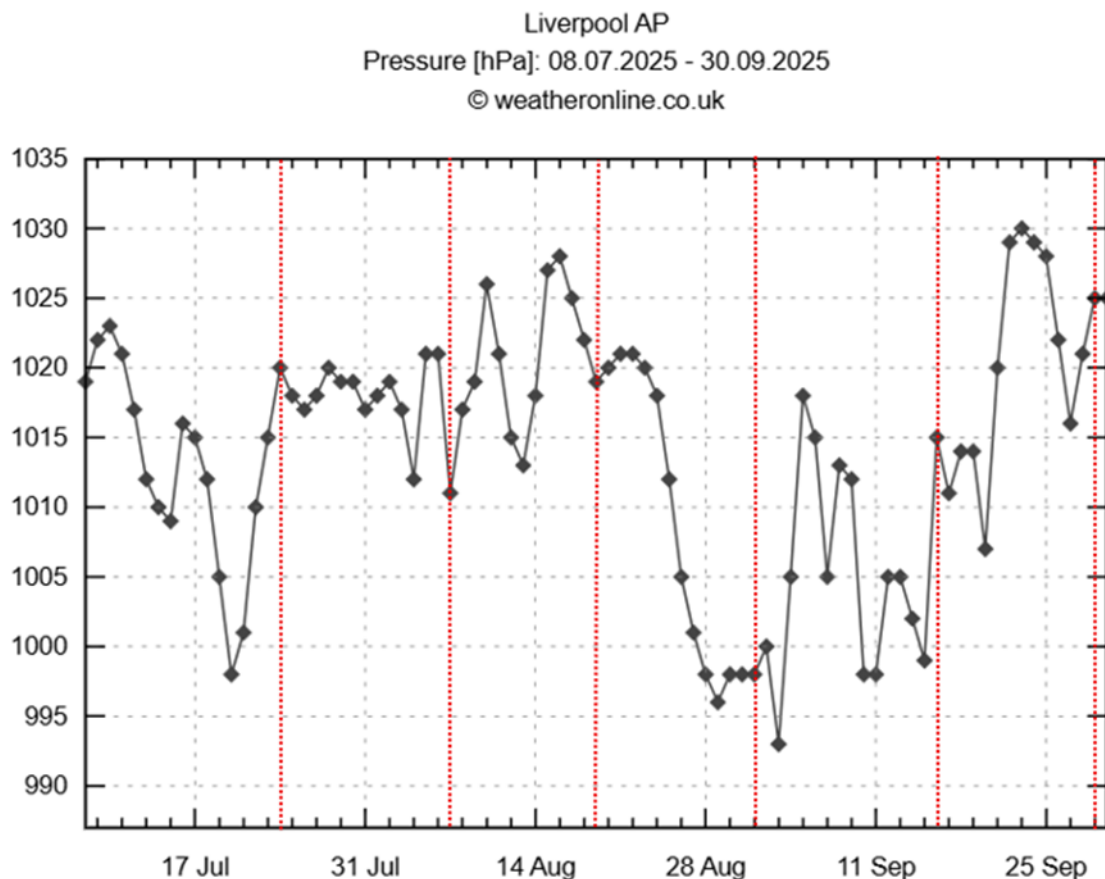


Figure 6 – Extract of Historical Barometric Pressure readings for Liverpool (Ref. 28).
Red dotted lines indicating dates monitoring visits were undertaken.

Individual data taken every 30 minutes (Ref. 29) from the nearby Huyton recording station places the fourth visit in a period of falling barometric pressure, with pressure decreasing from 1001mb in the 12 hours preceding the monitoring visit on the 2nd of September to 997mb in the 12 hours succeeding the monitoring visit.

The results log sheets are contained within *Appendix E* and summarised in *Table 16*.

Table 16 – 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
WS01	<0.1	1.1	19.7	0.5	<0.1
WS02	<0.1	0.9	19.3	<0.1	<0.1
WS05	<0.1	2.0	18.3	<0.1	<0.1
WS06	<0.1	1.9	18.3	<0.1	<0.1
WS08	<0.1	0.8	19.6	<0.1	<0.1
WS10	<0.1	1.0	19.9	<0.1	<0.1
WS11	<0.1	1.7	18.7	<0.1	<0.1
WS12	<0.1	0.8	19.8	<0.1	<0.1

Methane was recorded at below the limit of detection of the monitoring instrument (<0.1% v/v) in every borehole position during each monitoring visit.

Maximum carbon dioxide concentrations of 2.0% v/v were recorded in WS05 on the sixth visit. Carbon dioxide generally remained below <1.0% v/v in the majority of monitoring well installations throughout the monitoring period.

Carbon Monoxide and Hydrogen Sulphide were recorded below the limit of detection (<1 ppm) in all wells throughout the monitoring period.

Peak air flow rates were recorded at 0.5 l/hr within WS01 on the sixth visit, before returning to a steady state of <0.1 l/hr. Steady state airflow rates were recorded as <0.1 l/hr in all borehole positions throughout the monitoring period.

8.2 Ground Gas Assessment

The Preliminary Conceptual Site Model (PCSM) presented within the Phase 1 PRA (Ref. 1) identified Made Ground, an infilled pond and nearby mine workings as potential sources of ground gas generation. Noxious and asphyxiate gases were attributed to include, but not limited to, carbon dioxide, carbon monoxide, methane, and hydrogen sulphide. The PCSM identified a **Moderate/Low Risk**.

The development plans indicate that the site will comprise of up to 90 dwellings, with appropriate soft landscaping and infrastructure.

During the ground investigation Topsoil was encountered from ground level with thicknesses ranging between 0.32m to 0.95m, typically with limited putrescible content.

Natural deposits were encountered as granular and cohesive Glacial Deposits and Weathered Bedrock with limited organic matter (up to 2.28% w/w organic matter).

The NHBC Foundation (Ref. 18) advises that ground gas risk assessment be as described in the current British Standard. In accordance with BS8485:2019 (Ref. 16), consideration of the recorded soil gas concentrations and air flow rates, presented in *Section 8.1*, enables hazardous gas flow rates (Q_{hg}) to be evaluated. Q_{hg} can be derived for both 'representative' and 'worst case' scenarios, and a comparison made in support of an appropriate assessment of ground gas risk.

A total of six monitoring visits have been undertaken to date, in various atmospheric conditions. Monitoring has been undertaken in a range of atmospheric conditions, including rising, steady and falling barometric state, and following periods of rainfall.

It is considered that a representative dataset has been obtained, it is therefore considered that it is appropriate to use steady state air flow rates within the ground gas risk assessment.

For a 'borehole' scenario where the highest steady state flow rates and maximum gas concentrations, within a single borehole on a single monitoring event, are adopted, whereas for the 'worst-case' check the highest steady state air flow rates and peak gas concentrations, from any borehole at any time, within the same strata, are used.

Evaluation of the 'borehole' scenario records a maximum Q_{hg} of 0.002 l/hr for carbon dioxide (WS05 on the sixth visit) and 0.0001/hr (all boreholes on all visits) for methane. The same value is recorded for a 'worst case check'.

In accordance with BS8485 guidance, the 'borehole' scenario is taken as the site's GSV which indicates a Characteristic Situation 1 (CS-1). With consideration to the above commentary the site should be classified as a Characteristic Situation 1 (CS-1) not requiring ground gas protection measures.

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.

9 REVISED CONCEPTUAL SITE MODEL

The Preliminary Conceptual Site Model (PCSM) presented in the Phase 1 PRA Report (Ref. 1) and discussed in *Section 2.8* of this report has been revised following the GQRA in *Section 7.0* 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.

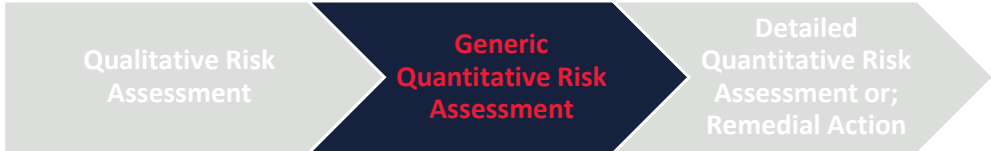
The CSM follows the framework outlined within CIRIA C552 (Ref. 19) which is summarised within *Appendix G*.

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. 20) 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 7.0* and presented within *Appendix C*.



- 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		
Made Ground of unknown composition from uncontrolled deposition of materials on-site during the construction of the Farmhouse and agricultural buildings, which were also constructed during a period where asbestos containing materials may have been used, and may be encountered within the Made Ground soils.	Direct contact and dermal uptake, soil and dust ingestion, dust & migration inhalation	End user of site	Medium Chronic health risk.	Unlikely	Low	No exceedances above commercial General Assessment Criteria were identified. No Asbestos Containing Materials were encountered.	No further action required. Construction workers to be provided with appropriate PPE and sanitary facilities.
	Vertical and horizontal migration through the superficial deposits (soils).	Construction Workers		Unlikely	Low		
	Horizontal migration over and through the superficial deposits (soils).	Controlled Waters (groundwater) Principal Aquifer associated with the bedrock deposits. Site is located within a Zone 3 Source Protection Zone No potable groundwater abstraction within 500m of the site.	Medium Pollution of classified groundwater.	Unlikely	Low	No visual or olfactory contamination was noted during this ground investigation. No gross contamination was encountered during this ground investigation.	No further action required.
	Direct contact and dermal uptake, soil and dust ingestion, dust & migration inhalation	Controlled Waters (surface water) Unnamed river located 37m southwest.	Medium Pollution of sensitive water resources.	Unlikely	Low		
Organic matter, Made Ground and/or contamination as source material for the generation of ground gas. Potential for ground gas due to the infilled pond on historical mapping, and mine gases from unrecorded mine workings close to the site.	Vertical and horizontal migration through Made Ground.	End users of site	Medium Chronic health risk.	Unlikely	Low	No elevated concentrations of methane, carbon dioxide, hydrogen sulphide or carbon monoxide were recorded during the monitoring period. A CS-1 situation has been assigned to the site, the development does not require any ground gas protection measures.	No further action required.
		Construction Workers		Unlikely	Low	No elevated concentrations of ground gas were encountered during this ground investigation.	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.

10 SUMMARY OF POTENTIAL POLLUTANT LINKAGES

A **Low** risk rating is identified to site end-users and construction workers from contamination in Made Ground soils from direct contact, dermal uptake, soil and dust ingestion and inhalation. There were no exceedances of Residential with Plant Uptake GACs and no asbestos containing materials have been encountered. Construction workers should be provided with appropriate PPE and sanitary facilities with respect to the environmental testing results enclosed herein.

A **Low** risk rating is identified to controlled waters (Groundwater and Surface Waters) as the ground investigation encountered no olfactory, visual or gross contamination.

A **Low** risk rating is identified to site end users from ground gases following the monitoring visits, with a CS-1 assigned to the site, the development requires no ground protection measures.

11 ENGINEERING ASSESSMENT AND RECOMMENDATIONS

11.1 Introduction

This section will assess the relevant geotechnical issues for the proposed development comprising of up to 90 dwellings.

The engineering assessment considers foundation design, bearing capacity, settlement, 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 be noted that no ground investigation was undertaken within the agricultural buildings located in the north of the site, or beneath their associated hardstanding due to these being in-use at the time of ground investigation; within an area not proposed to have any houses constructed; and due to the presence of overhead powerlines over these buildings. Similarly, no ground investigation was undertaken within the dwelling located in the south of the site. Should further investigation be required to further inform ground conditions, this should be undertaken post-demolition.

11.2 Summary of Ground Conditions

The ground conditions at the site generally comprised Topsoil underlain locally by Glacial Till, underlain by granular Weathered Bedrock, underlain by the Kinnerton Sandstone Formation.

Characteristic geotechnical parameters suggested for use in preliminary geotechnical designs are discussed in *Section 5.0* and *Section 6.0*.

11.3 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 should stand unsupported in the short term at suitable batters. 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.

Suitable side slope batters may be required. These must be designed by a suitably qualified temporary works contractor for any excavations.

It is anticipated that excavations with conventional plant through the Topsoil, Glacial Till, Weathered Bedrock and Bedrock will be attainable, however, a breaker may be required where bedrock becomes stronger.

Groundwater was not encountered during the ground investigation, or during post-investigation monitoring. 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.

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

11.4 Earthworks

It is known that earthworks will be required to facilitate the scheme. It is anticipated that a Cut and Fill will be required for the site, prior to construction of the up to 90 dwellings. Preliminary design indicates that final ground levels to range between c. 43.50m AOD in the west of the site, c. 42.60m to 40.00m AOD in the centre of the site, and c. 37.50m to 35m AOD in the east of the site.

It is important that the earthworks are undertaken under an Earthworks Specification in accordance with CC 601 Earthworks to capture the geotechnical acceptability criteria for the re-use of site won and imported materials as engineered fill and the compaction requirements.

The Proposed Levels drawings produced by Curtins (Ref: 087052-CUR-XX-XX-D-C-91001, Rev P01) show finished floor levels (FFL). These FFLs have been compared against the surveyed elevations of the exploratory holes to determine the degree of cut or fill in each location. A summary table is provided as Table 17 noting changes in elevation in relation to borehole locations, weathered bedrock elevation and preliminary foundation solution.

Table 17 – Cut and Fill Details based on Surveyed Exploratory Hole Locations and the Proposed Levels drawing

Exploratory Hole	Existing Ground Level (m AOD)	Finished Floor Level (m AOD)	Approx Elevation of Weathered Bedrock (m AOD)	Approx Min. Excavation Depth (m)	Likely Founding Solution (Post- Earthworks)
WS01	43.12	43.22	40.17	3.05	TBC
WS02	43.48	43.38	42.78	0.60	Shallow
WS03	43.37	42.90	40.97	1.93	Shallow / Trench Fill
WS04	43.68	43.39	43.29	0.10	Shallow
WS05	42.34	42.14	41.90	0.24	Shallow
WS06	41.97	41.93	41.43	0.50	Shallow
WS07	42.2	41.30	41.62	*	Shallow
WS08	41.15	41.17	40.48	0.69	Shallow
WS09	40.58	40.70	39.96	0.74	Shallow
WS10	39.73	39.53	37.92	1.61	Shallow / Trench Fill
WS11	38.69	37.62	36.14	1.48	Shallow
WS12	37.21	36.36	34.96	1.40	Shallow
TP01	43.7	43.50	42.72	0.78	Shallow
TP02	43.38	43.33	42.21	1.12	Shallow
TP03	43.1	43.60	42.19	1.41	Shallow
TP04	42.59	42.11	41.56	0.55	Shallow
TP05	43.33	42.82	42.76	0.06	Shallow
TP06	41.33	40.86	40.96	*	Shallow
TP07	42.17	41.86	41.74	0.12	Shallow
TP08	41.27	41.62	40.48	1.14	Shallow
TP09	40.89	40.95	40.20	0.75	Shallow
TP10	37.81	37.31	35.61	1.70	Shallow / Trench Fill
TP11	42.82	42.80	42.42	0.38	Shallow
SA01	38.4	37.82	35.85	1.97	Shallow / Trench Fill
SA02	38.03	36.78	37.66	*	Shallow

Notes

1. Finished Floor Levels are based off drawing Curtins Drawing 087052-CUR-XX-XX-D-C-91001_P01 (Cut and Fill)
2. TBC – If proposed structures are proposed in this location the depth to the weathered bedrock requires confirming to determine if shallow/ trench fill foundations are suitable.
3. *Denotes weathered bedrock likely to be present from ground level post earthworks.
4. Trench Fill specified where weathered bedrock may be > 1.50m bgl.

It is possible that material removed during the cut can be re-used in other areas of the site, depending on the materials suitability both geotechnically and chemically. This can be determined through classification testing. An Earthworks Strategy will be required for this development. A significant cut (c. 1.20m) is required at the proposed site entrance for the addition of an access road.

11.5 Soakaways

2 No. soakaways were undertaken as part of this ground investigation.

The Infiltration Rate for SA01 undertaken in the east of the site was determined as 1.08×10^{-4} m/s. The material in which this soakaway was undertaken was described as reddish brown, clayey, slightly gravelly sand.

The Infiltration Rate for SA02 undertaken in the south-east of the site was determined as N/A, due to the water level remaining the same throughout the length of the test. The material in which this soakaway was undertaken was described as reddish brown, very clayey, slightly gravelly sand.

Therefore, it is possible that soakaways in certain locations may be possible depending on the material and location specific testing. If the soil has a higher clay content (i.e. very clayey versus clayey), soakaways may not be suitable.

11.6 Foundation Design

It is understood that the proposed development is for up to 90 dwellings comprising of low-rise residential houses and apartment buildings. Structural loadings have not been provided at the time of writing this report.

Based on the ground conditions encountered during Curtins intrusive ground investigation it is considered that the Glacial Till is an unsuitable founding stratum due to its variable nature (both cohesive and granular) and risk of excessive differential settlement and variable strength/density.

For the low-rise residential houses it is recommended that shallow strip foundations are taken through the Glacial Till (absent in the centre of the site), to the typically very dense granular Weathered Bedrock, present from elevations ranging between c. 42.00m – 41.00m AOD in the west of the site, c. 41.00m – 40.00m AOD in the centre of the site, and c. 37.00m – 36.00m AOD in the east of the site. Some localised deepening may be required where the weathered bedrock is deeper. Trench Fill may be required where the depth to weathered bedrock is greater than 1.50m bgl. If proposed structures are in the vicinity of WS01, in the north-west of the site, where an approximate minimum excavation of 3.05m is required following the Cut and Fill (Table 16), further confirmation of the depth to weathered bedrock is required to determine if shallow/trench fill foundations are suitable.

A presumed safe bearing capacity of 150kPa is likely to be achievable within the granular Weathered Bedrock, comprising medium dense to very dense sand. The depth to this formation strata is anticipated to vary typically between c. 1.00m and c. 2.00m below ground levels following the Cut and Fill as indicated in Table 16.

11.7 Ground Floor Slabs

It is likely that ground bearing floor slab constructions are suitable for this development.

The formation should comprise one material type (cohesive or granular) to mitigate against differential settlement. Over excavation or excavate and replace should be undertaken to achieve this where necessary. It is recommended that all unsuitable materials (Topsoil, organic, anthropogenic, deleterious, soft, loose) material is removed from the formation level before being thoroughly rolled and compacted.

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

11.8 Volume Change Potential in Cohesive Glacial Till

Based on the laboratory testing results discussed in Section 6.2.2, the cohesive Glacial Till encountered on site has a low volume change potential in accordance with guidance from the NHBC Standards Chapter 4.2 (Ref. 9). Advice in BRE Special Digest 240 (Ref. 27) should be consulted with regards to minimum foundation depths in the vicinity of any existing, retained or proposed planting.

11.9 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 6.5.

Based on the laboratory test results, DS-1 and AC-2z is considered appropriate for this development. This is based on lower pH levels.

11.10 Existing Utilities

Liaison with utilities companies regarding safe easements around the existing pylons and overhead cables is recommended.

12 CONCLUSION AND RECOMMENDATIONS

12.1 Geotechnical

The limited Glacial Till deposits encountered on site are considered to be an unsuitable founding stratum.

The presence of granular Weathered Bedrock at shallow depths following cut & fill may enable a shallow foundation solution at the site, depending on the proposed loads. A presumed safe bearing capacity of 150kPa is likely to be achievable in the medium dense to very dense granular Weathered Bedrock.

Trench Fill may be required where the depth to weathered bedrock is greater than 1.50m bgl. If proposed structures are located in the vicinity of WS01, in the north-west of the site, where an approximate minimum excavation of 3.05m is required following the Cut and Fill, further confirmation of the depth to weathered bedrock is required to determine if shallow/trench fill foundations are suitable.

Ground bearing floor slabs are likely to be suitable for the development, founding wholly on a single strata.

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-2z.

12.2 Ground 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 9.0.

12.2.1 Ground Contamination

A **Low** risk rating is identified to site end-users and construction workers from contamination in Made Ground soils from direct contact, dermal uptake, soil and dust ingestion and inhalation. There were no exceedances of Residential with Plant Uptake GACs and no asbestos containing materials have been encountered. Construction workers should be provided with appropriate PPE and sanitary facilities with respect to the environmental testing results enclosed herein.

A **Low** risk rating is identified to controlled waters (Groundwater and Surface Waters) as the ground investigation encountered no olfactory, visual or gross contamination.

A **Low** risk rating is identified to site end users from ground gases following the monitoring visits, with a CS-1 assigned to the site, the development requires no ground protection measures.

12.3 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. Following confirmation of the building loads, the foundation solution should be confirmed. Following any changes to the cut & fill, the implication on likely foundation solution should be reviewed.
3. In anticipation of a cut and fill, an Earthworks Specification is likely to be required.
4. Post-demolition intrusive ground investigation can be undertaken following demolition of the northern buildings and associated hardstanding along with the dwelling in the south of the site. However, consideration will need to be given to working in the vicinity of overhead powerlines and utilizing appropriate techniques and machinery.

13 REFERENCES

1. Curtins (2025) Phase 1 Preliminary Risk Assessment Report for Halsnead Farm (Report Ref. 087052-CUR-XX-XX-T-GE-00001-P01).
2. Public Health England UK Radon Map. <https://www.ukradon.org/information/ukmaps> (accessed October 2025).
3. Environmental Agency (2020) Land Contamination Risk Management (LCRM).
4. British Standards Institution. (2011) Investigation of Potentially Contaminated Sites (Report No. BS10175).
5. British Standards Institution BSI. (2020) Code of Practice for Site Investigations (Report No.BS5930).
6. British Standards Institution. (2007) Eurocode 7: Geotechnical Design (report no. BS EN 1997).
7. British Standards Institution BSI (2015) Code of Practice for Site Investigations (report no. BS5930).
8. British Standard. (2016) Methods of test for soils for civil engineering purposes. General requirements and sample preparation (report no. BS1377-1).
9. NHBC Standards (2011). NHBC Standards 2011 – Part 4 Foundations section 4.2.
10. Stroud, M. a. B. F. (1975) The Standard Penetration Test and the Engineering Properties of Glacial Materials.
11. G E Barnes (2016) Soil Mechanics Principles and Practice.
12. M J Tomlinson (2001) Foundation Design and Construction.
13. Building Research Establishment. (2005) BRE Special Digest 1, 'Concrete in Aggressive Ground'. 2005.
14. British Standards Institution BSI (2013) Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs) (report no. BS58576).
15. CIRIA. (2007) C665 Assessing Risks Posed by Hazardous Ground Gases to Buildings.
16. British Standards Institution. (2015) BS8485 Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings.
17. Wilson S, Card G and Haines S. (2009) Ground Gas Handbook. Caithness: Whittles Publishing.
18. NHBC (2023) Hazardous Ground Gas – An Essential Guide for Housebuilders.
19. CIRIA C552. (2001) Contaminated Land Risk Assessment. A Guide to Good Practice.
20. CITB. (2015) Construction (Design and Management) Regulations.
21. Environmental Agency. (2009) Contaminated Land Exposure Assessment (CLEA) v1.071 model.
22. Environment Agency. (2009) Human Health Toxicological Assessment of Contaminants in Soil (report no. SC050021/SR2).

23. Environment Agency. (2009) Updated Technical Background to the CLEA Model (report no.SC050021/SR3).
24. Department of Environment Food and Rural Affairs (DEFRA). (2012) Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance (report no. PB13735).
25. BSi Standards Publication (2015) BS 8004:2015 Code of practice for foundations.
26. CL:AIRE. (2021) Research Bulletin: A Pragmatic Approach to Ground Gas Risk Assessment. ISSN 2047-6450.
27. British Research Establishment (1993) Special Digest 240: Low-Rise Buildings on Shrinkable Clay Soils: Part 1
28. WeatherOnline [online] Available at: <https://www.weatheronline.co.uk/weather/maps> (Last Accessed April 2026).
29. Time and Date [online] Available at: <https://www.timeanddate.com/weather/uk/liverpool/historic> (Last Accessed April 2026).

14 APPENDICES

Appendix A – Drawings

Appendix B – Exploratory Hole Logs

Appendix C – Chemical Laboratory Test Results

Appendix D – Geotechnical Laboratory Test Results

Appendix E – Ground Gas Monitoring Results

Appendix F – GAC Screening Thresholds

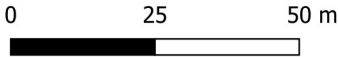
Appendix G – Risk Assessment Methodology

Appendix A – Drawings



Borehole Locations

- SA
- TP
- WS
- Power Lines



Curtins

Curtins Consulting Ltd
Merchant Exchange, 17-19 Whitworth Street West,
Manchester, M1 5WG
t: 0161 236 2394
e: manchester@curtins.com
www.curtins.com

Structures - Civils - Environmental - Infrastructure - Transport Planning - Sustainability - Expert Advisory Services
Birmingham - Bristol - Cardiff - Douglas - Edinburgh - Kendal - Leeds - Liverpool - London - Manchester - Nottingham

Status					INFORMATION
Project:					Halsnead Farm
Drg Title:					Exploratory Hole Location Plan
Scale:	See scale bar	Size:	A3	Issue Date:	15/10/2025
		Drawn:	LW	Checked:	NF
Drg No:					087052-CUR-XX-XX-D-GE-80003
					Rev: P02

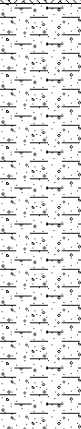
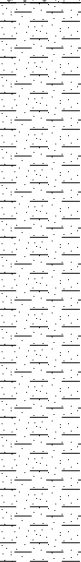
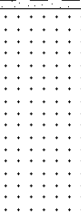


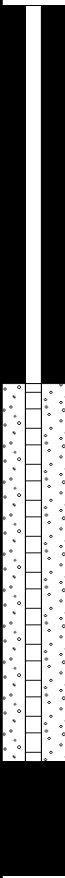
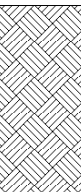
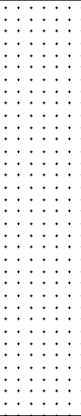
Drawing Title: Proposed Site Plan
Date: 28/09/2025
Drawing no: 1367 - 1001
Scale: 1:500 @ A1
Drawn: HB

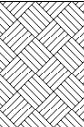
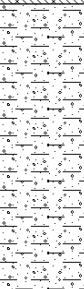
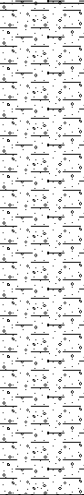
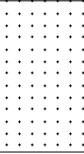
revision:
revision notes:

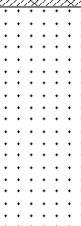
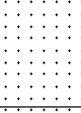
DK-Architects
26 Old Haymarket
Liverpool
L1 6ER
0151 231 1209 T
mail@dk-architects.com E
www.dk-architects.com W

Appendix B – Exploratory Hole Logs

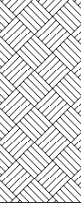
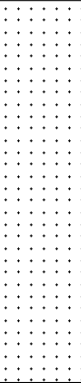
Curtins				Borehole Log				Borehole No. WS01 Sheet 1 of 1	
Project Name: Halsnead Farm				Project No. B087052		Co-ords: 347501.56 - 389624.20		Hole Type WS	
Location: Halsnead Farm				Level: 43.12		Scale 1:20		Logged By LW	
Client: Starship				Dates: 08/07/2025 - 08/07/2025					
Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	ES		0.32	42.80		Grass over TOPSOIL: Dark brown sandy, slightly gravelly clay with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of sandstone.	1
								Firm, brown mottled grey slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of sandstone.	
								Firm reddish brown very sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of sandstone	
								Orangish brown and yellow SANDSTONE recovered as sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, subangular of sandstone.	2
		2.00		N=38 (6,6/8,8,10,12)					
		2.00 - 2.45	D						
		3.00		50 (9,9/50 for 175mm)	2.95	40.17			
					3.50	39.62		Dynamic Probing at 3.50m bgl achieved a penetration of 40mm with 50 blows. End of borehole at 3.50 m	4
Remarks Hand pit excavated from ground level to 1.20m bgl. Groundwater not encountered. Borehole terminated due to SPT and Probe refusal.									

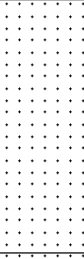
Curtins				Borehole Log				Borehole No. WS02 Sheet 1 of 1		
Project Name: Halsnead Farm				Project No. B087052		Co-ords: 347553.75 - 389600.04		Hole Type WS		
Location: Halsnead Farm				Level: 43.48		Scale 1:20		Logged By LW		
Client: Starship				Dates: 08/07/2025 - 08/07/2025						
Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.60	ES		0.51	42.97		Grass over TOPSOIL: Dark brown sandy, slightly gravelly clay with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of sandstone.	1	
		0.70 - 1.00	B		0.70	42.78		Brown, slightly clayey, slightly gravelly SAND. Sand is fine to medium. Gravel is fine to coarse, subrounded of sandstone.		
		1.20		N=36 (6,6/8,8,8,12)						Completely weathered SANDSTONE recovered as reddish brown clayey, slightly gravelly SAND with a low cobble content. Sand is fine to medium. Gravel is fine to coarse, subrounded of sandstone. Cobbles are subrounded of
		2.00		50 (19,6/50 for 70mm)	1.80	41.68				Very weak reddish brown SANDSTONE.
					2.30	41.18				Dynamic Probing at 2.30m bgl achieved a penetration of 30mm with 50 blows.
End of borehole at 2.30 m									4	
Remarks Hand pit excavated from ground level to 1.20m bgl. Groundwater not encountered. Borehole terminated due to SPT and Probe refusal.										

Curtins					Borehole Log			Borehole No. WS03 Sheet 1 of 1			
Project Name: Halsnead Farm					Project No. B087052		Co-ords: 347529.51 - 389563.82		Hole Type WS		
Location: Halsnead Farm					Level: 43.37		Scale 1:20		Logged By LW		
Client: Starship					Dates: 08/07/2025 - 08/07/2025						
Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
		Depth (m)	Type	Results							
					0.34	43.03		Grass over TOPSOIL: Dark brown sandy, slightly gravelly clay with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of sandstone.		1	
		0.50	ES					Firm, brown mottled grey, very sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of sandstone.			
		1.20		N=13 (2,2/2,3,4,4)	1.10	42.27		Stiff, reddish brown, very sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subrounded of sandstone and mudstone.			
		2.00		N=42 (4,5/7,10,12,13)							
		2.40			2.40	40.97		Completely weathered SANDSTONE recovered as reddish brown, very clayey, slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subrounded of sandstone. (Weathered Bedrock).			
		2.70		50 (11,11/50 for 165mm)	2.80	40.57		Dynamic Probing at 2.75m bgl achieved a penetration of 15mm with 50 blows.		3	
								End of borehole at 2.80 m			
											4
Remarks Hand pit excavated from ground level to 1.20m bgl. Groundwater not encountered. Borehole terminated due to SPT and Probe refusal.											

Curtins					Borehole Log			Borehole No. WS04 Sheet 1 of 1			
Project Name: Halsnead Farm					Project No. B087052		Co-ords: 347569.66 - 389627.53		Hole Type WS		
Location: Halsnead Farm					Level: 43.68		Scale 1:20		Logged By LW		
Client: Starship					Dates: 08/07/2025 - 08/07/2025						
Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
		Depth (m)	Type	Results							
		0.40	ES		0.39	43.29		Grass over TOPSOIL: Dark brown, very clayey, slightly gravelly sand with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of sandstone.		1	
								Completely weathered SANDSTONE recovered as brown and reddish brown, clayey, slightly gravelly SAND. Sand is fine to medium. Gravel is fine to coarse, subrounded of sandstone.			
		1.20		50 (8,10/50 for 220mm)	1.25	42.43		Weak cream SANDSTONE. Dynamic Probing at 1.40m bgl achieved a penetration of 60mm with 50 blows.			
					1.40	42.28		End of borehole at 1.40 m		2 3 4	
Remarks Hand pit excavated from ground level to 1.20m bgl. Groundwater not encountered. Borehole terminated due to SPT and Probe refusal.											

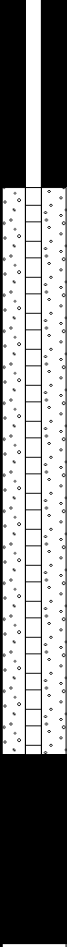
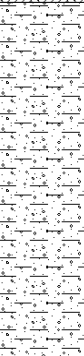
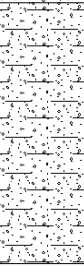
Curtins				Borehole Log				Borehole No. WS05 Sheet 1 of 1	
Project Name: Halsnead Farm				Project No. B087052		Co-ords: 347615.20 - 389611.44		Hole Type WS	
Location: Halsnead Farm				Level: 42.34		Scale 1:20		Logged By LW	
Client: Starship				Dates: 08/07/2025 - 08/07/2025					
Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.15	ES		0.44	41.90		Grass over TOPSOIL: Dark greyish brown, clayey, slightly gravelly sand with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subrounded of sandstone.	1
		0.50 - 0.90	B					Completely weathered SANDSTONE recovered as orangish brown, slightly clayey, slightly gravelly SAND. Sand is fine to medium. Gravel is fine to coarse, subrounded of sandstone.	
		1.10	D		1.10	41.24		Very weak cream and brown SANDSTONE.	
		1.20		50 (11,10/50 for 155mm)	1.30	41.04		Dynamic Probing at 1.30m bgl achieved a penetration of 25mm with 50 blows.	
							End of borehole at 1.30 m		4
Remarks Hand pit excavated from ground level to 1.20m bgl. Groundwater not encountered. Borehole terminated due to SPT and Probe refusal.									

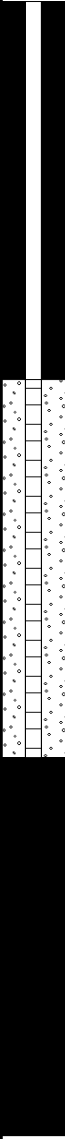
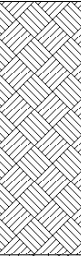
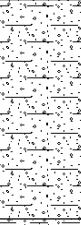
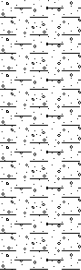
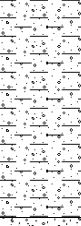
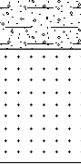
Curtins				Borehole Log				Borehole No. WS06 Sheet 1 of 1	
Project Name: Halsnead Farm				Project No. B087052		Co-ords: 347581.06 - 389540.13		Hole Type WS	
Location: Halsnead Farm				Level: 41.97		Scale 1:20		Logged By LW	
Client: Starship				Dates: 10/07/2025 - 10/07/2025					
Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.25	ES		0.54	41.43		Grass over TOPSOIL: Dark greyish brown, clayey, slightly gravelly sand with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subrounded of sandstone.	1
		1.20		N=18 (2,3/3,5,5,5)				Completely weathered SANDSTONE recovered as reddish brown, clayey, slightly gravelly SAND. Sand is fine to medium. Gravel is fine to coarse, subrounded of sandstone.	
		1.50		50 (14,11/50 for 95mm)	1.55	40.42		Weak reddish brown SANDSTONE.	
					1.80	40.17		Dynamic Probing at 1.80m bgl achieved a penetration of 5mm with 50 blows.	
								End of borehole at 1.80 m	2 3 4
Remarks Hand pit excavated from ground level to 1.20m bgl. Groundwater not encountered. Borehole terminated due to SPT and Probe refusal.									

Curtins					Borehole Log			Borehole No. WS07 Sheet 1 of 1			
Project Name: Halsnead Farm					Project No. B087052		Co-ords: 347613.23 - 389570.77		Hole Type WS		
Location: Halsnead Farm					Level: 42.20		Scale 1:20		Logged By LW		
Client: Starship					Dates: 10/07/2025 - 10/07/2025						
Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
		Depth (m)	Type	Results							
								Grass over TOPSOIL: Dark greyish brown, clayey, slightly gravelly sand with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subrounded of sandstone.		1 2 3 4	
		0.80	ES		0.58	41.62		Completely weathered SANDSTONE recovered as reddish/orangish brown, clayey, slightly gravelly SAND. Sand is fine to medium. Gravel is fine to coarse, subrounded of sandstone.			
		1.20		50 (14, 11/50 for 105mm)	1.25 1.30	40.95 40.90		Weak reddish/orangish brown SANDSTONE. <i>Dynamic Probing at 1.30m bgl achieved a penetration of 0mm with 50 blows.</i> End of borehole at 1.30 m			
Remarks Hand pit excavated from ground level to 1.20m bgl. Groundwater not encountered. Borehole terminated due to SPT and Probe refusal.											

Curtins				Borehole Log				Borehole No. WS08 Sheet 1 of 1	
Project Name: Halsnead Farm				Project No. B087052		Co-ords: 347647.55 - 389581.42		Hole Type WS	
Location: Halsnead Farm						Level: 41.15		Scale 1:20	
Client: Starship						Dates: 10/07/2025 - 10/07/2025		Logged By LW	
Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		1.20		50 (5,11/50 for 220mm)	0.67	40.48		Grass over TOPSOIL: Greyish brown, clayey, slightly gravelly sand with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of sandstone.	
								Completely weathered SANDSTONE recovered as orangish brown, clayey, slightly gravelly SAND. Sand is fine to medium. Gravel is fine to coarse, subangular to subrounded of sandstone.	
					1.30	39.85		Dynamic Probing at 1.30m bgl achieved a penetration of 10mm with 50 blows.	
								End of borehole at 1.30 m	
Remarks Hand pit excavated from ground level to 1.20m bgl. Groundwater not encountered. Borehole terminated due to SPT and Probe refusal.									
AGS									

Curtins					Borehole Log			Borehole No. WS09 Sheet 1 of 1			
Project Name: Halsnead Farm					Project No. B087052		Co-ords: 347644.69 - 389542.66		Hole Type WS		
Location: Halsnead Farm					Level: 40.58		Scale 1:20		Logged By LW		
Client: Starship					Dates: 10/07/2025 - 10/07/2025						
Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
		Depth (m)	Type	Results							
		0.50	ES	N=50 (10,13/50 for 235mm)	0.62	39.96		Grass over TOPSOIL: Greyish brown, clayey, slightly gravelly sand with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of sandstone.	1		
		0.70	ES					Completely weathered SANDSTONE recovered as orangish brown, slightly clayey, slightly gravelly SAND. Sand is fine to medium. Gravel is fine to coarse, subrounded of sandstone.			
		1.20						Weak orangish brown SANDSTONE.			
										Dynamic Probing at 1.50m bgl achieved a penetration of 145mm with 50 blows.	
		1.62		38.96		End of borehole at 1.62 m	2				
									3		
									4		
Remarks Hand pit excavated from ground level to 1.20m bgl. Groundwater not encountered. Borehole terminated due to SPT and Probe refusal.											

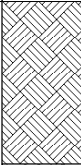
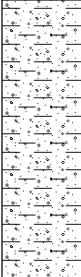
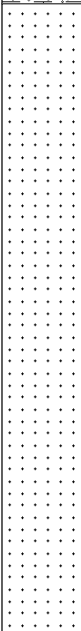
Curtins				Borehole Log				Borehole No. WS10 Sheet 1 of 1		
Project Name: Halsnead Farm				Project No. B087052		Co-ords: 347677.53 - 389611.24		Hole Type WS		
Location: Halsnead Farm				Level: 39.73		Scale 1:20		Logged By LW		
Client: Starship				Dates: 10/07/2025 - 10/07/2025						
Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.15	ES					Grass over TOPSOIL: Greyish brown, sandy, slightly gravelly clay with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of sandstone.		
		1.20		N=13 (2,3/3,3,3,4)	0.87	38.86		Firm, brown mottled grey, slightly sandy, slightly gravelly CLAY. Sand is fine to coarse, subrounded of sandstone.	1	
		1.30 - 1.65	D		1.81	37.92		Light brown, clayey, slightly gravelly SAND. Sand is fine to medium. Gravel is fine to coarse, subrounded of sandstone. (Weathered Bedrock).	2	
		2.00		50 (6.9/50 for 160mm)						
					2.50	37.23		Dynamic Probing at 2.50m bgl achieved a penetration of 125mm with 50 blows. End of borehole at 2.50 m	3	
Remarks Hand pit excavated from ground level to 1.20m bgl. Groundwater not encountered. Borehole terminated due to SPT and Probe refusal.										

Curtins				Borehole Log				Borehole No. WS11 Sheet 1 of 1		
Project Name: Halsnead Farm				Project No. B087052		Co-ords: 347718.81 - 389569.14		Hole Type WS		
Location: Halsnead Farm				Level: 38.69		Scale 1:20		Logged By LW		
Client: Starship				Dates: 11/07/2025 - 11/07/2025						
Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.30	ES		0.67	38.02		Grass over TOPSOIL: Dark greyish brown, clayey, slightly gravelly sand with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subrounded of sandstone.	1	
								Brown and orangish brown slightly clayey, slightly gravelly SAND. Sand is fine to medium. Gravel is fine to coarse, subrounded of sandstone.		
		1.20		N=15 (3,5/4,4,4,3)	1.25	37.44		Soft brown, slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subrounded to subangular of sandstone.	2	
		2.00		N=6 (1,0/0,1,3,2)						
		2.00 - 2.45	D					Cream, slightly clayey, slightly gravelly SAND. Sand is fine to medium. Gravel is fine to coarse, subrounded of sandstone. (Weathered Bedrock). Weak, cream SANDSTONE.	3	
		2.50		50 (10,12/50 for 115mm)	2.55	36.14				
		2.55 - 2.65	D		2.70	35.99		Dynamic Probing at 3.00m bgl achieved a penetration of 15mm with 50 blows.		
					3.00	35.69	End of borehole at 3.00 m			4
	Remarks Hand pit excavated from ground level to 1.20m bgl. Groundwater not encountered. Borehole terminated due to SPT and Probe refusal.									
	AGS									

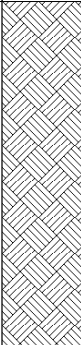
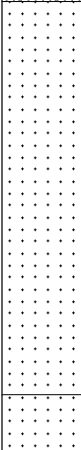
Curtins				Borehole Log				Borehole No. WS12 Sheet 1 of 1			
Project Name: Halsnead Farm				Project No. B087052		Co-ords: 347742.54 - 389611.70		Hole Type WS			
Location: Halsnead Farm				Level: 37.21		Scale 1:20		Logged By LW			
Client: Starship				Dates: 11/07/2025 - 11/07/2025							
Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
		Depth (m)	Type	Results							
			ES		0.44	36.77		Grass over TOPSOIL: Dark greyish brown, clayey, slightly gravelly sand with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subrounded of sandstone.	1		
		0.75						Brown, slightly clayey, slightly gravelly SAND. Sand is fine to medium. Gravel is fine to coarse, subrounded of sandstone.			
		1.20			N=4 (1,1/1,1,1,1)					Stiff brown, slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subrounded to subangular of sandstone.	2
								Weak, cream SANDSTONE.			
		2.00			N=50 (6,6/50 for 265mm)					Dynamic Probing at 2.45m bgl achieved a penetration of 220mm with 50 blows.	
					2.25	34.96			3		
					2.70	34.51		End of borehole at 2.70 m		4	
Remarks Hand pit excavated from ground level to 1.20m bgl. Groundwater not encountered. Borehole terminated due to SPT and Probe refusal.											

Curtins				Trial Pit Log				Trialpit No SA01 Sheet 1 of 1	
Project Name: Halsnead Farm				Project No. B087052		Co-ords: 347708.40 - 389604.20 Level: 38.40		Date 10/07/2025	
Location: Halsnead Farm				Client: Starship		Dimensions (m): Depth 2.70		Scale 1:20 Logged LW	
0.65		2							
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
				0.95	37.45		Grass over TOPSOIL: Dark brown, sandy, slightly gravelly clay with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subrounded to subangular of sandstone.		
							Firm, brown mottled grey, sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subrounded to subangular of sandstone.		
							Completely weathered SANDSTONE recovered as reddish brown, clayey, slightly gravelly SAND. Sand is fine to medium. Gravel is fine to coarse, subrounded of sandstone.		
							End of pit at 2.70 m		
Remarks: Trial pit excavated from ground level to 2.70m bgl. Groundwater not encountered. Trial pit completed. Soakaway undertaken.									
Stability: Stable									

Curtins				Trial Pit Log				Trialpit No TP01 Sheet 1 of 1	
Project Name: Halsnead Farm				Project No. B087052		Co-ords: 347541.29 - 389626.81 Level: 43.70		Date 09/07/2025	
Location: Halsnead Farm						Dimensions (m): 2 0.65		Scale 1:20	
Client: Starship						Depth 2.20		Logged LW	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
				0.51	43.18		Grass over TOPSOIL: Dark brown, sandy, slightly gravelly clay with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subrounded to subangular of sandstone.		
							Brown, very clayey, slightly gravelly SAND. Sand is fine to medium. Gravel is fine to coarse, subrounded of sandstone.		
				0.98	42.72		Completely weathered SANDSTONE recovered as reddish brown, clayey, slightly gravelly SAND with a medium cobble content. Sand is fine to medium. Gravel is fine to coarse, subrounded of sandstone. Cobbles are subrounded of sandstone.		
				1.95	41.74		Weak - moderately strong reddish brown SANDSTONE.		
				2.20	41.50	End of pit at 2.20 m			
Remarks: Trial pit excavated from ground level to 2.20m bgl. Groundwater not encountered. Terminated in bedrock.									
Stability: Stable									

Curtins				Trial Pit Log				Trialpit No TP02 Sheet 1 of 1	
Project Name: Halsnead Farm				Project No. B087052		Co-ords: 347522.78 - 389601.58 Level: 43.38		Date 09/07/2025	
Location: Halsnead Farm						Dimensions (m): 1.95 0.66		Scale 1:20	
Client: Starship						Depth 3.00		Logged LW	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.20	ES		0.43	42.95		Grass over TOPSOIL: Dark brown, sandy, slightly gravelly clay with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subrounded to subangular of sandstone.		
							Firm, brown and grey mottled, sandy, slightly gravelly CLAY with a low cobble content. Sand is fine to coarse. Gravel is fine to coarse, subrounded of sandstone. Cobbles are subrounded of sandstone.		
				1.17	42.21		Completely weathered SANDSTONE recovered as purplish reddish brown, clayey, gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular of sandstone.		
	1.60 - 1.90	B							
				2.85	40.53		Medium strong, purplish reddish brown SANDSTONE.		
			3.00	40.38		-----End of pit at 3.00 m-----			
Remarks: Trial pit excavated from ground level to 3.00m bgl. Groundwater not encountered. Terminated in bedrock.									
Stability: Stable									



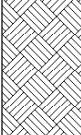
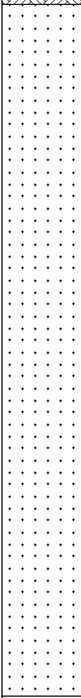
Curtins				Trial Pit Log				Trialpit No TP03 Sheet 1 of 1	
Project Name: Halsnead Farm				Project No. B087052		Co-ords: 347562.36 - 389573.30 Level: 43.10		Date 09/07/2025	
Location: Halsnead Farm				Dimensions (m): Depth 2.10		2 0.65		Scale 1:20	
Client: Starship								Logged LW	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
				0.91	42.19		Grass over TOPSOIL: Dark brown sandy gravelly clay with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subrounded to subangular of sandstone.		
							From 0.74m - 0.84m bgl, a land drain was encountered crossing the trial pit.		
							Completely weathered SANDSTONE recovered as reddish brown, slightly clayey, slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subrounded of sandstone.		
				1.95	41.15		Medium strong, reddish brown SANDSTONE.		
				2.10	41.00		End of pit at 2.10 m		
Remarks: Trial pit excavated from ground level to 2.10m bgl. Groundwater not encountered. Terminated in bedrock.								AGS	
Stability: Stable									

Curtins				Trial Pit Log				Trialpit No TP04 Sheet 1 of 1	
Project Name: Halsnead Farm				Project No. B087052		Co-ords: 347557.99 - 389546.32 Level: 42.59		Date 09/07/2025	
Location: Halsnead Farm				Dimensions (m): Depth 2.10 0.64 1.9				Scale 1:20 Logged LW	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
				0.51	42.08		Long grass over TOPSOIL: Dark brown, sandy, slightly gravelly clay with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subrounded to subangular of sandstone.		
				1.02	41.56		Firm, brown and grey mottled, sandy, slightly gravelly CLAY with a low cobble content. Sand is fine to coarse. Gravel is fine to coarse, subrounded of sandstone. Cobbles are subrounded of sandstone.		
				2.00	40.58		Completely weathered SANDSTONE recovered as reddish purplish brown, clayey, gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular of sandstone.		
				2.10	40.48		Medium strong, purplish brown SANDSTONE.		
							End of pit at 2.10 m		
Remarks: Trial pit excavated from ground level to 2.10m bgl. Groundwater not encountered. Terminated in bedrock.									
Stability: Stable									

AGS

Curtins				Trial Pit Log				Trialpit No TP05 Sheet 1 of 1	
Project Name: Halsnead Farm				Project No. B087052		Co-ords: 347579.88 - 389604.57 Level: 43.33		Date 09/07/2025	
Location: Halsnead Farm						Dimensions (m): 2.1 0.66		Scale 1:20	
Client: Starship						Depth 2.60		Logged LW	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.50	ES		0.57	42.76		Grass over TOPSOIL: Greyish brown, clayey, slightly gravelly sand with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of sandstone.		
	1.50 - 1.70	B		2.20	41.13		Completely weathered SANDSTONE recovered as reddish brown, clayey, slightly gravelly SAND. Sand is fine to medium. Gravel is fine to coarse, subrounded of sandstone.		
							Medium strong, reddish brown SANDSTONE.		
							End of pit at 2.60 m		
				2.60	40.73				
Remarks: Trial pit excavated from ground level to 2.60m bgl. Groundwater not encountered. Terminated in bedrock.									
Stability: Stable									

AGS

Curtins				Trial Pit Log				Trialpit No TP06 Sheet 1 of 1	
Project Name: Halsnead Farm				Project No. B087052		Co-ords: 347618.08 - 389544.59 Level: 41.33		Date 09/07/2025	
Location: Halsnead Farm						Dimensions (m): Depth 2.40		2.1 0.65	
Client: Starship								Scale 1:20 Logged LW	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.50	ES		0.37	40.96		Grass over TOPSOIL: Dark greyish brown, clayey, slightly gravelly sand with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subrounded of sandstone.		
							Completely weathered SANDSTONE recovered as reddish brown, clayey, slightly gravelly SAND. Sand is fine to medium. Gravel is fine to coarse, subrounded of sandstone.		
							Medium strong, reddish brown SANDSTONE.		
							End of pit at 2.40 m		
				2.20	39.13				
				2.40	38.93				
Remarks: Trial pit excavated from ground level to 2.40m bgl. Groundwater not encountered. Terminated in bedrock.									
Stability: Stable AGS									

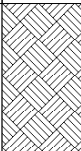
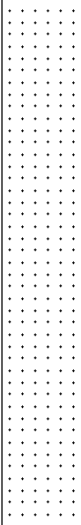
Curtins				Trial Pit Log				Trialpit No TP07 Sheet 1 of 1	
Project Name: Halsnead Farm				Project No. B087052		Co-ords: 347619.76 - 389591.03 Level: 42.17		Date 09/07/2025	
Location: Halsnead Farm						Dimensions (m): 2.1 0.65		Scale 1:20	
Client: Starship						Depth 2.10		Logged LW	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
				0.42	41.74		Grass over TOPSOIL: Dark greyish brown, clayey, slightly gravelly sand with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subrounded of sandstone.		
							Completely weathered SANDSTONE recovered as reddish brown, clayey, slightly gravelly SAND. Sand is fine to medium. Gravel is fine to coarse, subrounded of sandstone.		
				1.62	40.54		Medium strong, reddish brown SANDSTONE.		
				2.10	40.06		End of pit at 2.10 m		
Remarks: Trial pit excavated from ground level to 2.10m bgl. Groundwater not encountered. Terminated in bedrock.									
Stability: Stable									
AGS									

Curtins				Trial Pit Log				Trialpit No TP08 Sheet 1 of 1	
Project Name: Halsnead Farm				Project No. B087052		Co-ords: 347641.16 - 389619.84 Level: 41.27		Date 09/07/2025	
Location: Halsnead Farm						Dimensions (m): Depth 2.80		2 0.66	
Client: Starship								Scale 1:20 Logged LW	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.30	ES		0.79	40.48		Sparse vegetation over TOPSOIL: Greyish brown, slightly clayey, slightly gravelly sand with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subrounded to subangular of sandstone.		
	1.70 - 2.00	B		2.00	39.27		Completely weathered SANDSTONE recovered as orangish brown, slightly clayey, slightly gravelly SAND. Sand is fine to medium. Gravel is fine to coarse, subrounded of sandstone.		
							Weak, cream and yellow SANDSTONE.		
							End of pit at 2.80 m		
Remarks: Trial pit excavated from ground level to 2.80m bgl. Groundwater not encountered. Terminated in bedrock.									
Stability: Stable									

Curtins				Trial Pit Log				Trialpit No TP09 Sheet 1 of 1		
Project Name: Halsnead Farm				Project No. B087052		Co-ords: 347646.66 - 389562.19 Level: 40.89		Date 09/07/2025		
Location: Halsnead Farm						Dimensions (m): Depth 2.10		2.05 0.65		
Client: Starship								Scale 1:20 Logged LW		
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
	Depth	Type	Results							
				0.40	40.49		Grass over TOPSOIL: Dark greyish brown, clayey, slightly gravelly sand with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subrounded of sandstone.			
							Brown, slightly clayey, slightly gravelly SAND. Sand is fine to medium. Gravel is fine to coarse, subrounded of sandstone.			
							Completely weathered SANDSTONE recovered as reddish brown, clayey, slightly gravelly SAND. Sand is fine to medium. Gravel is fine to coarse, subrounded of sandstone. (Weathered Bedrock).			
							Medium strong, reddish brown SANDSTONE.			
							End of pit at 2.10 m			
				2.10	38.79					
Remarks: Trial pit excavated from ground level to 2.10m bgl. Groundwater not encountered. Terminated in bedrock.										
Stability: Stable										

Curtins				Trial Pit Log			Trialpit No TP10 Sheet 1 of 1		
Project Name: Halsnead Farm				Project No. B087052		Co-ords: 347721.79 - 389622.20 Level: 37.81		Date 09/07/2025	
Location: Halsnead Farm				Dimensions (m): Depth 2.80		2 0.61		Scale 1:20	
Client: Starship								Logged LW	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
				0.91	36.90		Grass over TOPSOIL: Dark greyish brown, sandy, slightly gravelly clay with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subrounded to subangular of sandstone.		
							Firm, brown and grey mottled, sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subrounded of sandstone.		
				2.20	35.61		Completely weathered SANDSTONE recovered as light orangish brown, clayey, slightly gravelly SAND. Sand is fine to medium. Gravel is fine to coarse, subrounded of sandstone.		
							Medium strong, light orangish brown SANDSTONE.		
							End of pit at 2.80 m		
2.80	35.01								
Remarks: Trial pit excavated from ground level to 2.80m bgl. Groundwater not encountered. Terminated in bedrock.									
Stability: Stable									



Curtins				Trial Pit Log			Trialpit No TP11 Sheet 1 of 1		
Project Name: Halsnead Farm				Project No. B087052		Co-ords: 347592.57 - 389579.71		Date 10/07/2025	
Location: Halsnead Farm				Dimensions (m):		2		Scale 1:20	
Client: Starship				Depth 1.80		0.7		Logged LW	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
				0.40	42.42		Grass over TOPSOIL: Dark brown, very clayey, slightly gravelly sand with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of sandstone.		
				1.80	41.02		Very weak reddish brown SANDSTONE. Sandstone is laminated. Very weak sandstone witnessed upon water draining from the trial pit.		
							End of pit at 1.80 m		
Remarks: Trial pit excavated from ground level to 1.80m bgl. Groundwater not encountered. Buried service encountered within the trial pit. Terminated due to service. Stability: Stable									
AGS									

Appendix C – Chemical Laboratory Test Results

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 25/07591
Issue Number: 1

Date: 25 July, 2025

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

Project Manager: Jonathan Lord/Lucy Woods/Rebecca Baksh-Jones
Project Name: Halsnead Farm
Project Ref: B087052
Order No: 24995
Date Samples Received: 11/07/25
Date Instructions Received: 14/07/25
Date Analysis Completed: 25/07/25

Approved by:

Gemma Berrisford
Deputy Client Services Supervisor

Envirolab Job Number: 25/07591

Client Project Name: Halsnead Farm

Client Project Ref: B087052

Lab Sample ID	25/07591/1	25/07591/2	25/07591/3	25/07591/4	25/07591/5	25/07591/6	25/07591/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS01	WS02	WS03	WS04	WS05	TP02	TP05			
Depth to Top	0.10	0.60	0.50	0.40	0.15	0.20	0.50			
Depth To Bottom										
Date Sampled	08-Jul-25	08-Jul-25	08-Jul-25	08-Jul-25	08-Jul-25	09-Jul-25	09-Jul-25			
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES			
Sample Matrix Code	4AE	4AE	4AE	4AE	4AE	4AE	4AE			
% Moisture at <40C _A	12.1	6.2	10.4	5.4	5.4	13.1	6.0	% w/w	0.1	A-T-044
% Stones >10mm _A	<0.1	4.9	6.7	1.4	0.5	2.7	<0.1	% w/w	0.1	A-T-044
pH _D ^{M#}	5.44	5.68	5.71	5.58	5.71	5.85	5.70	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	g/l	0.01	A-T-026s
Cyanide (total) _A ^{M#}	<1	<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	<0.2	mg/kg	0.2	A-T-050s
Organic Matter _D ^{M#}	3.78	1.16	0.85	1.31	2.28	3.00	3.46	% w/w	0.14	A-T-032s
Arsenic _D ^{M#}	10	5	4	3	8	10	8	mg/kg	1	A-T-024s
Boron (water soluble) _D ^{M#}	<1.0	<1.0	<1.0	<1.0	<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	<1.0	mg/kg	1	A-T-024s
Copper _D ^{M#}	72	24	16	20	36	49	46	mg/kg	1	A-T-024s
Chromium _D ^{M#}	20	16	22	10	13	18	15	mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-040s
Lead _D ^{M#}	55	22	12	18	36	53	48	mg/kg	1	A-T-024s
Mercury _D	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	14	13	20	6	11	14	11	mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-024s
Zinc _D ^{M#}	93	48	30	34	56	83	83	mg/kg	1	A-T-024s

Envirolab Job Number: 25/07591

Client Project Name: Halsnead Farm

Client Project Ref: B087052

Lab Sample ID	25/07591/1	25/07591/2	25/07591/3	25/07591/4	25/07591/5	25/07591/6	25/07591/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS01	WS02	WS03	WS04	WS05	TP02	TP05			
Depth to Top	0.10	0.60	0.50	0.40	0.15	0.20	0.50			
Depth To Bottom										
Date Sampled	08-Jul-25	08-Jul-25	08-Jul-25	08-Jul-25	08-Jul-25	09-Jul-25	09-Jul-25			
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES			
Sample Matrix Code	4AE	4AE	4AE	4AE	4AE	4AE	4AE			
Asbestos in Soil (inc. matrix)										
Asbestos in soil _D [#]	NAD	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	N/A			A-T-045

Envirolab Job Number: 25/07591

Client Project Name: Halsnead Farm

Client Project Ref: B087052

Lab Sample ID	25/07591/1	25/07591/2	25/07591/3	25/07591/4	25/07591/5	25/07591/6	25/07591/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS01	WS02	WS03	WS04	WS05	TP02	TP05			
Depth to Top	0.10	0.60	0.50	0.40	0.15	0.20	0.50			
Depth To Bottom										
Date Sampled	08-Jul-25	08-Jul-25	08-Jul-25	08-Jul-25	08-Jul-25	09-Jul-25	09-Jul-25			
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES			
Sample Matrix Code	4AE	4AE	4AE	4AE	4AE	4AE	4AE			
PAH-16MS										
Acenaphthene _A ^{M#}	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	mg/kg	0.01	A-T-019s

Envirolab Job Number: 25/07591

Client Project Name: Halsnead Farm

Client Project Ref: B087052

Lab Sample ID	25/07591/1	25/07591/2	25/07591/3	25/07591/4	25/07591/5	25/07591/6	25/07591/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS01	WS02	WS03	WS04	WS05	TP02	TP05			
Depth to Top	0.10	0.60	0.50	0.40	0.15	0.20	0.50			
Depth To Bottom										
Date Sampled	08-Jul-25	08-Jul-25	08-Jul-25	08-Jul-25	08-Jul-25	09-Jul-25	09-Jul-25			
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES			
Sample Matrix Code	4AE	4AE	4AE	4AE	4AE	4AE	4AE			
TPH CWG with Clean Up										
Ali >C5-C6 _A	<0.01	<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	<0.01	mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C21-C35 _A ^{M#}	19	<1	<1	2	7	<1	6	mg/kg	1	A-T-055s
Total Aliphatics _A	19	<1	<1	2	7	<1	6	mg/kg	1	Calc-As Recd
Aro >C5-C7 _A [#]	<0.01	<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	<0.01	mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	2	<1	<1	<1	2	<1	2	mg/kg	1	A-T-055s
Aro >C10-C12 _A	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Aro >C12-C16 _A	1	<1	<1	<1	<1	<1	1	mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	1	<1	<1	<1	1	<1	2	mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	3	<1	<1	<1	3	<1	4	mg/kg	1	A-T-055s
Total Aromatics _A	8	<1	<1	<1	6	<1	10	mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C35) _A	27	<1	<1	2	14	<1	16	mg/kg	1	Calc-As Recd
BTEX - Benzene _A [#]	<0.01	<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	<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	<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	<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	<0.01	mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s

Envirolab Job Number: 25/07591

Client Project Name: Halsnead Farm

Client Project Ref: B087052

Lab Sample ID	25/07591/8	25/07591/9	25/07591/10	25/07591/11	25/07591/12	25/07591/13	25/07591/14	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP06	TP08	WS06	WS07	WS09	WS08	WS10			
Depth to Top	0.50	0.30	0.25	0.80	0.50	0.70	0.15			
Depth To Bottom										
Date Sampled	09-Jul-25	09-Jul-25	10-Jul-25	10-Jul-25	10-Jul-25	10-Jul-25	10-Jul-25			
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES			
Sample Matrix Code	4A	4AE	4AE	4AE	4AE	1A	4AE			
% Moisture at <40C _A	8.5	8.4	7.2	3.6	8.3	7.6	9.3	% w/w	0.1	A-T-044
% Stones >10mm _A	1.8	1.1	2.0	<0.1	<0.1	<0.1	<0.1	% w/w	0.1	A-T-044
pH _D ^{M#}	5.75	7.03	5.86	5.57	5.66	5.64	5.77	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	g/l	0.01	A-T-026s
Cyanide (total) _A ^{M#}	<1	<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	<0.2	mg/kg	0.2	A-T-050s
Organic Matter _D ^{M#}	0.34	2.30	1.84	1.29	2.41	2.28	2.59	% w/w	0.14	A-T-032s
Arsenic _D ^{M#}	5	10	9	7	9	9	10	mg/kg	1	A-T-024s
Boron (water soluble) _D ^{M#}	<1.0	<1.0	<1.0	<1.0	<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	<1.0	mg/kg	1	A-T-024s
Copper _D ^{M#}	10	40	32	28	44	42	48	mg/kg	1	A-T-024s
Chromium _D ^{M#}	7	13	18	12	15	15	16	mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-040s
Lead _D ^{M#}	10	44	36	27	46	43	49	mg/kg	1	A-T-024s
Mercury _D	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	11	12	14	11	13	13	13	mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1	<1	<1	1	<1	<1	mg/kg	1	A-T-024s
Zinc _D ^{M#}	23	69	55	46	62	59	73	mg/kg	1	A-T-024s

Envirolab Job Number: 25/07591

Client Project Name: Halsnead Farm

Client Project Ref: B087052

Lab Sample ID	25/07591/8	25/07591/9	25/07591/10	25/07591/11	25/07591/12	25/07591/13	25/07591/14	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP06	TP08	WS06	WS07	WS09	WS08	WS10			
Depth to Top	0.50	0.30	0.25	0.80	0.50	0.70	0.15			
Depth To Bottom										
Date Sampled	09-Jul-25	09-Jul-25	10-Jul-25	10-Jul-25	10-Jul-25	10-Jul-25	10-Jul-25			
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES			
Sample Matrix Code	4A	4AE	4AE	4AE	4AE	1A	4AE			
Asbestos in Soil (inc. matrix)										
Asbestos in soil _D [#]	NAD	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	N/A			A-T-045

Envirolab Job Number: 25/07591

Client Project Name: Halsnead Farm

Client Project Ref: B087052

Lab Sample ID	25/07591/8	25/07591/9	25/07591/10	25/07591/11	25/07591/12	25/07591/13	25/07591/14	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP06	TP08	WS06	WS07	WS09	WS08	WS10			
Depth to Top	0.50	0.30	0.25	0.80	0.50	0.70	0.15			
Depth To Bottom										
Date Sampled	09-Jul-25	09-Jul-25	10-Jul-25	10-Jul-25	10-Jul-25	10-Jul-25	10-Jul-25			
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES			
Sample Matrix Code	4A	4AE	4AE	4AE	4AE	1A	4AE			
PAH-16MS										
Acenaphthene _A ^{M#}	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	<0.04	<0.04	<0.04	<0.04	0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	<0.04	0.04	<0.04	<0.04	0.05	<0.04	0.06	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	<0.05	0.06	<0.05	<0.05	0.08	<0.05	0.07	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	<0.06	0.06	<0.06	<0.06	0.08	<0.06	0.07	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	<0.08	0.09	<0.08	<0.08	0.10	<0.08	<0.08	mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	<0.03	0.04	<0.03	<0.03	0.04	<0.03	0.04	mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	<0.03	0.04	<0.03	<0.03	0.04	<0.03	0.03	mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	<0.07	0.10	<0.07	<0.07	0.10	<0.07	0.09	mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	<0.08	0.43	<0.08	<0.08	0.53	<0.08	0.36	mg/kg	0.01	A-T-019s

Envirolab Job Number: 25/07591

Client Project Name: Halsnead Farm

Client Project Ref: B087052

Lab Sample ID	25/07591/8	25/07591/9	25/07591/10	25/07591/11	25/07591/12	25/07591/13	25/07591/14	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP06	TP08	WS06	WS07	WS09	WS08	WS10			
Depth to Top	0.50	0.30	0.25	0.80	0.50	0.70	0.15			
Depth To Bottom										
Date Sampled	09-Jul-25	09-Jul-25	10-Jul-25	10-Jul-25	10-Jul-25	10-Jul-25	10-Jul-25			
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES			
Sample Matrix Code	4A	4AE	4AE	4AE	4AE	1A	4AE			
TPH CWG with Clean Up										
Ali >C5-C6 _A	<0.01	<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	<0.01	mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C21-C35 _A ^{M#}	<1	10	<1	<1	7	<1	6	mg/kg	1	A-T-055s
Total Aliphatics _A	<1	10	<1	<1	7	<1	6	mg/kg	1	Calc-As Recd
Aro >C5-C7 _A [#]	<0.01	<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	<0.01	mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	<1	2	<1	<1	2	<1	2	mg/kg	1	A-T-055s
Aro >C10-C12 _A	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Aro >C12-C16 _A	<1	1	<1	<1	1	<1	1	mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	<1	2	<1	<1	2	<1	2	mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	<1	6	<1	<1	4	<1	4	mg/kg	1	A-T-055s
Total Aromatics _A	<1	12	<1	<1	10	<1	10	mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C35) _A	<1	22	<1	<1	16	<1	15	mg/kg	1	Calc-As Recd
BTEX - Benzene _A [#]	<0.01	<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	<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	<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	<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	<0.01	mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s

Envirolab Job Number: 25/07591

Client Project Name: Halsnead Farm

Client Project Ref: B087052

Lab Sample ID	25/07591/15	25/07591/16						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS12	WS11								
Depth to Top	0.75	0.30								
Depth To Bottom										
Date Sampled	11-Jul-25	11-Jul-25								
Sample Type	SOIL - ES	SOIL - ES								
Sample Matrix Code	4AE	4AE								
% Moisture at <40C _A	5.2	7.9						% w/w	0.1	A-T-044
% Stones >10mm _A	<0.1	<0.1						% w/w	0.1	A-T-044
pH _D ^{M#}	5.70	4.95						pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	<0.01	<0.01						g/l	0.01	A-T-026s
Cyanide (total) _A ^{M#}	<1	<1						mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2						mg/kg	0.2	A-T-050s
Organic Matter _D ^{M#}	1.17	2.38						% w/w	0.14	A-T-032s
Arsenic _D ^{M#}	2	7						mg/kg	1	A-T-024s
Boron (water soluble) _D ^{M#}	<1.0	<1.0						mg/kg	1	A-T-027s
Cadmium _D	<1.0	1.2						mg/kg	1	A-T-024s
Copper _D ^{M#}	10	39						mg/kg	1	A-T-024s
Chromium _D ^{M#}	6	13						mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1						mg/kg	1	A-T-040s
Lead _D ^{M#}	10	59						mg/kg	1	A-T-024s
Mercury _D	<0.17	<0.17						mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	4	11						mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1						mg/kg	1	A-T-024s
Zinc _D ^{M#}	17	65						mg/kg	1	A-T-024s

Envirolab Job Number: 25/07591

Client Project Name: Halsnead Farm

Client Project Ref: B087052

Lab Sample ID	25/07591/15	25/07591/16						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS12	WS11								
Depth to Top	0.75	0.30								
Depth To Bottom										
Date Sampled	11-Jul-25	11-Jul-25								
Sample Type	SOIL - ES	SOIL - ES								
Sample Matrix Code	4AE	4AE								
Asbestos in Soil (inc. matrix)										
Asbestos in soil _D [#]	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								A-T-045

Envirolab Job Number: 25/07591

Client Project Name: Halsnead Farm

Client Project Ref: B087052

Lab Sample ID	25/07591/15	25/07591/16						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS12	WS11								
Depth to Top	0.75	0.30								
Depth To Bottom										
Date Sampled	11-Jul-25	11-Jul-25								
Sample Type	SOIL - ES	SOIL - ES								
Sample Matrix Code	4AE	4AE								
PAH-16MS										
Acenaphthene _A ^{M#}	<0.01	<0.01						mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	<0.01	<0.01						mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	<0.02	<0.02						mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	<0.04	<0.04						mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	<0.04	<0.04						mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	<0.05	<0.05						mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	<0.05	<0.05						mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	<0.07	<0.07						mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	<0.06	0.08						mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	<0.04	<0.04						mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	<0.08	0.10						mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	<0.01	<0.01						mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	<0.03	<0.03						mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	<0.03						mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	<0.03	<0.03						mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	<0.07	0.12						mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	<0.08	0.30						mg/kg	0.01	A-T-019s

Envirolab Job Number: 25/07591

Client Project Name: Halsnead Farm

Client Project Ref: B087052

Lab Sample ID	25/07591/15	25/07591/16								
Client Sample No										
Client Sample ID	WS12	WS11								
Depth to Top	0.75	0.30								
Depth To Bottom										
Date Sampled	11-Jul-25	11-Jul-25								
Sample Type	SOIL - ES	SOIL - ES								
Sample Matrix Code	4AE	4AE								
TPH CWG with Clean Up										
Ali >C5-C6 _A	<0.01	<0.01						mg/kg	0.01	A-T-022s
Ali >C6-C8 _A	<0.01	<0.01						mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	<1						mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	<1						mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	<1	<1						mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	<1	<1						mg/kg	1	A-T-055s
Ali >C21-C35 _A ^{M#}	2	5						mg/kg	1	A-T-055s
Total Aliphatics _A	2	5						mg/kg	1	Calc-As Recd
Aro >C5-C7 _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	<1	2						mg/kg	1	A-T-055s
Aro >C10-C12 _A	<1	<1						mg/kg	1	A-T-055s
Aro >C12-C16 _A	<1	<1						mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	<1	2						mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	<1	4						mg/kg	1	A-T-055s
Total Aromatics _A	<1	9						mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C35) _A	2	14						mg/kg	1	Calc-As Recd
BTEX - Benzene _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
MTBE _A [#]	<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 “A”	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°C / 11550µS/cm @ 20°C 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 No:	25/07591
Project:	Halsnead Farm	Date Received:	14/07/2025 (am)
Clients Project No:	B087052	Cool Box Temperatures (°C):	23.3, 23.2, 22.9

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	25/07591/1	25/07591/2	25/07591/3	25/07591/4	25/07591/5	25/07591/6	25/07591/7	25/07591/8	25/07591/9	25/07591/10	25/07591/11	25/07591/12
Client Sample No												
Client Sample ID/Depth	WS01 0.10m	WS02 0.60m	WS03 0.50m	WS04 0.40m	WS05 0.15m	TP02 0.20m	TP05 0.50m	TP06 0.50m	TP08 0.30m	WS06 0.25m	WS07 0.80m	WS09 0.50m
Date Sampled	08/07/25	08/07/25	08/07/25	08/07/25	08/07/25	09/07/25	09/07/25	09/07/25	09/07/25	10/07/25	10/07/25	10/07/25
A-T-019s	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025
A-T-022s	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025
A-T-024s	24/07/2025	24/07/2025	24/07/2025	24/07/2025	24/07/2025	24/07/2025	24/07/2025	24/07/2025	24/07/2025	24/07/2025	24/07/2025	24/07/2025
A-T-026s	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025
A-T-027s	24/07/2025	24/07/2025	24/07/2025	24/07/2025	24/07/2025	24/07/2025	24/07/2025	24/07/2025	24/07/2025	24/07/2025	24/07/2025	24/07/2025
A-T-031s	22/07/2025	22/07/2025	22/07/2025	22/07/2025	22/07/2025	22/07/2025	22/07/2025	22/07/2025	22/07/2025	22/07/2025	22/07/2025	22/07/2025
A-T-032s	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025
A-T-040s	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025
A-T-042sTCN	24/07/2025	24/07/2025	24/07/2025	24/07/2025	24/07/2025	24/07/2025	24/07/2025	24/07/2025	24/07/2025	24/07/2025	24/07/2025	24/07/2025
A-T-044	22/07/2025	22/07/2025	22/07/2025	22/07/2025	22/07/2025	22/07/2025	22/07/2025	22/07/2025	22/07/2025	22/07/2025	22/07/2025	22/07/2025
A-T-045	17/07/2025	17/07/2025	17/07/2025	17/07/2025	17/07/2025	17/07/2025	17/07/2025	17/07/2025	17/07/2025	17/07/2025	17/07/2025	17/07/2025
A-T-050s	25/07/2025	25/07/2025	25/07/2025	25/07/2025	25/07/2025	25/07/2025	25/07/2025	25/07/2025	25/07/2025	25/07/2025	25/07/2025	25/07/2025
A-T-055s	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025
Calc-As Recd	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025

Lab Sample ID	25/07591/13	25/07591/14	25/07591/15	25/07591/16
Client Sample No				
Client Sample ID/Depth	WS08 0.70m	WS10 0.15m	WS12 0.75m	WS11 0.30m
Date Sampled	10/07/25	10/07/25	11/07/25	11/07/25
A-T-019s	23/07/2025	23/07/2025	23/07/2025	23/07/2025
A-T-022s	23/07/2025	23/07/2025	23/07/2025	23/07/2025
A-T-024s	24/07/2025	24/07/2025	24/07/2025	24/07/2025
A-T-026s	23/07/2025	23/07/2025	23/07/2025	23/07/2025
A-T-027s	24/07/2025	24/07/2025	24/07/2025	24/07/2025
A-T-031s	22/07/2025	22/07/2025	22/07/2025	22/07/2025
A-T-032s	23/07/2025	23/07/2025	23/07/2025	23/07/2025
A-T-040s	23/07/2025	23/07/2025	23/07/2025	23/07/2025
A-T-042sTCN	24/07/2025	24/07/2025	24/07/2025	24/07/2025
A-T-044	22/07/2025	22/07/2025	22/07/2025	22/07/2025
A-T-045	17/07/2025	17/07/2025	17/07/2025	17/07/2025
A-T-050s	25/07/2025	25/07/2025	25/07/2025	25/07/2025
A-T-055s	23/07/2025	23/07/2025	23/07/2025	23/07/2025
Calc-As Recd	23/07/2025	23/07/2025	23/07/2025	23/07/2025

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

Curtins
17-19 Whitworth Street West
Manchester

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

Analytical Report Number : 25-037554

Project / Site name:	Halsnead Farm	Samples received on:	14/07/2025
Your job number:	B087052	Samples instructed on/ Analysis started on:	16/07/2025
Your order number:	25065	Analysis completed by:	22/07/2025
Report Issue Number:	1	Report issued on:	22/07/2025
Samples Analysed:	9 soil samples		

Signed: _____

Rachel Chappell
Key Account Manager
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

Excel copies of reports are only valid when accompanied by this PDF certificate.

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.

Analytical Report Number: 25-037554
Project / Site name: Halsnead Farm
Your Order No: 25065

Lab Sample Number	615607	615608	615609	615610	615611
Sample Reference	WS02	WS05	WS05	TP02	TP05
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)	0.70-1.00	0.50-0.90	1.10	1.60-1.90	1.50-1.70
Date Sampled	08/07/2025	08/07/2025	08/07/2025	09/07/2025	09/07/2025
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	21.9	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	3.7	2.6	2.1	8.5	6.9
Total mass of sample received	kg	0.1	NONE	0.3	0.3	0.4	0.4	0.3

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	6.6	7	8.7	8.9	7.9
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	9.4	10	8.9	11	12
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	4.69	5.17	4.43	5.25	6

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

Analytical Report Number: 25-037554
 Project / Site name: Halsnead Farm
 Your Order No: 25065

Lab Sample Number				615612	615613	615614	615615
Sample Reference				TP08	WS10	WS11	WS12
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A	N/A
Depth (m)				1.70-2.00	1.20-1.65	2.55-2.65	1.20-1.65
Date Sampled				09/07/2025	10/07/2025	11/07/2025	11/07/2025
Time Taken				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
Moisture Content	%	0.01	NONE	4.1	9.2	3.8	12
Total mass of sample received	kg	0.1	NONE	0.3	0.1	0.5	0.3

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	7.9	7.4	7.5	7.5
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	11	10	29	14
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	5.7	5.13	14.6	7.17

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

Analytical Report Number : 25-037554

Project / Site name: Halsnead Farm

* 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 *
615607	WS02	None Supplied	0.70-1.00	Brown loam and sand with gravel and vegetation
615608	WS05	None Supplied	0.50-0.90	Brown loam and sand with stones and vegetation
615609	WS05	None Supplied	1.1	Brown sand with gravel
615610	TP02	None Supplied	1.60-1.90	Brown clay and sand with gravel
615611	TP05	None Supplied	1.50-1.70	Brown sand with gravel
615612	TP08	None Supplied	1.70-2.00	Brown sand with gravel
615613	WS10	None Supplied	1.20-1.65	Brown clay and sand with gravel
615614	WS11	None Supplied	2.55-2.65	Brown sand with gravel
615615	WS12	None Supplied	1.20-1.65	Brown sand with gravel

Analytical Report Number : 25-037554

Project / Site name: Halsnead Farm

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	Moisture content, determined gravimetrically (up to 30°C)	In-house method	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
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	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 30°C.

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

Appendix D – Geotechnical Laboratory Test Results



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

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



Environmental Science

4041

Client: Curtins
Client Address: 17-19 Whitworth Street West, Manchester

Client Reference: B087052
Job Number: 25-037553-1
Date Sampled: 08/07/2025
Date Received: 14/07/2025
Date Tested: 22/07/2025
Sampled By: Not Given

Contact: Lucy Woods
Site Address: Halsnead Farm

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

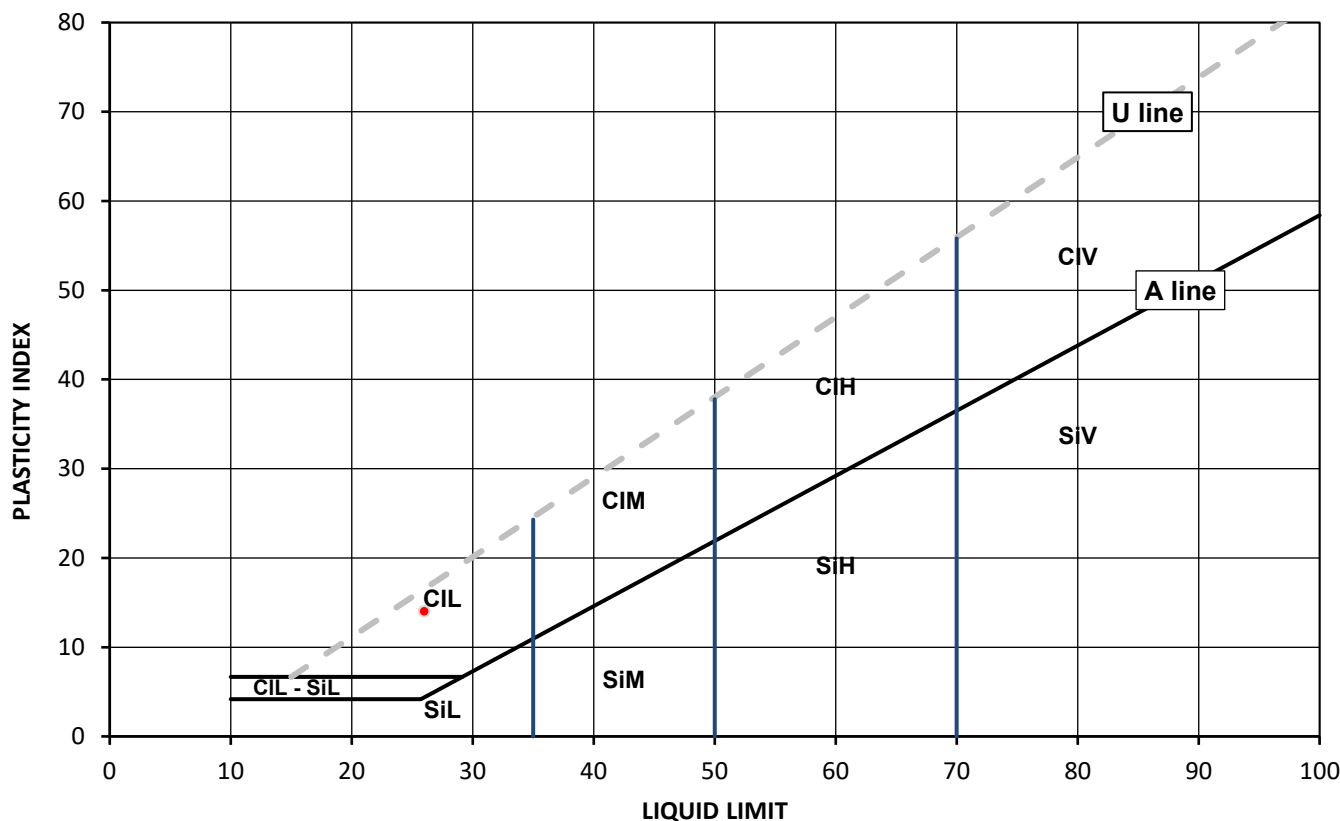
Test Results:

Laboratory Reference: 615597
Hole No.: WS01
Sample Reference: Not Given
Sample Description: Orangish brown very sandy CLAY

Depth Top [m]: 2.00
Depth Base [m]: 2.45
Sample Type: D

Sample Preparation: Tested in natural condition; 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
11.8	26	12	14	0.00	1.00	100



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

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

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

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



Environmental Science

4041

Client: Curtins
Client Address: 17-19 Whitworth Street West, Manchester

Client Reference: B087052
Job Number: 25-037553-1
Date Sampled: 08/07/2025
Date Received: 14/07/2025
Date Tested: 22/07/2025
Sampled By: Not Given

Contact: Lucy Woods
Site Address: Halsnead Farm

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

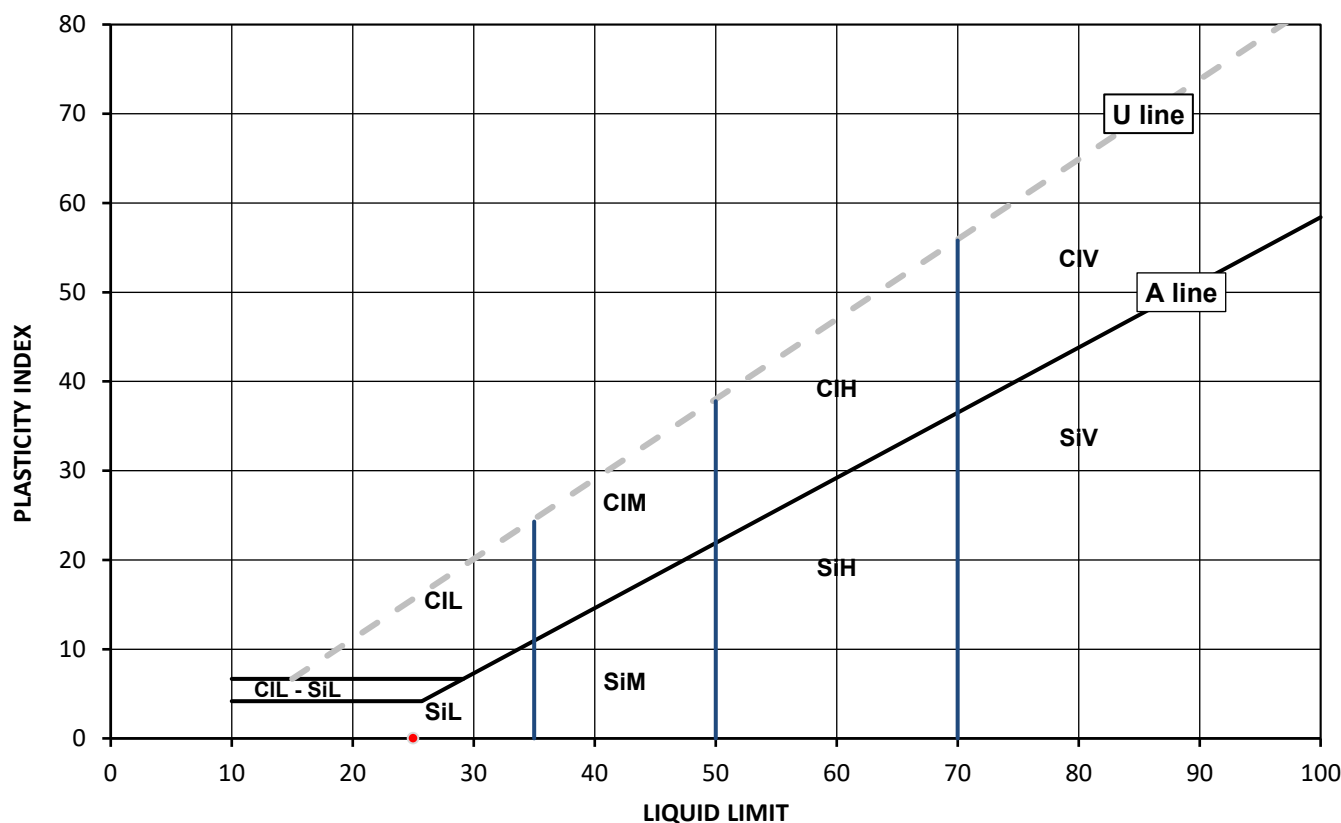
Test Results:

Laboratory Reference: 615599
Hole No.: WS03
Sample Reference: Not Given
Sample Description: Orangish brown SAND

Depth Top [m]: 2.00
Depth Base [m]: 2.45
Sample Type: D

Sample Preparation: Tested in natural condition; 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
12.5	25	NP	NP	N/A	N/A	100



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: NP - non plastic.

Signed:

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

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



Environmental Science

4041

Client: Curtins
Client Address: 17-19 Whitworth Street West, Manchester

Client Reference: B087052
Job Number: 25-037553-1
Date Sampled: 10/07/2025
Date Received: 14/07/2025
Date Tested: 22/07/2025
Sampled By: Not Given

Contact: Lucy Woods
Site Address: Halsnead Farm

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

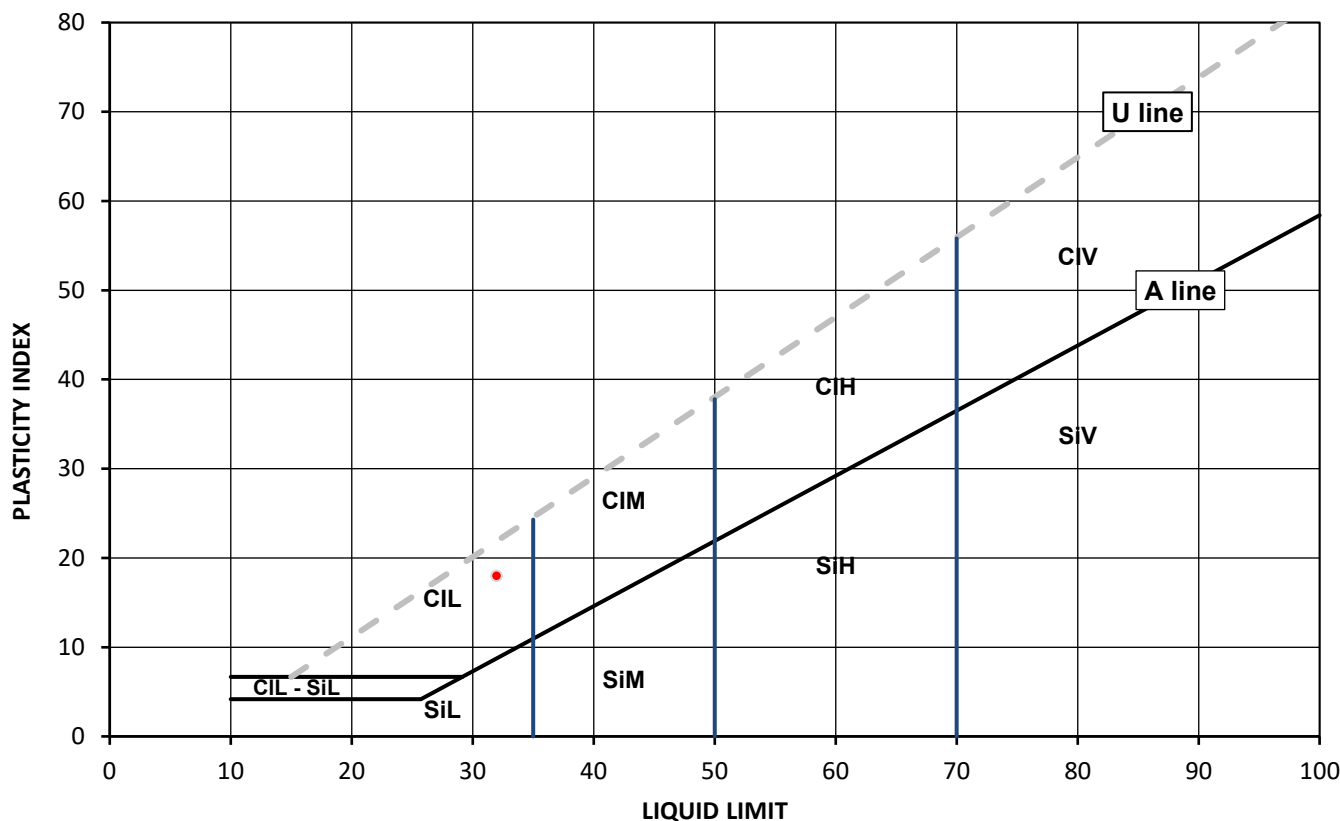
Test Results:

Laboratory Reference: 615604
Hole No.: WS10
Sample Reference: Not Given
Sample Description: Brown slightly gravelly very sandy CLAY

Depth Top [m]: 1.20
Depth Base [m]: 1.65
Sample Type: D

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
13.2	32	14	18	-0.06	1.06	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

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

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



Environmental Science

4041

Client: Curtins
Client Address: 17-19 Whitworth Street West, Manchester

Client Reference: B087052
Job Number: 25-037553-1
Date Sampled: 11/07/2025
Date Received: 14/07/2025
Date Tested: 22/07/2025
Sampled By: Not Given

Contact: Lucy Woods
Site Address: Halsnead Farm

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

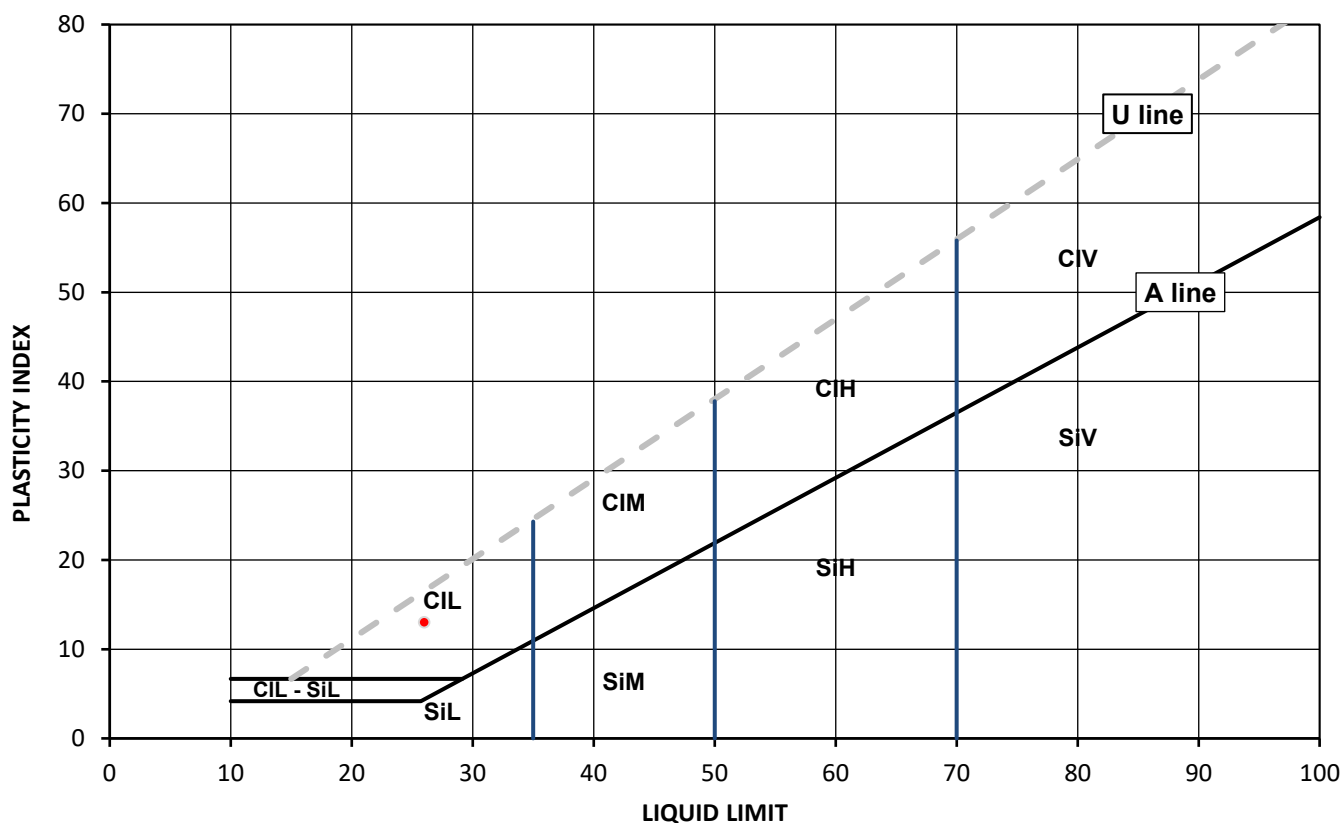
Test Results:

Laboratory Reference: 615605
Hole No.: WS11
Sample Reference: Not Given
Sample Description: Brown slightly gravelly very sandy CLAY

Depth Top [m]: 2.00
Depth Base [m]: 2.45
Sample Type: D

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
16.9	26	13	13	0.31	0.69	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 CIHO)

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

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

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



Environmental Science

4041

Client: Curtins
Client Address: 17-19 Whitworth Street West, Manchester

Client Reference: B087052
Job Number: 25-037553-1
Date Sampled: 11/07/2025
Date Received: 14/07/2025
Date Tested: 22/07/2025
Sampled By: Not Given

Contact: Lucy Woods
Site Address: Halsnead Farm

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

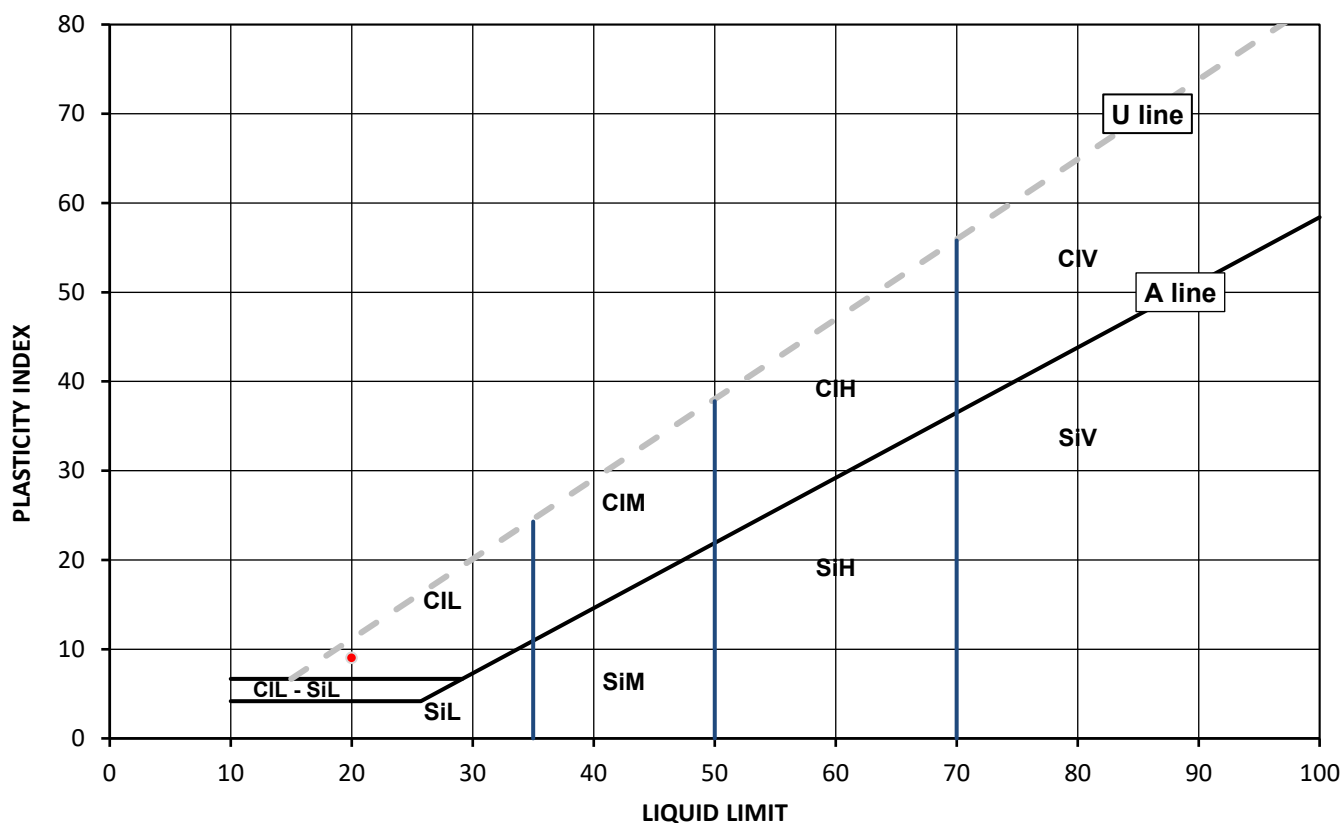
Test Results:

Laboratory Reference: 615606
Hole No.: WS12
Sample Reference: Not Given
Sample Description: Yellowish brown slightly gravelly clayey SAND

Depth Top [m]: 2.00
Depth Base [m]: 2.45
Sample Type: D

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
10.0	20	11	9	-0.11	1.11	92



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

	Plasticity	Liquid Limit
Cl	Clay	below 35
Si	Silt	35 to 50
	L	Low
	M	Medium
	H	High
	V	Very high
	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

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.



SUMMARY REPORT

SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with:

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



Environmental Science

4041

Client: Curtins

Client Address:

17-19 Whitworth Street West, Manchester

Contact: Lucy Woods

Site Address: Halsnead Farm

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

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.

Client Reference: B087052

Job Number: 25-037553-1

Date Sampled: 08/07 - 11/07/2025

Date Received: 14/07/2025

Date Tested: 22/07/2025

Sampled By: Not Given

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	W	Liquid & Plastic Limit							Density		
		Reference	Depth Top	Depth Base	Type				% Passing 425um	WL*	Correlation Factor	Wp	Ip	Cone type	Sample Preparation	bulk	dry	PD
			m	m					%	%		%	%			Mg/m3	Mg/m3	Mg/m
615597	WS01	Not Given	2.00	2.45	D	Orangish brown very sandy CLAY	Atterberg 4 Point	11.8	100	26	-	12	14	80g/30 deg	N / I			
615599	WS03	Not Given	2.00	2.45	D	Orangish brown SAND	Atterberg 4 Point	12.5	100	25	-	NP	NP	80g/30 deg	N / I			
615604	WS10	Not Given	1.20	1.65	D	Brown slightly gravelly very sandy CLAY	Atterberg 4 Point	13.2	90	32	-	14	18	80g/30 deg	R / I			
615605	WS11	Not Given	2.00	2.45	D	Brown slightly gravelly very sandy CLAY	Atterberg 4 Point	16.9	91	26	-	13	13	80g/30 deg	R / I			
615606	WS12	Not Given	2.00	2.45	D	Yellowish brown slightly gravelly clayey SAND	Atterberg 4 Point	10.0	92	20	-	11	9	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:

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.

Signed:



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



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

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



Environmental Science

4041
Client: Curtins
Client Address: 17-19 Whitworth Street West, Manchester

Contact: Lucy Woods
Site Address: Halsnead Farm

Client Reference: B087052
Job Number: 25-037553-1
Date Sampled: 08/07 - 11/07/2025
Date Received: 14/07/2025
Date Tested: 22/07/2025
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														
615597	WS01	Not Given	2.00	2.45	D	Orangish brown very sandy CLAY		11.8											
615599	WS03	Not Given	2.00	2.45	D	Orangish brown SAND		12.5											
615604	WS10	Not Given	1.20	1.65	D	Brown slightly gravelly very sandy CLAY		13.2											
615605	WS11	Not Given	2.00	2.45	D	Brown slightly gravelly very sandy CLAY		16.9											
615606	WS12	Not Given	2.00	2.45	D	Yellowish brown slightly gravelly clayey SAND		10.0											

Comments:

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.

Signed:



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



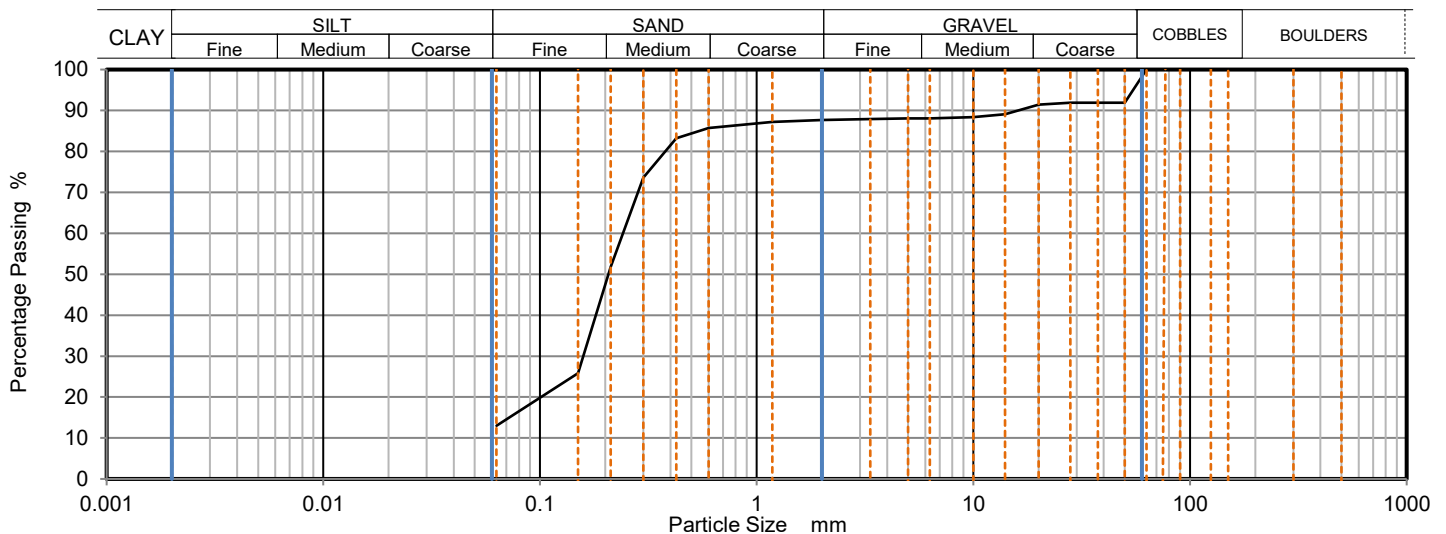
4041

TEST CERTIFICATE**DETERMINATION OF PARTICLE
SIZE DISTRIBUTION**Tested in Accordance with: BS EN ISO 17892-4:2016,
BS 1377-2:2022 cl. 10i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Client: Curtins
Client Address: 17-19 Whitworth Street West, ManchesterClient Reference: B087052
Job Number: 25-037553-1
Date Sampled: 08/07/2025
Date Received: 14/07/2025
Date Tested: 22/07/2025
Sampled By: Not GivenContact: Lucy Woods
Site Address: Halsnood Farm

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

Test Results:Laboratory Reference: 615598
Hole No.: WS02
Sample Reference: Not Given
Sample Description: Brown gravelly clayey SAND
Sample Preparation: Sample was whole tested, oven dried at 108.5 °C and broken down by hand.Depth Top [m]: 0.70
Depth Base [m]: 1.00
Sample Type: B

Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	92		
37.5	92		
28	92		
20	91		
14	89		
10	88		
6.3	88		
5	88		
3.35	88		
2	88		
1.18	87		
0.6	86		
0.425	83		
0.3	74		
0.212	52		
0.15	26		
0.063	13		

Sample Proportions	% dry mass
Very coarse	0
Gravel	12
Sand	75
Fines <0.063 mm	13

Grading Analysis	
D100	mm 63
D60	mm 0.242
D30	mm 0.159
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with ISO 17892 -4, by sieving on as received or wet sample

Remarks:

Signed:

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.



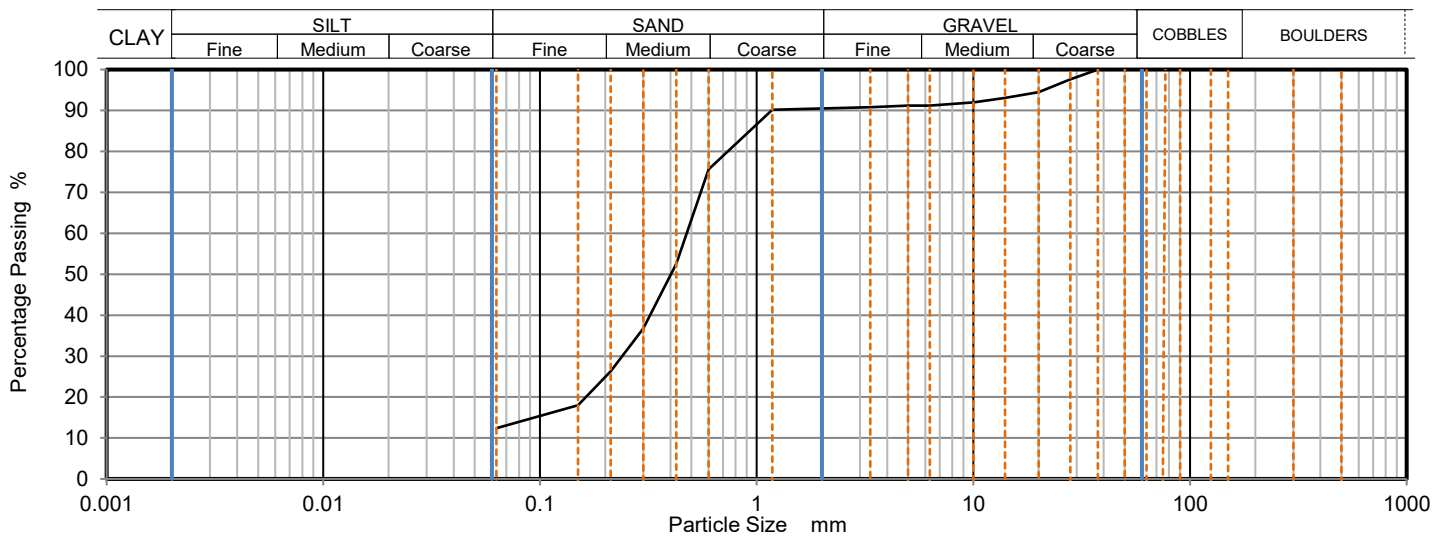
4041

**TEST CERTIFICATE****DETERMINATION OF PARTICLE
SIZE DISTRIBUTION**Tested in Accordance with: BS EN ISO 17892-4:2016,
BS 1377-2:2022 cl. 10i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Client: Curtins
Client Address: 17-19 Whitworth Street West, ManchesterClient Reference: B087052
Job Number: 25-037553-1
Date Sampled: 08/07/2025
Date Received: 14/07/2025
Date Tested: 22/07/2025
Sampled By: Not GivenContact: Lucy Woods
Site Address: Halsnood Farm

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

Test Results:Laboratory Reference: 615600
Hole No.: WS05
Sample Reference: Not Given
Sample Description: Orangish brown gravelly clayey SAND
Sample Preparation: Sample was whole tested, oven dried at 108.5 °C and broken down by hand.Depth Top [m]: 0.50
Depth Base [m]: 0.90
Sample Type: B

Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	98		
20	95		
14	93		
10	92		
6.3	91		
5	91		
3.35	91		
2	91		
1.18	90		
0.6	76		
0.425	53		
0.3	37		
0.212	26		
0.15	18		
0.063	12		

Sample Proportions	% dry mass
Very coarse	0
Gravel	9
Sand	79
Fines <0.063 mm	12

Grading Analysis		
D100	mm	37.5
D60	mm	0.475
D30	mm	0.24
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Uniformity and Curvature Coefficient calculated in accordance
with BS EN ISO 14688-2:2018

Note: Tested in Accordance with ISO 17892 -4, by sieving on as received or wet sample

Remarks:

Signed:

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 PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS EN ISO 17892-4:2016,
BS 1377-2:2022 cl. 10

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



Environmental Science

4041

Client: Curtins
Client Address: 17-19 Whitworth Street West, Manchester

Client Reference: B087052
Job Number: 25-037553-1
Date Sampled: 09/07/2025
Date Received: 14/07/2025
Date Tested: 22/07/2025
Sampled By: Not Given

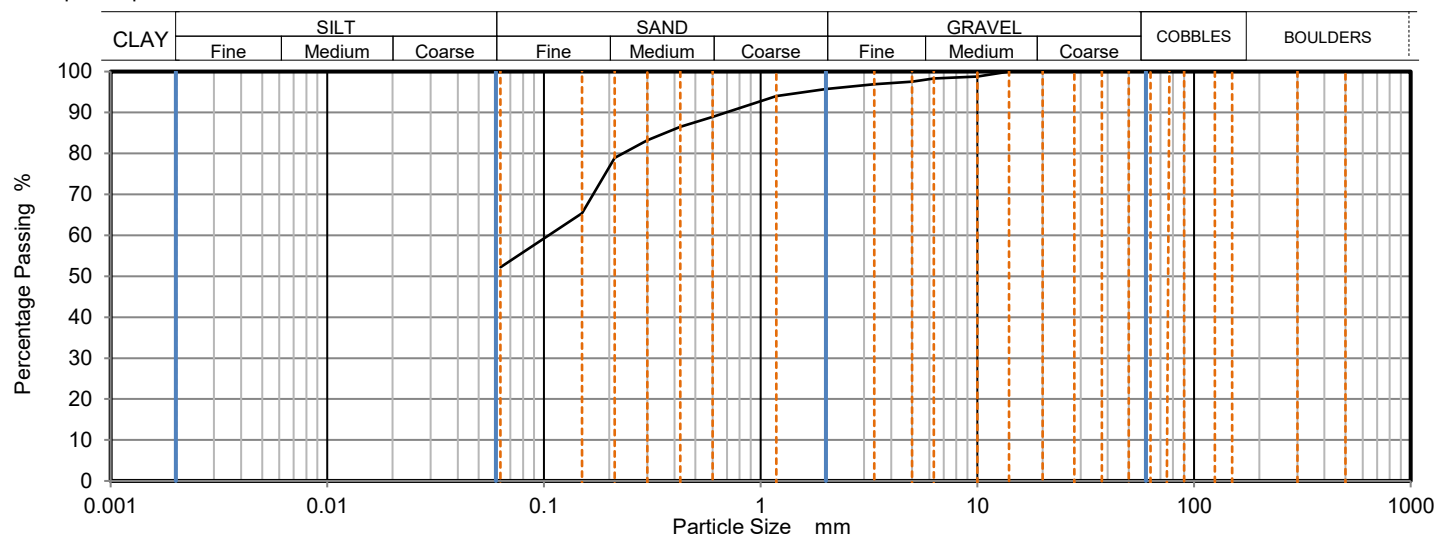
Contact: Lucy Woods
Site Address: Halsnood Farm

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

Test Results:

Laboratory Reference: 615601
Hole No.: TP02
Sample Reference: Not Given
Sample Description: Reddish brown slightly gravelly sandy CLAY
Sample Preparation: Sample was quartered, oven dried at 108.1 °C and broken down by hand.

Depth Top [m]: 1.60
Depth Base [m]: 1.90
Sample Type: B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	99		
6.3	98		
5	98		
3.35	97		
2	96		
1.18	94		
0.6	89		
0.425	87		
0.3	83		
0.212	79		
0.15	65		
0.063	52		

Sample Proportions	% dry mass
Very coarse	0
Gravel	4
Sand	44
Fines <0.063 mm	52

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with ISO 17892 -4, by sieving on as received or wet sample

Remarks:

Signed:

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.



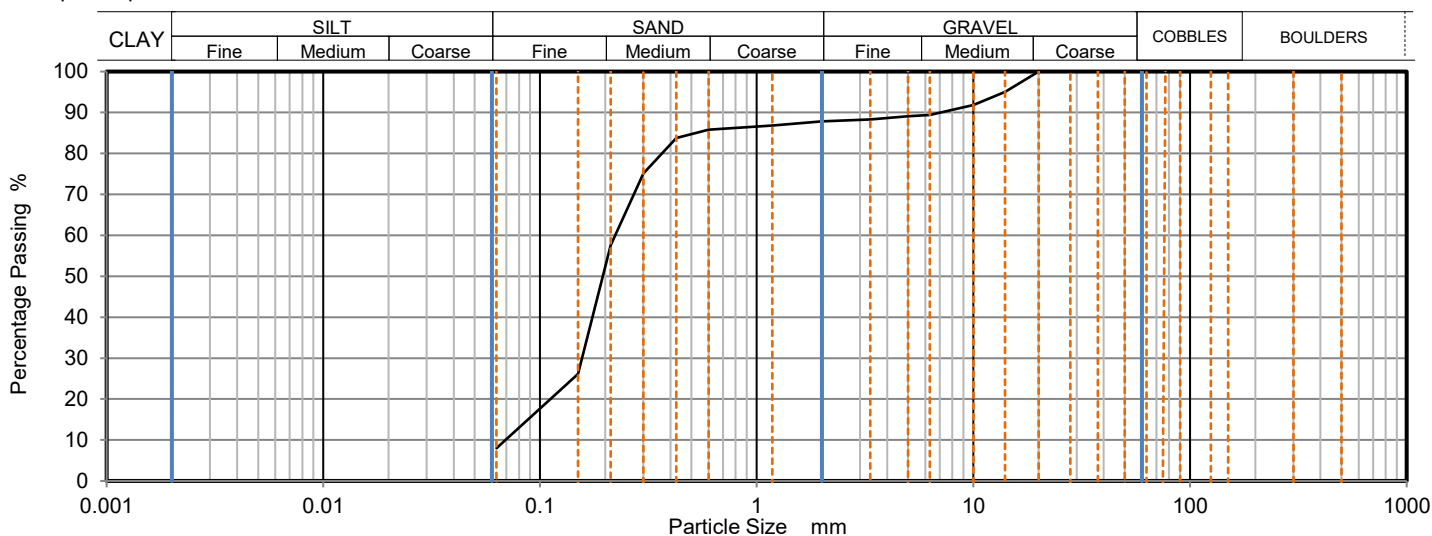
4041

**TEST CERTIFICATE****DETERMINATION OF PARTICLE
SIZE DISTRIBUTION**Tested in Accordance with: BS EN ISO 17892-4:2016,
BS 1377-2:2022 cl. 10i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Client: Curtins
Client Address: 17-19 Whitworth Street West, ManchesterClient Reference: B087052
Job Number: 25-037553-1
Date Sampled: 09/07/2025
Date Received: 14/07/2025
Date Tested: 22/07/2025
Sampled By: Not GivenContact: Lucy Woods
Site Address: Halsnood Farm

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

Test Results:Laboratory Reference: 615602
Hole No.: TP05
Sample Reference: Not Given
Sample Description: Brown gravelly clayey SAND
Sample Preparation: Sample was quartered, oven dried at 108.5 °C and broken down by hand.Depth Top [m]: 1.50
Depth Base [m]: 1.70
Sample Type: B

Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	95		
10	92		
6.3	89		
5	89		
3.35	88		
2	88		
1.18	87		
0.6	86		
0.425	84		
0.3	75		
0.212	58		
0.15	26		
0.063	8		

Sample Proportions	% dry mass
Very coarse	0
Gravel	12
Sand	80
Fines <0.063 mm	8

Grading Analysis	
D100	mm 20
D60	mm 0.222
D30	mm 0.157
D10	mm 0.0695
Uniformity Coefficient	3.2
Curvature Coefficient	1.6

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with ISO 17892 -4, by sieving on as received or wet sample

Remarks:

Signed:

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.



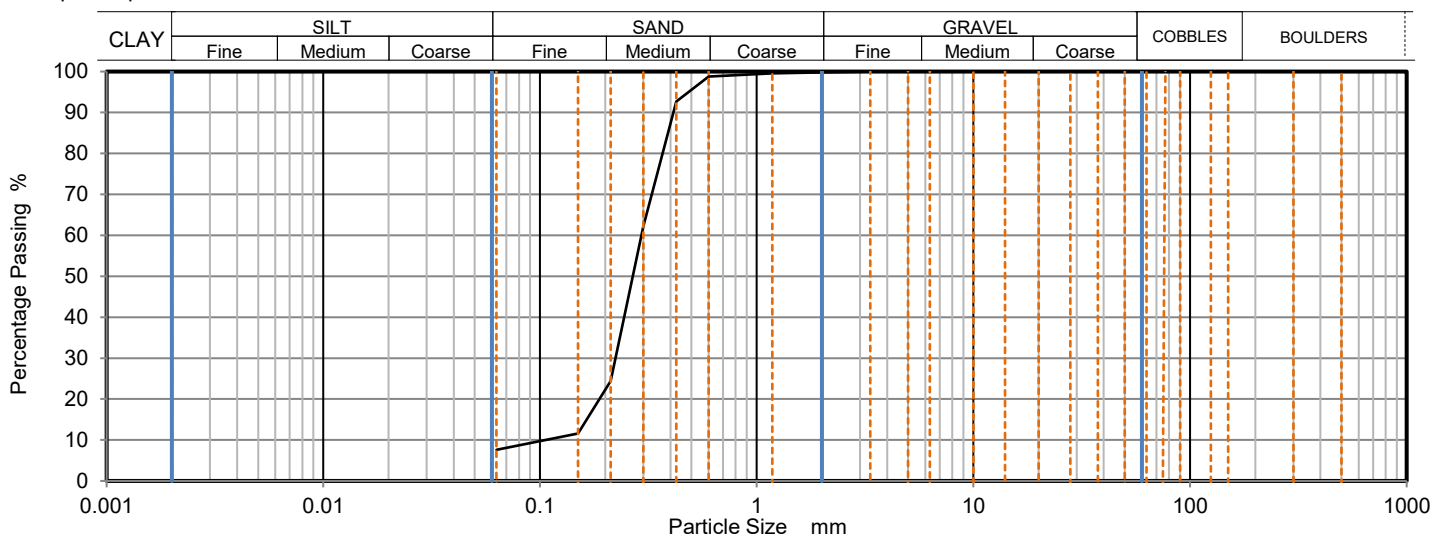
4041

**TEST CERTIFICATE****DETERMINATION OF PARTICLE
SIZE DISTRIBUTION**Tested in Accordance with: BS EN ISO 17892-4:2016,
BS 1377-2:2022 cl. 10i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Client: Curtins
Client Address: 17-19 Whitworth Street West, ManchesterClient Reference: B087052
Job Number: 25-037553-1
Date Sampled: 09/07/2025
Date Received: 14/07/2025
Date Tested: 22/07/2025
Sampled By: Not GivenContact: Lucy Woods
Site Address: Halsnood Farm

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

Test Results:Laboratory Reference: 615603
Hole No.: TP08
Sample Reference: Not Given
Sample Description: Orangish brown clayey SAND
Sample Preparation: Sample was quartered, oven dried at 108.5 °C and broken down by hand.Depth Top [m]: 1.70
Depth Base [m]: 2.00
Sample Type: B

Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	99		
0.425	93		
0.3	62		
0.212	24		
0.15	12		
0.063	8		

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	92
Fines <0.063 mm	8

Grading Analysis		
D100	mm	3.35
D60	mm	0.294
D30	mm	0.223
D10	mm	0.106
Uniformity Coefficient		2.8
Curvature Coefficient		1.6

Uniformity and Curvature Coefficient calculated in accordance
with BS EN ISO 14688-2:2018

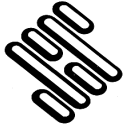
Note: Tested in Accordance with ISO 17892 -4, by sieving on as received or wet sample

Remarks:

Signed:

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.



STRUCTURAL SOILS LTD
INSITU TESTING REPORT



1774

Report No. 785794R.01(01)

Office Location: Castleford

Date 11-July-2025 Contract: Halsnead Farm, Whiston, Widnes
Client Curtins Consulting Limited
Address 51-55 Tithebarn Street,
Liverpool,
L2 2SB

For the Attention of: Rebecca Baksh-Jones

Order received	30-June-2025	Client Reference	None
Testing Started	10-July-2025	Client Order No.	None
Testing Completed	10-July-2025	Instruction Type	Written

Tests marked 'Not UKAS Accredited' in this report are not included in the UKAS Accreditation Schedule for our Laboratory.

UKAS Accredited Tests

Not UKAS Accredited Tests

* 2 no. Soakaway Testing to BRE Digest 365
Please note that 3 fills in each pit was not achievable due to time constraints/ground conditions

The results represent the ground conditions at the specified locations and depths at the time of testing.

Please Note: Remaining samples will be retained for a period of one month from today and will then be disposed of.

Test were undertaken on samples 'as received' unless otherwise stated.

Opinions and interpretations expressed in this report are outside the scope of accreditation for this laboratory.

Results relate only to items tested

This report shall not be reproduced except in full without written permission of SSL Laboratories

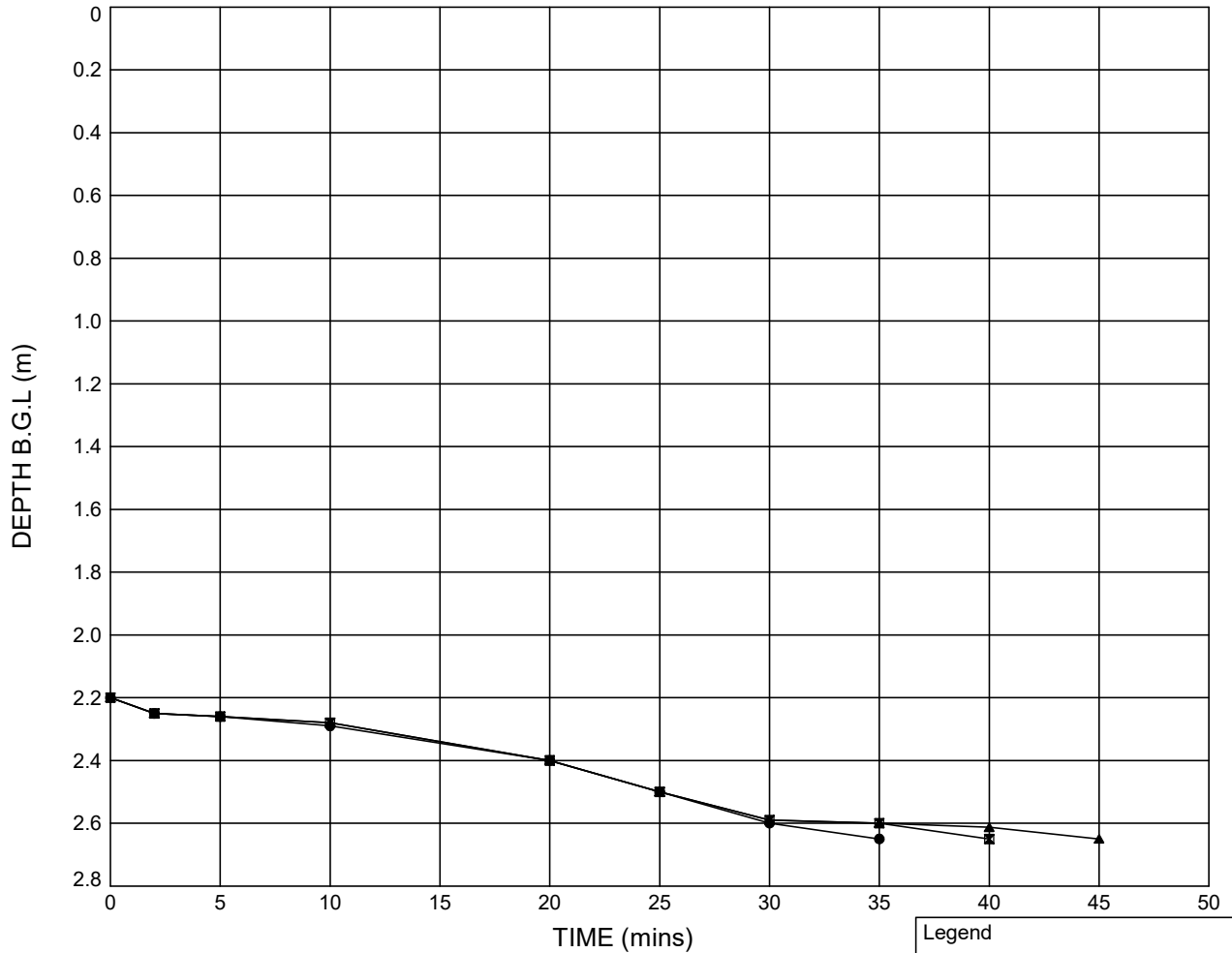
Structural Soils Ltd, The Potteries, Pottery Street, Castleford, WF10 1NJ Tel.01977552255, email Matthew Doran, matthew.doran@soils.co.uk

FULL SCALE SOAKAWAY TEST

In accordance with BRE Digest 365

Soakaway Test - Position ID : **SA01**

PLOT OF DEPTH OF WATER BELOW GROUND LEVEL AGAINST TIME

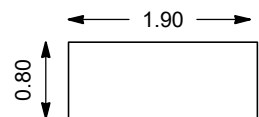


	Test 1	Test 2	Test 3	
Pit start depth:	= 2.75	2.75	2.75	m
Pit final depth:	= 2.75	2.75	2.75	m
Effective depth, D_e	= 0.55	0.55	0.55	m
Effective storage volume, V_{p75-25}	= 0.4180	0.4180	0.4180	m ³
Surface area, a_{s50}	= 3.0050	3.0050	3.0050	m ²
Time, t_{p75-25}	= 1016.0	1288.0	1501.0	secs
Infiltration rate, f	= 1.37×10^{-4}	1.08×10^{-4}	9.27×10^{-4}	m/s

Legend

- Test 1 (10.07.25)
- Test 2 (10.07.25)
- ▲ Test 3 (10.07.25)

Plan (Not to scale)



No Bearing Taken



STRUCTURAL SOILS
The Potteries
Pottery Street
Castleford
W. Yorkshire WF10 1NJ

Compiled By

Date

15/10/25

Checked By

Date

15/10/25

Contract

Halsnead Farm, Whiston, Widnes

Contract Ref:

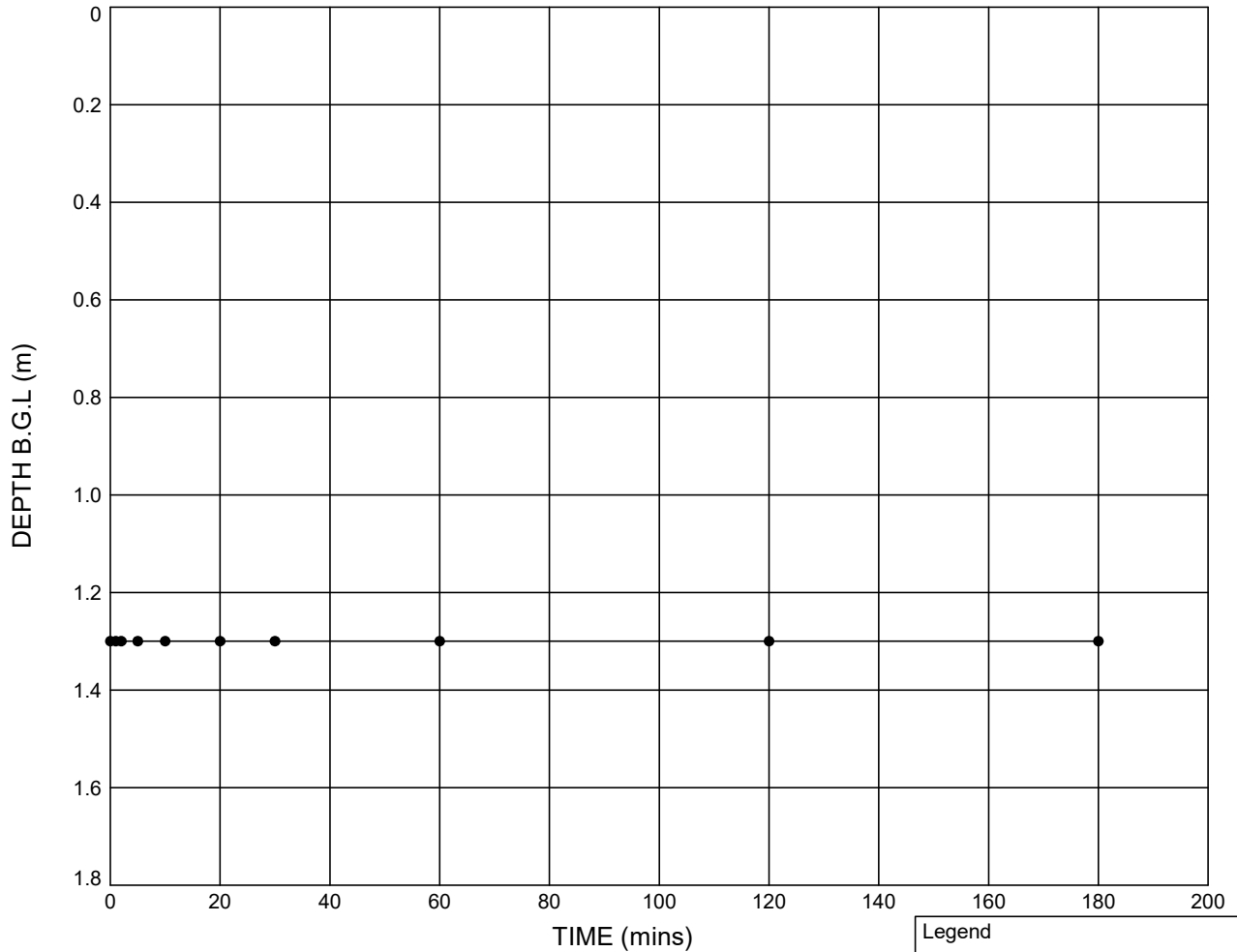
785794

FULL SCALE SOAKAWAY TEST

Non-standard test

Soakaway Test - Position ID : **SA02**

PLOT OF DEPTH OF WATER BELOW GROUND LEVEL AGAINST TIME



Test 1

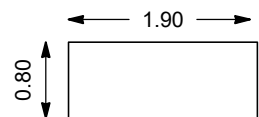
Pit start depth: = **1.75** m
Pit final depth: = **1.75** m
Effective depth, D_e = **0.45** m
Effective storage volume, V_{p75-25} = **0.3420** m³
Surface area, a_{s50} = **2.7350** m²
Time, t_{p75-25} = **N/A** secs
Infiltration rate, f = **N/A** m/s

Notes: Test 1 - Unable to calculate infiltration rate due to insufficient drop in water level.

Legend

● Test 1 (10.07.25)

Plan (Not to scale)



No Bearing Taken



STRUCTURAL SOILS
The Potteries
Pottery Street
Castleford
W. Yorkshire WF10 1NJ

Compiled By

Date

15/10/25

Checked By

Date

15/10/25

Contract

Halsnead Farm, Whiston, Widnes

Contract Ref:

785794

Appendix E – Ground Gas Monitoring Results

Project: Halsnead Farm **Date:** 24/07/2025
Job Number: B087052 **Visit:** 1
Client: Starship Hub **Weather:** Sunny
Barometric State: Rising **Ground Conditions:** Damp

Borehole Reference	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						
WS01	1014	0.0	0.0	0.0	0.0	1.1	1.1	19.8	0	0	2.63	2.96	
WS02	1014	0.0	0.0	0.0	0.0	0.9	0.9	19.9	0	0	DRY	1.66	
WS05	1014	0.0	0.0	0.0	0.0	0.7	0.7	20.1	0	0	DRY	0.98	
WS06	1014	0.0	0.0	0.0	0.0	1.3	1.3	19.8	0	0	DRY	1.70	
WS08	1014	0.0	0.0	0.0	0.0	0.8	0.8	20.2	0	0	DRY	1.12	
WS10	1014	0.0	0.0	0.0	0.0	0.1	0.1	20.7	0	0	DRY	2.09	
WS11	1014	0.0	0.0	0.0	0.0	0.5	0.5	20.6	0	0	DRY	1.99	
WS12	1014	0.0	0.0	0.0	0.0	0.5	0.4	20.5	0	0	DRY	1.53	

Notes

Logged by

LW

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

Project: Halsnead Farm **Date:** 08/08/2025
Job Number: B087052 **Visit:** 2
Client: Starship Hub **Weather:** Sunny
Barometric State: Rising **Ground Conditions:** Damp

Borehole Reference	Barometric Pressure mb	Flow		Methane		Carbon Dioxide		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		l/hr		%		%							
		Max	SS	Max	SS	Max	SS						
WS01	1012	0.0	0.0	0.0	0.0	0.7	0.7	20.00	0	0	2.7	2.96	
WS02	1012	0.0	0.0	0.0	0.0	0.7	0.7	20.10	0	0	DRY	1.66	
WS05	1011	0.0	0.0	0.0	0.0	0.8	0.8	20.00	0	0	DRY	0.98	
WS06	1012	0.0	0.0	0.0	0.0	0.7	0.7	20.10	0	0	DRY	1.70	
WS08	1012	0.0	0.0	0.0	0.0	0.5	0.5	20.30	0	0	DRY	1.12	
WS10	1011	0.0	0.0	0.0	0.0	0.0	0.0	20.6	0	0	DRY	2.09	
WS11	1012	0.0	0.0	0.0	0.0	0.2	0.2	20.6	0	0	DRY	1.99	
WS12	1012	0.0	0.0	0.0	0.0	0.3	0.3	20.4	0	0	DRY	1.53	

Notes

Logged by

LW

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

Project: Halsnead Farm **Date:** 19/08/2025
Job Number: B087052 **Visit:** 3
Client: Starship Hub **Weather:** Short showers
Barometric State: Steady **Ground Conditions:** Damp

Borehole Reference	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						
WS01	1014	0.0	0.0	0.0	0.0	0.6	0.6	20.2	0	0	2.77	2.96	
WS02	1014	0.0	0.0	0.0	0.0	0.5	0.5	20.2	0	0	DRY	1.66	
WS05	1014	0.0	0.0	0.0	0.0	0.7	0.7	20.1	0	0	DRY	0.98	
WS06	1014	0.0	0.0	0.0	0.0	0.5	0.5	20.2	0	0	DRY	1.70	
WS08	1014	0.0	0.0	0.0	0.0	0.7	0.7	20.2	0	0	DRY	1.12	
WS10	1014	0.0	0.0	0.0	0.0	1.0	1.0	19.9	0	0	DRY	2.09	
WS11	1014	0.0	0.0	0.0	0.0	1.6	1.6	19.1	0	0	DRY	1.99	
WS12	1014	0.0	0.0	0.0	0.0	0.3	0.3	20.4	0	0	DRY	1.53	

Notes

Logged by

LW

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

Project: Halsnead Farm **Date:** 02/09/2025
Job Number: B087052 **Visit:** 4
Client: Starship Hub **Weather:** Sunny
Barometric State: Falling **Ground Conditions:** Wet

Borehole Reference	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						
WS01	996	0.0	0.0	0.0	0.0	0.7	0.7	20.3	0	0	2.80	2.99	1
WS02	997	0.0	0.0	0.0	0.0	0.5	0.4	20.3	0	0	Dry	1.67	1
WS05	996	0.0	0.0	0.0	0.0	0.5	0.5	20.4	0	0	Dry	0.98	1
WS06	996	0.0	0.0	0.0	0.0	0.6	0.6	20.2	0	0	Dry	1.71	1
WS08	996	0.0	0.0	0.0	0.0	0.6	0.6	20.3	0	0	Dry	1.13	1
WS10	996	0.0	0.0	0.0	0.0	0.2	0.2	20.6	0	0	Dry	2.09	1
WS11	996	0.0	0.0	0.0	0.0	0.5	0.5	20.4	0	0	Dry	2.03	1
WS12	997	0.0	0.0	0.0	0.0	0.4	0.4	20.3	0	0	Dry	1.55	1

Notes

1 Steady state gas flow achieved instantly

Logged by

RT

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

Project: Halsnead Farm **Date:** 16/09/2025
Job Number: B087052 **Visit:** 5
Client: Starship Hub **Weather:** Overcast
Barometric State: Rising **Ground Conditions:** Wet

Borehole Reference	Barometric Pressure mb	Flow		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						
WS01	1007	0.0	0.0	0.0	0.0	0.9	0.9	20.0	0	0	2.86	2.99	
WS02	1007	0.0	0.0	0.0	0.0	0.8	0.8	20.0	0	0	Dry	1.67	
WS05	1007	0.0	0.0	0.0	0.0	0.7	0.7	20.0	0	0	Dry	0.99	
WS06	1009	0.0	0.0	0.0	0.0	0.7	0.7	20.4	0	0	Dry	1.70	
WS08	1009	0.0	0.0	0.0	0.0	0.4	0.4	20.6	0	0	Dry	1.13	
WS10	1010	0.0	0.0	0.0	0.0	0.2	0.2	20.8	0	0	Dry	2.09	
WS11	1009	0.0	0.0	0.0	0.0	0.3	0.3	20.6	0	0	Dry	2.06	
WS12	1011	0.0	0.0	0.0	0.0	0.5	0.5	20.4	0	0	Dry	1.55	

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

Project: Halsnead Farm **Date:** 30/09/2025
Job Number: B087052 **Visit:** 6
Client: Starship Hub **Weather:** Sunny
Barometric State: Steady **Ground Conditions:** Wet

Borehole Reference	Barometric Pressure mb	Flow		Methane		Carbon Dioxide		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		l/hr		%		%							
		Max	SS	Max	SS	Max	SS						
WS01	1020	-0.5	0.0	0.0	0.0	1.2	0.9	19.7	0	0	2.26	3.00	
WS02	1020	0.0	0.0	0.0	0.0	1.1	0.9	19.3	0	0	Dry	1.07	
WS05	1020	0.0	0.0	0.0	0.0	2.0	2.0	18.3	0	0	Dry	0.99	
WS06	1020	0.0	0.0	0.0	0.0	1.9	1.9	18.3	0	0	Dry	1.68	
WS08	1020	0.0	0.0	0.0	0.0	0.7	0.7	19.6	0	0	Dry	1.15	
WS10	1020	0.0	0.0	0.0	0.0	0.2	0.2	20.3	0	0	Dry	2.10	
WS11	1020	0.0	0.0	0.0	0.0	1.7	1.7	18.7	0	0	Dry	2.05	
WS12	1021	0.0	0.0	0.0	0.0	0.8	0.8	19.8	0	0	Dry	1.55	

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

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



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)

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		
Tetrachloroethene (PCE)	0.31	0.32	2	24	3200	1400		
1,1,1,2 Tetrachloroethane	1.2	1.5	0.79	110	1400	1500		
1,1,1 Trichloroethane	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		

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		

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		3590
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		
Tetrachloroethene (PCE)	1.6	1.6	11	130	3400	2500		
1,1,1,2 Tetrachloroethane	6.4	8.2	4.4	560	1400	2100		
1,1,1 Trichloroethane	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		

- 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:

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

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 result 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 soil 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

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.

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 <i>high probability</i> that <i>severe harm</i> could arise to a designated receptor from an identified hazard at the site without appropriate further action.
High Risk	<i>Harm is likely to arise</i> to a designated receptor from an identified hazard at the site without appropriate further action.
Moderate Risk	<i>It is possible</i> that without appropriate further action <i>harm could arise</i> to a designated receptor. It is relatively <i>unlikely</i> that any such harm would be <i>severe</i> , and if any harm were to occur it is <i>more likely</i> that such harm would be <i>relatively mild</i> .
Low Risk	<i>It is possible</i> that <i>harm could arise</i> to a designated receptor from an identified hazard. It is <i>likely</i> that, at worst, if any harm was realised any effects would be <i>mild</i> .
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.