

PHASE 2 GROUND INVESTIGATION

Lidl Great Britain Ltd
Fallowfield Retail Park, Manchester

Client: Lidl Great Britain Ltd

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806.02.01
February 2021



Executive Summary

Remada Ltd was commissioned by Lidl Great Britain Ltd to undertake a Phase 2 Ground Investigation of Fallowfield Retail Park, off Birchfield Road, Manchester M14 6FS. This report follows a Phase 1 Preliminary Risk Assessment (Remada report reference 806.01.01) previously prepared for the site in December 2020.

Summary of Phase 1 Desk Study

The earliest available historic mapping of 1848 shows the site to be undeveloped fields. Fallowfield Brook bisects the central area of the site, although this appears to have been infilled by 1923. By the mapping of 1934, the site had been redeveloped and occupied by a tramway depot, latterly a bus depot which remained until circa 1992. By 1995 the site had been redeveloped again to its present form as part of Fallowfield Retail Park.

Published geological maps record that the site is underlain by Devensian Till, designated as a Secondary Undifferentiated Aquifer, and the Collyhurst Sandstone Formation, designated as a Principal Aquifer. The site is not located within an area which may be affected by coal mining activity.

Intrusive Investigation

The investigation comprised the drilling of ten (10 No) window sample holes (WS1, WS1A, WS2 – WS5, WS5A, WS6 – WS8), execution of four (4 No) CBR tests and three (4 No) infiltration tests within the installed monitoring wells at locations indicated on **Figure 2** between 9th and 10th December 2020. The retail park was active at the time of Remada's investigation, with only two of the retail units (Units 5 and 8) being vacant and accessible. Borehole WS2 was located internally within Unit 5, whilst WS4 was located within the former Blockbusters retail unit (Unit 8). All other boreholes were positioned within the existing car park and service yard areas.

A variable thickness of made ground was encountered beneath the site which was encountered to at least 4m in thickness. The made ground was generally granular and contained fragments of concrete and brick up to boulder size. Due to the shallow obstructions encountered within the majority of window sample boreholes, natural strata were only observed within one location (WS6) in the south-western area of the site. Below 2.4m bgl, reddish brown clayey fine to medium sand was encountered, transitioning into soft sandy clay between 2.95m and 3.3m bgl. Below 3.65m bgl, brown fine to medium sand was encountered and resulted with an SPT refusal at 4.0m bgl.

No bedrock was positively identified during this intrusive investigation, although it is considered possible that the dense brown sand encountered in WS6 may be representative of weathered Collyhurst Sandstone Formation. Further investigation would be required to establish the presence and depth to bedrock underlying the site.

Human Health Assessment

The results of soil chemical analysis were compared to Human Health Generic Assessment Criteria for commercial land use. Within the sample from WS1 at 0.8 – 0.9m bgl, the concentrations of benzo(b)fluoranthene, benzo(a)pyrene and dibenz(a,h)anthracene were in exceedance of their respective human health GAC values protective of on-site workers.

Water Resources Assessment

The results of the soil chemical analysis undertaken has identified that concentrations of metals and inorganic contaminants are within the range of typical made ground. Detectable concentrations of TPH and PAHs were encountered in some samples. In one location (WS1), a maximum concentration of 20,000mg/kg was recorded within the made ground at 0.8 – 0.9m bgl, resting above a concrete obstruction. Post-development, the made ground in this area will be removed to accommodate the proposed Lidl retail store on-site. In addition, it should be noted that the site will be predominantly covered with the building and areas of hardstanding. Therefore, the risk of leaching of contaminants as a result of infiltration of groundwater is likely to be limited. However, further investigation of the risk to groundwater from contaminants within the made ground at the site is considered prudent post-demolition.



Waste Classification

In general, the results of the chemical analysis indicates that the majority of the material would be classified as non-hazardous waste. While Waste Acceptance Criteria (WAC) analysis has not been undertaken, one of the five samples selected for analysis exceeded this limit it is considered that the waste may potentially be accepted at an inert landfill. However, the made ground in the vicinity of WS1 will require further analysis due to its elevated concentrations of PAHs, TPH and BTEX compounds.

Two samples of bituminous surfacing were analysed for concentrations of PAH compounds. The results indicated that the concentrations of PAHs were very low (total PAH concentration <2.0 mg/kg), and the concentration of benzo(a)pyrene of <0.1mg/kg was below the 50mg/kg limit defined in WM3. Therefore, the bituminous surfacing represented by this sample would be classified as non-hazardous waste and assigned the List of Wastes code 17 03 02 for bituminous mixtures other than those mentioned in 17 03 01.

Geotechnical Assessment

The proposed footprint will be directly underlain by made ground and relict foundations as recorded in window sample holes WS1, WS2, WS3 and WS4. Made ground was recovered as generally a gravel of brick, concrete and sandstone that is indicative of previous buildings and foundations. SPT refusal values (N = 50) were recorded within the made ground at 0.8m bgl in WS1 WS1A & WS2, 4m bgl in WS3, 1.5m in WS4. Natural soils were proven only outside the proposed store footprint in WS6 below 2.4m bgl and recovered as a fine to medium sand that refused at 4m bgl. Resting groundwater levels were not recorded in any individual monitoring well.

Shallow spread foundations are not considered a suitable foundation solution due to the unknown depth of made ground.

Piled foundations bearing in the natural strata are a potential foundation solution but as the full depth of made ground was not penetrated beneath the proposed footprint it would be necessary to bore additional rotary exploratory holes to prove the natural strata. Obstructions to piles would also have to be removed.

A Design Sulphate Class DS-2 is considered appropriate for buried concrete and an ACEC Class of AC-1s is considered appropriate for the location.

Ground Gas

The results of four rounds of gas monitoring visits placed the site into Characteristic Situation 1 and therefore ground gas protection measures will not be required within the proposed buildings.



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Issue No	Date	Prepared By	Technical Review	Authorised
01	12.02.2021	P Dickinson	G Jones 	G Jones 



1 INTRODUCTION

Remada Ltd was commissioned by Lidl Great Britain Ltd to undertake a Phase 2 Ground Investigation of Fallowfield Retail Park, off Birchfield Road, Manchester M14 6FS at the location indicated in **Figure 1**.

1.1 Objectives

The objectives of this assessment are as follows:

- to examine whether there have been any potentially contaminative uses on the site or nearby land;
- to develop a conceptual model of the site to identify plausible pollutant linkages;
- to assess ground conditions in relation to the proposed development in relation to construction design issues including the presence, nature, likely severity and extent of soil and groundwater contamination, which may be present, its potential environmental impact and likely requirement for further work; and
- Provide preliminary foundation design recommendations for the proposed development.

1.2 Scope of Work

The scope and layout of this investigation and report is generally in accordance with BS10175:2011+A2 2017 and the Environment Agency's Land Contamination Risk Management guidance for land contamination reports.

The scope of work comprised:

- 4 No window sample boreholes to target depths of 6m including SPTs;
- 4 No window sample boreholes to target depths of 3m including SPTs;
- 3 No combined groundwater and gas monitoring standpipes installed with window sample boreholes;
- 3 No Infiltration tests;
- Suite of geotechnical classification and strength tests;
- 5 No soil sample suites for chemical analysis of CLEA metals, asbestos, speciated hydrocarbons, cyanide and phenols to further delineate soil contamination;
- 4 No ground gas and groundwater monitoring visits to satisfy planning requirements; and
- Combined Factual & Interpretative Geoenvironmental Report.

1.3 Previous Reports

The following Phase 1 Desk Study had been previously prepared for the site:

- Phase 1 Site Investigation & Preliminary Risk Assessment. Remada Ltd Report 806.01.01, December 2020.

1.4 Limitations

The comments given in this report and the opinions expressed are based on the information reviewed and observations during site work. However, there may be conditions pertaining to the site that have not been disclosed by this assessment and therefore could not be taken into account.



2 SUMMARY OF PHASE 1 DESK STUDY

The Executive Summary, Conceptual Site Model and pertinent findings presented within the Phase 1 Desk Study are reproduced below:

Site Setting

The site occupies an irregular plot of land, bounded between the B5093 Moseley Road, A34 Birchfields Road and a railway line on an embankment. The site is currently occupied by the retail units and associated car parking of Fallowfield Retail Park. An electricity substation is located behind the outlet buildings, within what appears to be the staff car park area.

The site comprises five adjoining retail units in the eastern area of the site, comprising Pizza Hut, Jollyes Pet Store, Barnardos and two vacant units (one previously Blockbusters). The Hawthorn Medical Centre is present in the southern area of the site. These buildings are all of single storey construction, with brickwork exterior walls and pitched roofs. A Burger King restaurant and drive-through is present in the north-western area of the site, with the remaining areas being predominantly occupied by asphalt-surfaced car parking and soft landscaping. A concrete-surfaced service area is located adjacent to the eastern boundary of the site, whilst an electricity substation is present in the north-eastern corner.

The western boundary of the site is marked by a grassed verge and low wooden rail fence along Birchfield Road. This fencing continues along the southern boundary, although is replaced by a low brick wall in the south-eastern area. The northern boundary is marked by the northern pavement of the site access road off Birchfield Road and the southern façade of a Poundstretcher retail unit. The eastern boundary is marked by a brick walk circa 3.0m in elevation, beyond which lies the vegetated embankment of an adjacent railway line.

Site History

The earliest available historic mapping of 1848 shows the site to be undeveloped and occupied by fields. The Fallowfield Brook watercourse bisects the central area of the site, although this appears to have been infilled by 1923. By the mapping of 1934, the site had been redeveloped and occupied by a tramway depot, latterly a bus depot which remained until circa 1992. By 1995 the site had been redeveloped again and took on its present form as part of Fallowfields Retail Park.

Geological Mapping

Published geological maps record that the site is underlain by Devensian Till, designated as a Secondary Undifferentiated Aquifer, and the Collyhurst Sandstone Formation, designated as a Principal Aquifer.

Mining

The site is not located within an area which may be affected by coal mining activity.

Environmental Risk Assessment

The desk study has identified on-site and off-site potential sources of contamination that would require further investigation. The following is recommended:

- Investigation of the lateral and vertical extent of made ground/ landfill beneath the proposed development;*
- Collection of soil samples from the areas identified above for contaminants of concern; and*
- Groundwater and ground gas monitoring (where possible).*

Geotechnical Assessment

It is recommended that a ground investigation is undertaken to enable preliminary foundation design.



Potential Source Areas	Potential Contaminant of Concern	Pathways	Potential Receptor	Exposure Route (Human unless otherwise stated)	Potential Identified Linkage (unmitigated)	Findings of Ground investigation	Risk (Un-mitigated)	Proposed Remediation (Mitigation) Measures	Residual Risk Estimation
On-site Sources General Made Ground Infilling of Fallowfield Brook Tramway / Bus Depot Electricity Sub-Station Retail Park Off-site Sources Garage Railway Lines Fuel Filling Station Residential Properties	Asbestos / Metals As, Be, Cd, Cu, Cr (VI), Cr (III) Hg, Ni, Se, Va, Zn, Boron, TPH /PAH, PCBs Ground gas	Disturbance due to construction plant causing direct contact, dusts, vapours. Direct Contact with occupants of the proposed development	Occupants of the development / building fabric	• Direct Soil Ingestion	Yes	To be assessed (TBA)	Potential risk	(To be assessed (TBA)	(To be assessed (TBA)
				• Indoor Dust ingestion	Yes	As above	Potential risk	TBA	TBA
				• Skin Contact with Soils	Yes	As above	Potential risk	TBA	TBA
				• Skin Contact with Dust	Yes	As above	Potential risk	TBA	TBA
				• Inhalation of Outdoor Dust	Yes	As above	Potential risk	TBA	TBA
				• Inhalation of Outdoor Vapours	Yes	As above	Potential risk	TBA	TBA
		Inhalation of fibres / vapours / gases by occupants of proposed development Permeation of water supply pipework	Adjacent residents during construction	• Inhalation of ground gas	Yes	As above	Potential risk	TBA	TBA
				• Inhalation of radon gas	Yes	Lower Probability Radon Area As above	Negligible	None	Negligible
				• Inhalation of Indoor Vapours	Yes	As above	Potential risk	TBA	TBA
				• Ingestion via permeated water supply pipework	Yes	As above	Potential risk	TBA	TBA
				• Inhalation of ground gas	Yes	As above	Potential risk	TBA	TBA
				• Leaching to Secondary and Principal Aquifers in Superficial and Bedrock deposits	Yes	As above	Potential risk	TBA	TBA
		Leachate	Secondary Undifferentiated & Principal Aquifers						

Table 1: Outline Conceptual Site Model

Direct contact with subsurface soil and/or groundwater during redevelopment works are not assessed as part of the CSM. It is considered that risks to workers will be managed as part of any the redevelopment works at the site through the application of health and safety procedures, where required.



3 ENVIRONMENTAL & GEOTECHNICAL INVESTIGATION METHODOLOGY

3.1 Investigation Strategy

In accordance with Lidl Ground Investigation standard 04.2018, four (4 No). window sample holes were required beneath the proposed store footprint to a depth of 6m or refusal, and four (4 No) beneath the delivery bay, HGV access and car park. Four (4 No) ground gas monitoring visits were scheduled for the site to provide the minimum required by C665.

The investigation comprised the drilling of ten (10 No) window sample holes (WS1, WS1A, WS2 – WS5, WS5A, WS6 – WS8), execution of four (4 No) CBR tests and three (3 No) infiltration tests within the installed monitoring wells at locations indicated on **Figure 2** between 9th and 10th December 2020.

The retail park was active at the time of Remada's investigation, with only two of the retail units (Units 5 and 8) being vacant and accessible. Borehole WS2 was located internally within Unit 5, whilst WS4 was located within the former Blockbusters retail unit (Unit 8). All other boreholes were positioned within the existing car park and service yard areas.

All exploratory holes were logged by a suitably qualified Geo-environmental Engineer in general accordance with the recommendations of BS5930:2015. Detailed descriptions, together with relevant comments, are given in the Exploratory Hole Logs.

3.2 Intrusive Investigation

3.2.1 Window Sample Holes

Four of the window samples were advanced to a target depth of 6m and four to a target depth of 3m. However, as obstructions were encountered at relatively shallow depths in many of the locations, ten (10 No) window sample holes were drilled to refusal which was between 0.3m and 4.0m bgl. Combined Groundwater and Ground Gas monitoring standpipes were installed in WS3, WS4 and WS8.

Standard Penetration Tests (SPTs) in the window samples were carried out at 1.0m intervals as recorded on the borehole logs to assess the relative density and consistency of soils.

SPTs were conducted in accordance with BS EN ISO 22476-3 and the recorded SPT N-values are summarised on the borehole logs. The SPT Calibration Certificate is presented at **Appendix A**.

3.2.2 Infiltration Tests

Three infiltration tests were attempted in the installed monitoring wells in WS3, WS4 and WS8 on 9th February 2021, in order to determine the feasibility of soakaway drainage on-site. The tests were carried out using the falling head test methodology, with 20 litres of clean water being poured into the monitoring wells and the time for the head of water to drop recorded.

The results of the falling head tests results are presented at **Appendix B**.

3.2.3 Dynamic Cone Penetrometer (DCP) Tests

The DCP tests were conducted in order to determine California Bearing Ratio (CBR) values for near surface soils. A known mass is dropped through a known distance to drive a cone into the ground. The penetration distance per blow is recorded in order to enable the CBR value to be calculated.

As the is the existing site surfaced and there are no landscape areas, it was not possible to carry CBR tests.



3.3 Soil Sampling

3.3.1 Environmental

Made ground and natural soils were selected by visual and olfactory means for subsequent analysis. Samples for chemical laboratory testing purposes were collected in amber glass jars, amber glass vials and plastic tubs and retained in a cool box for transport to the laboratory.

3.3.2 Geotechnical

Geotechnical samples were collected at depths indicated on the window sample logs with samples retrieved from within a sleeve line. The disturbed samples were placed in sealed and correctly labelled plastic tubs or bags as appropriate. All geotechnical samples were dispatched to the laboratory for testing with a completed chain of custody.

3.4 Gas and Groundwater Monitoring

3.4.1 Installations

Combined ground gas and groundwater monitoring standpipes were installed in two of the window sample boreholes. The standpipes consisted of high-density polyethylene (HDPE) pipe. A bentonite seal was made around the plain pipe and a clean gravel pack was placed around the slotted pipe. A summary of the installation construction is tabulated below:

Location and Depth	Internal Diameter Pipe	Response Zone (m bgl)	Targeted Strata
WS3 – 3.0m bgl	50mm HDPE	1.0 – 3.0	Made Ground
WS4 – 1.5m bgl	50mm HDPE	0.5 – 1.5	Made Ground
WS8 – 1.0m bgl	50mm HDPE	0.5 – 1.0	Made Ground

Table 2: Monitoring Standpipe Installation Details

3.4.2 Monitoring

Ground gas monitoring was undertaken using Geotech GA5000 gas analyser for the parameters reported below. Groundwater levels were measured with a GeoSense OWP30 oil water interface probe.

Permanent ground gas monitoring involved the measurement of the following in the prescribed order:

- Pressure difference between the monitoring well and the atmosphere,
- Peak and steady flow rates of gas into or out of the monitoring well;
- Peak and steady concentrations of carbon dioxide, methane, oxygen (minimum and steady recorded), carbon monoxide, hydrogen sulphide; and
- Depth to groundwater.

Gas and groundwater monitoring data is presented **Table 3**.

3.5 Quality Assurance and Quality Control

All samples were submitted to a United Kingdom Accredited Laboratory (UKAS) under a completed chain of custody. The laboratory carried out its own QA/QC programme to ensure that the quality of the analytical data conformed to the appropriate test method protocols.



3.6 Laboratory Testing

3.6.1 Soil Chemical Analysis

Five (5 No) soil samples were scheduled for the analysis of asbestos, arsenic, barium, beryllium, cadmium, chromium (III & VI), copper, mercury, nickel, lead, selenium, zinc, fraction of organic carbon, Total Petroleum Hydrocarbons (TPHCWG), Polyaromatic Hydrocarbons (PAH), BTEX compounds (benzene, toluene, ethylbenzene and xylene) and phenols.

In addition, two samples of bituminous surfacing were analysed for PAH compounds.

The results of laboratory chemical analyses are presented at **Appendix C**.

3.6.2 Geotechnical

Samples recovered from the boreholes were submitted to an accredited laboratory for the following analyses in general accordance with BS1377:1990:

- 8 No Particle Size Distribution tests;
- 3 No. Compaction Tests using a 2.5kg rammer; and
- 4 No BRE SD1 suites.

The results of the geotechnical testing are presented at **Appendix D**.



4 GEOTECHNICAL & ENVIRONMENTAL INVESTIGATION FINDINGS

4.1 Ground Conditions

A brief description of the published geology is provided together with a summary of the ground conditions encountered during the intrusive investigation. Exploratory logs are presented at the end of the report.

4.1.1 Published Geology

Information from the British Geological Survey (BGS) 1:50,000 scale map Sheet 85 (Manchester) indicates that no made ground deposits have been recorded on-site. It is not expected to be encountered according to the mapping; however, taking consideration of the site's historic use and satellite imagery it was considered likely that made ground would be encountered underlying the site during this intrusive investigation.

The superficial deposits underlying the site are indicated to comprise Devensian Till. The BGS describe these deposits as typically comprising a 'heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape.'

The bedrock directly underlying the site is formed of the Collyhurst Sandstone Formation. The BGS describes this unit as typically comprising 'soft red sandstone with abundant beds of "millet seed" sand grains alternating with beds of fine-grained sharp sand; some interbedded grey sandstones locally'.

The superficial deposits are designated as a Secondary (Undifferentiated) Aquifer, whereas the bedrock geology is designated as Principal Aquifer. The site itself is not located within a Source Protection Zone.

4.1.2 Made Ground

Made ground was encountered in all ten exploratory holes on-site during Remada's investigation and was present to a maximum depth of at least 4m (WS3).

Two exploratory holes were located within vacant retail units on-site, with boreholes WS2 and WS4 being located within Units 5 and 8 respectively. Within these two units, the reinforced concrete floor slab was between 0.17m and 0.18m thick, with the rebar being present at 0.06 – 0.08m depth respectively. The slab was predominantly underlain by a locally clayey sandy gravel of mixed lithologies including concrete and brick fragments. SPT refusals ($N > 50$) were encountered within the made ground at depths of 0.8m and 1.5m bgl on suspected concrete obstructions. In both instances, pale grey / white concrete dust was observed on the tip of the SPT cone upon its withdrawal from the borehole.

Within the shared service yard area in the east of the site, borehole WS3 recorded concrete surfacing to 0.18m bgl, underlain by brown / dark brown gravelly sand incorporating gravels of brick, clinker, glass and metal. Below 1.0m bgl, dark brown slightly clayey gravelly sand was encountered to the base of the borehole at 4.0m, with the gravel generally comprising brick and concrete fragments.

Within the existing car park area, asphalt surfacing was encountered to depths of between 0.08m and 0.15m thick and underlain by a light brown gravelly sand sub-base; the latter ranging in thickness between 0.06m and 0.20m. The surfacing and sub-base was then typically underlain by brown / reddish brown / dark brown / grey locally clayey sand and gravel, with localised brick and concrete cobbles being encountered. SPT refusals ($N > 50$) were encountered within the made ground in five of the six exploratory holes in the car park area, ranging in depths between 0.3m and 1.0m bgl on suspected concrete obstructions. However, within WS6 in the south-western area of the car park, it was possible to advance the borehole to 2.4m bgl, whereupon the base of the made ground was established.

4.1.3 Superficial Deposits

Due to the shallow obstructions encountered within the majority of window sample boreholes, natural strata were only observed within one location (WS6) in the south-western area of the site. Below 2.4m bgl, reddish brown clayey fine to medium sand was encountered, transitioning into soft sandy clay between 2.95m and 3.3m bgl. Below 3.65m bgl, brown fine to medium sand was encountered and resulted with an SPT refusal at 4.0m bgl.

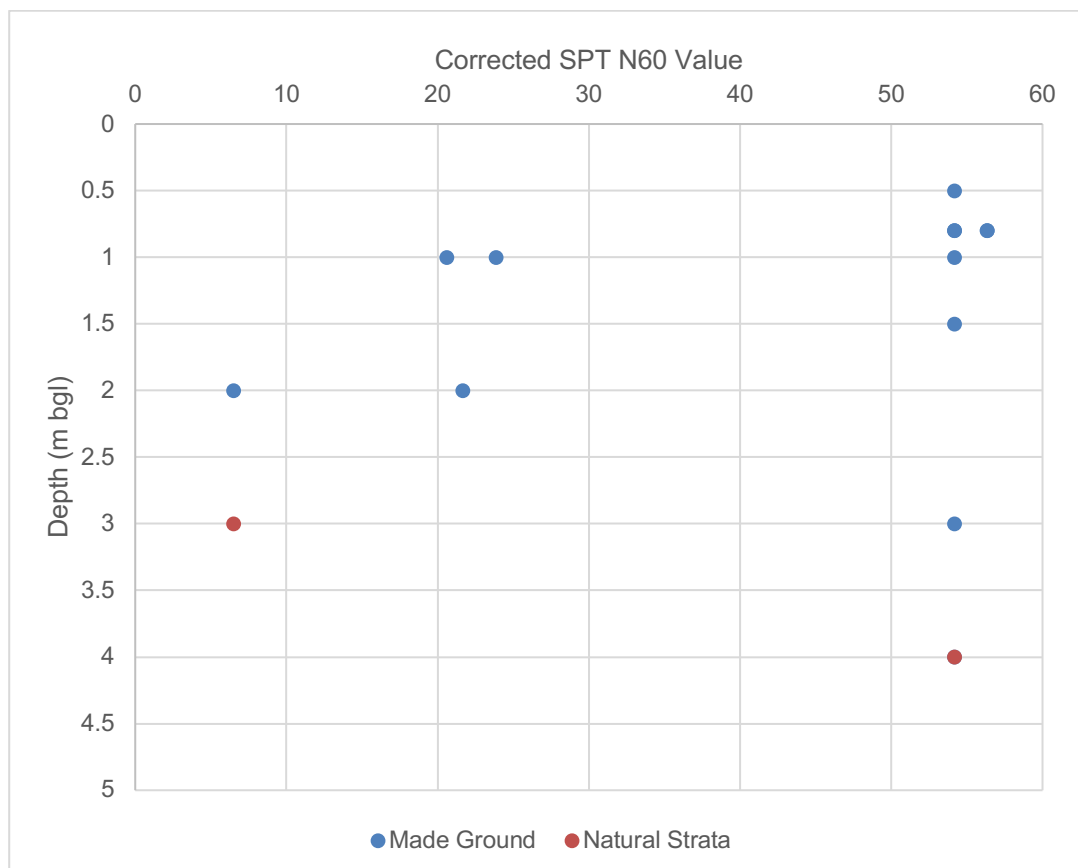
4.1.4 Bedrock

No bedrock was positively identified during this intrusive investigation, although it is considered possible that the dense brown sand encountered in WS6 below 3.65m may be representative of weathered Collyhurst Sandstone Formation. Further investigation would be required to establish the presence and depth to bedrock underlying the site.

4.2 In-situ Testing

4.2.1 SPTs

In-situ SPTs were undertaken to assist with the interpretation of strata encountered. The SPT N-values have been corrected based on the Energy Ratio of 65% for the SPT hammer on the window sampling rig. The SPT Hammer Energy Test Reports, undertaken in accordance with BS EN ISO 22476-3:2005 are included in **Appendix A**. The results of corrected N-values versus depth are plotted in the graph below:



Graph 1: Plot of Corrected SPT N-Values Versus Depth



4.2.2 Infiltration Testing

Falling head permeability test within boreholes provide an indication of the infiltration potential of the soil. The results of infiltration tests in WS3 and WS4 produced values of 1.21×10^{-7} and 4.75×10^{-7} m/s respectively and the results are presented at **Appendix B**.

4.3 Soil Observations

Made Ground was recovered at all locations as a heterogeneous granular material containing a variety of man-made materials including brick, concrete, clinker, glass and metal.

A slight hydrocarbon odour was recorded within the made ground in WS1 below 0.8m bgl; the strata being logged on-site as containing 'slight hydrocarbon and burnt odours'. There were no other visible indicators of contamination including asbestos within the sampled soils.

4.4 Groundwater Observations

No groundwater was encountered during the intrusive investigation.

4.5 Chemical Analysis - Soils

Results of the soil chemical analysis are presented in **Table 4** at the end of the report and full laboratory certificates are presented in **Appendix C**. Results of the chemical analyses are summarised as follows.

The average FOC and pH were 0.02 and 9.6 respectively. Asbestos was not detected in the samples analysed. Detectable concentrations of metals were identified, although these are generally within the range that would typically be expected for made ground.

Concentrations of TPH were detected above method detection limit (MDL) in all five of the samples analysed. The hydrocarbons were generally heavy end hydrocarbons within the range C16 to C35 carbon range. However, hydrocarbons in the C8 to C16 carbon range were also encountered in the samples from WS5A at 0.3 – 0.47m and in WS1 at 0.8 – 0.9m depth. The latter sample recorded the maximum TPH concentration of 20,000mg/kg and also recorded the only BTEX compounds above detection limit.

Concentrations of PAHs were generally low (<100mg/kg). A maximum concentration (excluding bituminous surfacing samples) of 1300 mg/kg was encountered in WS1 at 0.8 – 0.9m bgl.

4.6 Geotechnical Testing

Results of the geotechnical testing are summarised as follows and full laboratory certificates are presented in **Appendix D**.

The PSD tests revealed the following:

- Made ground in WS1 at 0.15 – 0.7m comprised brown silty, sandy gravel with cobbles.
- Made ground in WS2 at 0.18 – 0.8m comprised brown silty, clayey, sandy gravel.
- Made ground in WS3 at 1.0 – 2.0m comprised reddish brown very clayey, very sandy gravel.
- Made ground in WS4 at 1.2 – 1.5m comprised brown silty, clayey, very sandy gravel.
- Made ground in WS5 at 0.3 – 0.7m comprised brown slightly clayey, silty, sandy gravel with cobbles.
- Made ground in WS6 at 1.0 – 2.0m comprised brown gravelly very sandy clay.
- Made ground in WS7 at 0.07 – 0.51m comprised silty, very clayey, very gravelly sand.
- Made ground in WS8 at 0.5 – 1.0m comprised slightly clayey, silty, sandy gravel.



The dry density/moisture content relationship analyses revealed the following:

- Within the sample of made ground in WS3 at 1.0 – 2.0m bgl, a maximum dry density of 1.85 mg/m³ was recorded, with an optimum moisture content of 13%. The initial moisture content of the sample was 19%.
- Within the sample of made ground in WS4 at 1.2 – 1.5m bgl, a maximum dry density of 1.79 mg/m³ was recorded, with an optimum moisture content of 16%. The initial moisture content of the sample was 14%.
- Within the sample of made ground in WS8 at 0.5– 1.0m bgl, a maximum dry density of 2.01 mg/m³ was recorded, with an optimum moisture content of 10%. The initial moisture content of the sample was 8.2%.

The water-soluble sulphate contents varied from 0.06 to 0.78 g/l in the four soil samples analysed with pH varying from 8.8 to 10.9. The total sulphur content varied from 0.06 to 0.15% and acid soluble sulphate varied from 0.09 to 0.44%.

4.7 Ground Gas Monitoring Results

Ground gas monitoring was undertaken on 18th December 2020, and 6th, 15th and 19th January 2021, at WS3, WS4 and WS8. Results are presented in **Table 3** and summarised below:

- Methane concentrations were recorded below the instrument detection limit of <0.1 % v/v in all the monitoring wells on all four occasions.
- The peak carbon dioxide was recorded at maximum concentration of 0.8% v/v in WS4 on 6th January 2021. The steady state carbon dioxide concentration was recorded at a maximum of 0.5% v/v in WS4 on 15th January 2021.
- Oxygen concentrations were recorded at a minimum concentration of 18.9 % v/v in WS8 on 18th December 2020.
- Ground gas flow rates were recorded at a maximum of 1.3 litres per hour (l/hr) in WS3 and WS4 concurrently on 6th January 2021.
- No groundwater was encountered within WS3 and WS4 over the course of the monitoring programme. The headworks and standpipe in WS8 were recorded as being flooded during the third and fourth monitoring visit.
- Atmospheric pressure at the time of sampling varied between a high of 1023 millibar (mbar) on 15th January 2021 and a low of 996 mbar on 18th December 2020. The monitoring visits were undertaken during periods of rising and falling pressure trends.



5 GENERIC QUANTITATIVE RISK ASSESSMENT

5.1 Human Health Risk Assessment

In order to provide an up to date assessment of the risks to human health, Remada has adopted the most recent Generic Assessment Criteria (GAC) published by LQM/CIEH (S4ULs) and CL:AIRE/EIC/AGS for the assessment of potential risks to human health. The derivation of GAC, methodology, input parameters and technical guidance (CLEA) may be obtained upon request.

Default parameters have been adopted for sandy loam of pH 7 and commercial land use. FOC ranged from 0.0043 to 0.082 giving a Soil Organic Matter (SOM) content range of between 0.74 to 14.14% with an average result of 3.78%. In order to present a conservative assessment, the SOM content of 2.5% has been adopted.

The depth to potential sources of contamination for indoor air pathways has been assumed to be 0.5m below building foundation level. The source has been conservatively assumed to be at ground level for outdoor air and direct contact pathways.

For commercial land use the CLEA version 1.06 critical receptor is conservatively modelled as a female working adult with an exposure duration of 49 years. In accordance with the default parameters, it was assumed that employees spend most of their time indoors and that 80% of outdoor area is covered by hardstanding. As such, the potential exposure pathways have been assumed to be:

- Direct Soil and Indoor Dust Ingestion;
- Skin contact with soils and dusts;
- Inhalation of indoor and outdoor dusts and vapours.

Where GAC values for individual TPH fractions are not exceeded, the potential additive effect has been assessed by calculating overall TPH hazard index for each sample.

5.2 Comparison of Soil Analysis Results with Human Health GAC

A comparison of soil chemical analysis with GAC is presented as **Table 4**.

TPH, PAH & BTEX

Within the sample from WS1 at 0.8 – 0.9m bgl, the concentrations of benzo(b)fluoranthene, benzo(a)pyrene and dibenz(a,h)anthracene were in exceedance of their respective human health GAC values protective of on-site workers.

None of the TPH and BTEX analytes tested were detected at concentrations that exceeded the human health GAC protective of on-site workers.

Metals & Inorganics Excluding Asbestos

None of the analytes tested were detected at concentrations that exceeded the human health GAC protective of on-site workers.

Asbestos

There was no asbestos detected in the samples selected for analysis.

5.3 Controlled Waters Risk Assessment

The site is not located within a designated Groundwater Source Protection Zone. The investigation has revealed that the site is underlain by superficial deposits which are likely to comprise the Devensian Till, a Secondary (Undifferentiated) Aquifer. It is anticipated that there is only a limited thickness of the Till present



beneath the site before the Collyhurst Sandstone Formation bedrock is encountered; the latter classified as a Principal Aquifer.

The results of the soil chemical analysis undertaken has identified that concentrations of metals and inorganic contaminants are within the range of typical made ground. Detectable concentrations of TPH and PAHs were encountered in some samples. In one location (WS1), a maximum concentration of 20,000mg/kg was recorded within the made ground at 0.8 – 0.9m bgl, resting above a concrete obstruction. Post-development, the made ground in this area will be removed to accommodate the proposed Lidl retail store on-site. In addition, it should be noted that the site will be predominantly covered with the building and areas of hardstanding. Therefore, the risk of leaching of contaminants as a result of infiltration of groundwater is likely to be limited. However, further investigation of the risk to groundwater from contaminants within the made ground at the site is considered prudent post-demolition.

5.4 Ground Gas Assessment

In order to understand the gassing regime at the site, a Characteristic Situation (as defined in CIRIA C665 and BS8576:2013) is determined for the site. CIRIA C665 and BS8576 provides definitions for each Characteristic Situation based on Gas Screening Values (GSV) which are calculated as follows:

$GSV = \text{Gas Concentration (\% v/v)} \times \text{Measured Borehole Flow Rate (l/hr)}$

BS8576 makes a distinction between the GSV and the Hazardous Gas Flow Rate (Q_{hg}) which is also calculated using the above calculation. BS8576 states that Q_{hg} is calculated for each individual borehole for each monitoring visit, whereas the GSV is taken as the representative value for the site or site zone.

As a worst case assessment, the GSV for the site is therefore taken as the maximum steady state carbon dioxide/methane concentration recorded in the boreholes which is multiplied by the maximum flow rate recorded during the same monitoring programme

- Methane GSV = 0.1 % x 1.3 l/hr = 0.0013 l/hr (methane concentration taken as equal to the instrument detection limit of 0.1%).
- Carbon Dioxide GSV = 0.5 % x 1.3 l/hr = 0.0065 l/hr

The calculated GSV for methane and carbon dioxide places the site into Characteristic Situation 1. BS8485 states that for Characteristic Situation 1 the methane concentration would typically be less than 1% and carbon dioxide less than 5% and that if concentrations are above these limits then consideration should be given to placing the site into Characteristic Situation 2. As the concentrations of methane and carbon dioxide were both within these typical limits it is considered that the Characteristic Situation 1 classification is appropriate for the site. Therefore, gas protection measures are not deemed necessary for the proposed development.

5.5 Revised Conceptual Site Model

A revised Conceptual Site Model is presented as **Table 5** below.

5.6 Waste Classification

In general, the results of the chemical analysis indicates that the majority of the material would be classified as non-hazardous waste. While Waste Acceptance Criteria (WAC) analysis has not been undertaken, the assessment has included determination of the fraction of organic carbon (foc) which can be converted to TOC by multiplying the result by 100. A TOC limit of 3% is placed on waste destined for disposal in an inert landfill. As only one of the five samples selected for analysis exceeded this limit it is considered that the waste may potentially be accepted at an inert landfill. However, the made ground in the vicinity of WS1 will require further analysis due to its elevated concentrations of PAHs, TPH and BTEX compounds.



Two samples of bituminous surfacing were analysed for concentrations of PAH compounds. The purpose of this analysis was to determine if the samples contained coal tar as this would result in a hazardous waste classification. The Environment Agency Technical Guidance document WM3 states that *“where the concentration of benzo(a)pyrene is at or above 50ppm (mg/kg) in the black top alone (excluding other material) then the amount of coal tar should be considered to be sufficient (0.1% or more) for the material to be hazardous”*.

The results indicated that the concentrations of PAHs were very low (total PAH concentration <2.0 mg/kg), and the concentration of benzo(a)pyrene of <0.1mg/kg was below the 50mg/kg limit defined in WM3. Therefore, the bituminous surfacing represented by this sample would be classified as non-hazardous waste and assigned the List of Wastes code 17 03 02 for bituminous mixtures other than those mentioned in 17 03 01.

5.7 Health & Safety Considerations

To ensure direct exposure of construction workers involved in the site redevelopment to any impacted contaminated shallow soils is minimised, the guidance stated in HSG 66 “Protection of Workers and the General Public During Redevelopment of Contaminated Land” should be followed.



Potential Source Areas	Potential Contaminant of Concern	Pathways	Potential Receptor	Exposure Route (Human unless otherwise stated)	Potential Identified Linkage (unmitigated)	Findings of Ground investigation	Risk (Unmitigated)	Proposed Remediation (Mitigation) Measures	Residual Risk Estimation
On-site Sources General Made Ground Infilling of Fallowfield Brook Tramway / Bus Depot Electricity Sub-Station Retail Park Off-site Sources Garage Railway Lines Fuel Filling Station Residential Properties	Asbestos / Metals As, Be, Cd, Cu, Cr (VI), Cr (III) Hg, Ni, Se, Va, Zn, Boron, TPH /PAH, PCBs Ground gas	Disturbance due to construction plant causing direct contact, dusts, vapours. Direct Contact with occupants of the proposed development Inhalation of fibres / vapours / gases by occupants of proposed development Permeation of water supply pipework	Occupants of the development / building fabric Adjacent residents during construction	<ul style="list-style-type: none"> Direct Soil Ingestion 	Yes	As TPH, PAH >GAC	Potential risk	Additional Assessment / Remediation	(To be assessed (TBA))
				<ul style="list-style-type: none"> Indoor Dust ingestion 	Yes	As above	Potential risk	TBA	TBA
				<ul style="list-style-type: none"> Skin Contact with Soils 	Yes	As above	Potential risk	TBA	TBA
				<ul style="list-style-type: none"> Skin Contact with Dust 	Yes	As above	Potential risk	TBA	TBA
				<ul style="list-style-type: none"> Inhalation of Outdoor Dust 	Yes	As above	Potential risk	TBA	TBA
				<ul style="list-style-type: none"> Inhalation of Outdoor Vapours 	Yes	As above	Potential risk	TBA	TBA
				<ul style="list-style-type: none"> Inhalation of ground gas 	Yes	CS2	Potential risk	Basic gas protection measures	Negligible
				<ul style="list-style-type: none"> Inhalation of radon gas 	Yes	Lower Probability Radon Area	Negligible	None	Negligible
				<ul style="list-style-type: none"> Inhalation of Indoor Vapours 	Yes	As TPH, PAH >GAC	Potential risk	Additional Assessment / Remediation	(To be assessed (TBA))
				<ul style="list-style-type: none"> Ingestion via permeated water supply pipework 	Yes	As above	Potential risk	TBA	TBA
		Leachate	Secondary Undifferentiated (superficial) & Principal (bedrock) Aquifers	<ul style="list-style-type: none"> Inhalation of ground gas 	Yes	As above	Potential risk	TBA	TBA
				<ul style="list-style-type: none"> Leaching to Secondary and Principal Aquifers in Superficial and Bedrock deposits 	Yes	As above	Potential risk	TBA	TBA

Table 5: Refined Conceptual Site Model

Direct contact with subsurface soil and/or groundwater during redevelopment works are not assessed as part of the CSM. It is considered that risks to workers will be managed as part of any the redevelopment works at the site through the application of health and safety procedures, where required



6 GEOTECHNICAL SITE ASSESSMENT

6.1 Geotechnical Considerations

An indicative site layout is indicated in **Figure 2** with the Lidl store zone being in eastern part of the site that is currently occupied by retail units 4 to 9. It is assumed that the proposed finished floor level will be more or less similar to the existing floor levels and consequently the proposed footprint will be directly underlain by made ground and relict foundations. Window sample holes WS1, WS2, WS3 and WS4 are located within the proposed store footprint whilst WS8 is in close proximity. Made ground was recovered within the window samples as generally a gravel of brick, concrete and sandstone that is indicative of previous buildings and foundations.

SPT refusal values ($N = 50$) were recorded within the made ground at 0.8m bgl in WS1 and its alternative second advance WS1A (obstruction), 0.8m bgl in WS2, 4m bgl in WS3, 1.5m in WS4 and at 1m in WS8. Natural soils were proven only outside the proposed store footprint in WS6 below 2.4m bgl and recovered as a fine to medium sand that refused at 4m bgl. Resting groundwater levels were not recorded in any individual monitoring well.

Hand dug trial pits to expose existing foundations did not form part of the scope of work and consequently the design and depth of existing foundation is not known.

Details of the proposed permanent and variable design loads (actions) are not currently known although an indicative column load of 400kN has been provided.

6.2 Design Approach

Shallow spread foundations are not considered to be a suitable foundation solution due to the unknown depth of made ground. Piled foundations bearing in the natural strata are a potential foundation solution but as the full depth of made ground was not penetrated beneath the proposed footprint it would be necessary to bore additional rotary exploratory holes to prove the natural strata. Obstructions to piles would also have to be removed.

Remada has undertaken a preliminary assessment of potential safe working loads for pile design based upon the following idealised soil profile and based on the very limited available information (WS6) and the following assumptions:

Depth (m)	Ground Conditions	Assumptions
GL to 2.4m	Made Ground	Ignored in calculations
2.95m	Superficial Deposits	Assume granular for skin friction component and cohesive for end bearing component. N values and c_u values taken from Remada's design lines as shown on Graphs 1 as Average N value of 6 taken at 3m depth/
>4.0	Bedrock	Assumed to comprise very dense sand with $N=50$ ($\phi=41^\circ$ Tomlinson)

Table 6: Idealised Soil Profile

Groundwater has been assumed to be at >6mbgl.

The following table provides a summary of the estimated safe working loads based on the assumptions detailed above:



Pie Toe Depth (m)	Pile Type	Pile Diameter (mm)	Estimated Safe Working Load (kN)
8.0	CFA	300	316
8.0	CFA	450	665
8.0	CFA	600	1141
8.0	Driven	300	407
8.0	Driven	450	864
8.0	Driven	600	1492

Table 7: Estimated Safe Working Loads

The safe working load has been calculated by two different methods. In the first method, a factor of safety of 2.5 is applied to both the end bearing and skin friction components. In the second method, a factor of safety of 3.0 is applied to the end bearing component and 1.5 to the skin friction component. The safe working load is calculated by both methods and the lower of the two adopted.

The above table is for preliminary use only and additional ground investigation is required to prove soil characteristics and depths and the piles should be designed by a specialist contractor.

6.3 Floor Slab

Due to the made ground a suspended ground floor slab is required.

6.4 Excavations and Temporary Works

Excavations and side slopes within the Made Ground and the underlying natural sand are unlikely to remain stable even in the short term without support or without being battered back to a safe slope gradient. A detailed inspection of the side slopes should be made during excavation and a risk assessment carried out to fully assess the support measures required.

No groundwater was encountered during the intrusive investigation. During the subsequent monitoring, one of the exploratory holes was recorded as being flooded on two occasions, but this is considered likely to be associated with surface water run-off and snow melt.

6.5 Protection of Buried Concrete

In accordance with BRE SD1 for buried concrete in a brownfield site with mobile groundwater, analysis of selected samples for water soluble sulphate returned values of up to 0.78 g/l and pH >8.8. A total potential sulphate value of 0.45% was also calculated from the total sulphur results. Therefore, a Design Sulphate Class DS-2 is considered appropriate for buried concrete and an ACEC Class of AC-1s is considered appropriate for the location.

6.6 General Construction Advice

All formations should be cleaned, and subsequently inspected, by a suitably qualified engineer prior to placing concrete. Should any soft, compressible or otherwise unsuitable materials be encountered they should be removed and replaced by blinding concrete.

Foundation concrete, or alternatively, a blinding layer of concrete, should be placed immediately after excavation and inspection in order to protect the formation against softening and disturbance.

Generally, all formations should be placed wholly within the same material type, unless specific geotechnical inspection and assessment have been undertaken.



Where applicable ground beneath the proposed building footprint and potentially car parking may require to be stripped to reveal localised areas of made ground and structures. Excavations should be backfilled with suitably re-compacted materials to achieve formation level.

During foundation excavation works arisings should be constantly monitored for the presence of contamination.



7 CONCLUSIONS & RECOMENDATIONS

7.1 Conclusions

The following conclusions have been made based on the findings of this investigation.

7.1.1 Phase 2 Site Investigation

The earliest available historic mapping of 1848 shows the site to be undeveloped fields. Fallowfield Brook bisects the central area of the site, although this appears to have been infilled by 1923. By the mapping of 1934, the site had been redeveloped and occupied by a tramway depot, latterly a bus depot which remained until circa 1992. By 1995 the site had been redeveloped again to its present form as part of Fallowfield Retail Park.

A variable thickness of made ground was encountered beneath the site which was encountered to at least 4m in thickness. The made ground was generally granular and contained fragments of concrete and brick up to boulder size. Due to the shallow obstructions encountered within the majority of window sample boreholes, natural strata were only observed within one location (WS6) in the south-western area of the site. Below 2.4m bgl, reddish brown clayey fine to medium sand was encountered, transitioning into soft sandy clay between 2.95m and 3.3m bgl. Below 3.65m bgl, brown fine to medium sand was encountered and resulted with an SPT refusal at 4.0m bgl.

No bedrock was positively identified during this intrusive investigation, although it is considered possible that the dense brown sand encountered in WS6 may be representative of weathered Collyhurst Sandstone Formation. Further investigation would be required to establish the presence and depth to bedrock underlying the site.

7.1.2 Human Health Risk Assessment

The results of soil chemical analysis were compared to Human Health Generic Assessment Criteria for commercial land use. Within the sample from WS1 at 0.8 – 0.9m bgl, the concentrations of benzo(b)fluoranthene, benzo(a)pyrene and dibenz(a,h)anthracene were in exceedance of their respective human health GAC values protective of on-site workers.

7.1.3 Water Resources Risk Assessment

The results of the soil chemical analysis undertaken has identified that concentrations of metals and inorganic contaminants are within the range of typical made ground. Detectable concentrations of TPH and PAHs were encountered in some samples. In one location (WS1), a maximum concentration of 20,000 mg/kg was recorded within the made ground at 0.8 – 0.9m bgl, resting above a concrete obstruction. Post-development, the made ground in this area will be removed to accommodate the proposed Lidl retail store on-site. In addition, it should be noted that the site will be predominantly covered with the building and areas of hardstanding. Therefore, the risk of leaching of contaminants as a result of infiltration of groundwater is likely to be limited. However, further investigation of the risk to groundwater from contaminants within the made ground at the site is considered prudent post-demolition.

7.1.4 Waste Classification

In general, the results of the chemical analysis indicates that the majority of the material would be classified as non-hazardous waste. While Waste Acceptance Criteria (WAC) analysis has not been undertaken, one of the five samples selected for analysis exceeded this limit it is considered that the waste may potentially be accepted at an inert landfill. However, the made ground in the vicinity of WS1 will require further analysis due to its elevated concentrations of PAHs, TPH and BTEX compounds.

Two samples of bituminous surfacing were analysed for concentrations of PAH compounds. The results indicated that the concentrations of PAHs were very low (total PAH concentration <2.0 mg/kg), and the concentration of benzo(a)pyrene of <0.1mg/kg was below the 50mg/kg limit defined in WM3. Therefore,



the bituminous surfacing represented by this sample would be classified as non-hazardous waste and assigned the List of Wastes code 17 03 02 for bituminous mixtures other than those mentioned in 17 03 01.

7.1.4 Foundations

The proposed footprint will be directly underlain by made ground and relict foundations as recorded in window sample holes WS1, WS2, WS3 and WS4. Made ground was recovered as generally a gravel of brick, concrete and sandstone that is indicative of previous buildings and foundations. SPT refusal values ($N = 50$) were recorded within the made ground at 0.8m bgl in WS1 WS1A & WS2, 4m bgl in WS3, 1.5m in WS4. Natural soils were proven only outside the proposed store footprint in WS6 below 2.4m bgl and recovered as a fine to medium sand that refused at 4m bgl. Resting groundwater levels were not recorded in any individual monitoring well.

Shallow spread foundations are not considered a suitable foundation solution due to the unknown depth of made ground.

7.2 Recommendations

Piled foundations bearing in the natural strata are a potential foundation solution but as the full depth of made ground was not penetrated beneath the proposed footprint it would be necessary to bore additional rotary exploratory holes to prove the natural strata. Obstructions to piles would also have to be removed.

A Design Sulphate Class DS-2 is considered appropriate for buried concrete and an ACEC Class of AC-1s is considered appropriate for the location.

7.3 Ground Gas

The results of four rounds of gas monitoring visits placed the site into Characteristic Situation 1 and therefore ground gas protection measures will not be required within the proposed buildings.



REFERENCES & GUIDANCE

- AGS, *Guidance on the Waste Classification for Soils – A Practitioners' Guide* 2019.
- Barnes, G. 2010, *Soil Mechanics Principles and Practice*. 3rd Edition.
- BRE, *Special Digest 1:2005 (3rd Edition), Concrete in Aggressive Ground*. 2005.
- BS 10175:2011+A1:2013, *Investigation of potentially contaminated sites: Code of practice*.
- BS 1377:1999. *Methods of test for soils for civil engineering purposes*.
- BS 5930:2015, *Code of practice for site investigations*.
- BS 8485:2015, *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*.
- BS 8576:2013, *Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs)*.
- BS EN ISO 22476-3:2005, *Geotechnical investigation and testing: Field testing - Standard penetration test*.
- CIRIA, C504, *Engineering in glacial tills*, 1999.
- CIRIA, C665, *Assessing risks posed by hazardous ground gases to buildings*, 2007.
- CIRIA, C682, *The VOCs Handbook: Investigating, assessing and managing risks from inhalation of VOCs at land affected by contamination*, 2009.
- CIRIA, C716, *Remediating and mitigating risks from volatile organic compound (VOC) vapours from land affected by contamination*, 2012.
- CIRIA C733, *Asbestos in Soil and Made Ground: A Guide to Understanding & Managing Risks*.
- CL:AIRE/EIC/AGS, *The Soil Generic Assessment Criteria for Human Health Risk Assessment*, 2009.
- CL:AIRE, SP1010, *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination -Final Project Report*. 2013.
- CL:AIRE, *The Definition of Waste: Development Industry Code of Practice Version 2*
- DEFRA, Circular 01/2006, *Contaminated Land Environmental Protection Act 1990, Part 2A*. 2006.
- DEFRA, SP1010, *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document*. March 2014.
- Environment Agency, *Model Procedures for the Management of Land Contamination*, CLR 11, 2004.
- Environment Agency, *Verification of Remediation of Land Contamination Science Report – NC/00/38/SR*
- Environment Agency, *Waste Classification, Guidance on the classification and assessment of waste (1st Edition V1.1) Technical Guidance WM3*.
- Health & Safety Executive, HSG 66, *Protection of Workers and the General Public During Redevelopment of Contaminated Land*. 1991.
- Highways Agency, IAN 73/06 Rev 1, *Design of Pavement Foundations*, 2009.
- Land Contamination Risk Management www.gov.uk 08.10.2020.
- LCM/CIEH, *The LQM/CIEH S4ULs for Human Health Risk Assessment*. Land Quality Press, S4UL3146, 2015.
- NHBC Standards, 2019.
- Tomlinson, M.J., 2001, *Foundation Design and Construction*, 7th Edition.
- The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015
- The Definition of Waste: Development Industry Code of Practice, CL:AIRE 2011.
- Guidance on the classification and assessment of waste (1st Edition v1.1) Technical Guidance WM3 2018.



STUDY LIMITATIONS

IMPORTANT. This section should be read before reliance is placed on any of the information, opinions, advice, recommendations or conclusions contained in this report.

1. This report has been prepared by Remada, Ltd with all reasonable skill, care and diligence within the terms of the Appointment and with the resources and manpower agreed with (the 'Client'). Remada does not accept responsibility for any matters outside the agreed scope.

2. This report has been prepared for the sole benefit of the Client unless agreed otherwise in writing.

3. Unless stated otherwise, no consultations with authorities or funders or other interested third parties have been carried out. Remada is unable to give categorical assurance that the findings will be accepted by these third parties as such bodies may have published, more stringent objectives. Further work may be required by these parties.

4. All work carried out in preparing this report has used, and is based on, Remada's professional knowledge and understanding of current relevant legislation. Changes in legislation or regulatory guidance may cause the opinion or advice contained in this report to become inappropriate or incorrect. In giving opinions and advice pending changes in legislation, of which Remada is aware, have been considered. Following delivery of the report Remada has no obligation to advise the Client or any other party of such changes or their repercussions.

5. This report is only valid when used in its entirety. Any information or advice included in the report should not be relied upon until considered in the context of the whole report.

6. Whilst this report and the opinions made are to the best of Remada's belief, Remada cannot guarantee the accuracy or completeness of any information provided by third parties.

7. This report has been prepared based on the information reasonably available during the project programme. All information relevant to the scope may not have received.

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

9. The content of this report represents the professional opinion of experienced environmental consultants. Remada does not provide specialist legal or other professional advice. The advice of other professionals may be required.

10. Where intrusive investigation techniques have been employed they have been designed to provide a reasonable level of assurance on the conditions. Given the discrete nature of sampling, no investigation technique is capable of identifying all conditions present in all areas. In some cases the investigation is further limited by site operations, underground obstructions and above ground structures. Unless otherwise stated, areas beyond the boundary of the site have not been investigated.

11. If below ground intrusive investigations have been conducted as part of the scope, service tracing for safe location of exploratory holes has been carried out. The location of underground services shown on any drawing in this report has been determined by visual observations and electromagnetic techniques. No guarantee can be given that all services have been identified. Additional services, structures or other below ground obstructions, not indicated on the drawing, may be present on site.

12. Unless otherwise stated the report provides no comment on the nature of building materials, operational integrity of the facility or on any regulatory compliance issues.

13. Unless otherwise stated, samples from the site (soil, groundwater, building fabric or other samples) have NOT been analysed or assessed for waste classification purposes.



TABLES

Table 2: Gas Groundwater Monitoring Data														Remada					
GAS & GROUNDWATER MONITORING DATA																			
SITE		Fallowfields Retail Park, Peaceville Road, Manchester, M14 6FS																	
PROJECT No.		806.02		Atmospheric & Ground Conditions															
		Atmospheric Pressure Variations During Visit										Ground Surface Conditions							
Carried Out by:		Idris Shafqat		996mb										Wet					
Date:		18.12.2020																	
Instrument Details	GA 5000 G501261			Atmospheric Pressure Trend Over Previous 48hrs										Weather Conditions					
				Rising										Light Rain					
Well No.	Cover Height (m AOD)	Well Diameter (mm)	CH ₄ (% v/v)		CH ₄ Steady LEL (%)	CO ₂ (% v/v)		O ₂ (% v/v)		Duration (secs)*	Flow Rate (l/hr)	Relative Pressure (Pa)	PID (ppm)		Atmospheric Pressure (mb)	Water Level (m bgl)	Water Level (m AoD)	Depth of Pipe (m bgl)	Comments
			Peak	Steady		Peak	Steady	Minimum	Steady				Peak	Steady					
WS3		50	0.0	0.0	0.0	0.2	0.0	20.1	20.5	60	0.7	-0.07	-	-	996	DRY	-	3.000	
WS4		50	0.0	0.0	0.0	0.0	0.0	19.7	19.9	60	0.7	-0.35	-	-	996	DRY	-	1.500	
WS8		50	0.0	0.0	0.0	0.0	0.0	18.9	19.2	60	0.6	-0.26	-	-	996	DRY	-	1.000	

Notes: NR = Not Recorded ^ For measurement of gas concentrations > = Above LEL WST = Water Sample Taken GL = Ground Level

GAS & GROUNDWATER MONITORING DATA													Remada						
SITE		Fallowfields Retail Park, Peaceville Road, Manchester, M14 6FS																	
PROJECT No.		806.02		Atmospheric & Ground Conditions															
Carried Out by:		Idris Shafqat		Atmospheric Pressure Variations During Visit									Ground Surface Conditions						
Date:		06.01.2021		1015mb									Wet						
Instrument Details	GA 5000 G501261			Atmospheric Pressure Trend Over Previous 48hrs									Weather Conditions						
				Falling									Light rain, cloudy, windy						
Well No.	Cover Height (m AOD)	Well Diameter (mm)	CH ₄ (% v/v)		CH ₄ Steady LEL (%)	CO ₂ (% v/v)		O ₂ (% v/v)		Duration (secs)^	Flow Rate (l/hr)	Relative Pressure (Pa)	PID (ppm)		Atmospheric Pressure (mb)	Water Level (m bgl)	Water Level (m AoD)	Depth of Pipe (m bgl)	Comments
			Peak	Steady		Peak	Steady	Minimum	Steady				Peak	Steady					
WS3		50	0.0	0.0	0.0	0.1	0.0	19.7	19.9	60	1.3	-0.38	-	-	1015	DRY	-	3.000	
WS4		50	0.0	0.0	0.0	0.8	0.3	19.8	20.5	60	1.3	-0.56	-	-	1015	DRY	-	1.500	
WS8		50	0.0	0.0	0.0	0.0	0.0	20.3	20.5	60	1.0	-0.63	-	-	1015	DRY	-	1.000	

Notes: NR = Not Recorded ^ For measurement of gas concentrations > = Above LEL WST = Water Sample Taken GL = Ground Level

GAS & GROUNDWATER MONITORING DATA													Remada								
SITE		Fallowfields Retail Park, Peaceville Road, Manchester, M14 6FS																			
PROJECT No.		806.02		Atmospheric & Ground Conditions																	
		Atmospheric Pressure Variations During Visit											Ground Surface Conditions								
Carried Out by:		Idris Shafqat		1023mb											Wet						
Date:		15.01.2020		Atmospheric Pressure Trend Over Previous 48hrs											Weather Conditions						
Instrument Details	GA 5000 G501261			Rising											Light rain, cloudy, windy						
Well No.	Cover Height (m AOD)	Well Diameter (mm)	CH ₄ (% v/v)		CH ₄ Steady LEL (%)	CO ₂ (% v/v)		O ₂ (% v/v)		Duration (secs)^	Flow Rate (l/hr)	Relative Pressure (Pa)	PID (ppm)		Atmospheric Pressure (mb)	Water Level (m bgl)	Water Level (m AoD)	Depth of Pipe (m bgl)	Comments		
			Peak	Steady		Peak	Steady	Minimum	Steady				Peak	Steady							
WS3		50	0.0	0.0	0.0	0.1	0.0	19.4	20.3	60	1.0	-0.46	-	-	1023	DRY	-	3.000			
WS4		50	0.0	0.0	0.0	0.7	0.5	19.7	20.1	60	0.8	-0.52	-	-	1023	DRY	-	1.500			
WS8		50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.000	Not Accessible		

Notes: NR = Not Recorded ^ For measurement of gas concentrations > = Above LEL WST = Water Sample Taken GL = Ground Level

GAS & GROUNDWATER MONITORING DATA														Remada						
SITE		Fallowfields Retail Park, Peaceville Road, Manchester, M14 6FS																		
PROJECT No.		806.02		Atmospheric & Ground Conditions																
Carried Out by:		Idris Shafqat		Atmospheric Pressure Variations During Visit									Ground Surface Conditions							
Date:		19.01.2020		999mb									Wet							
Instrument Details	GA 5000 G501261			Atmospheric Pressure Trend Over Previous 48hrs									Weather Conditions							
				Falling									Heavy rain, cold, windy							
Well No.	Cover Height (m AOD)	Well Diameter (mm)	CH ₄ (% v/v)		CH ₄ Steady LEL (%)	CO ₂ (% v/v)		O ₂ (% v/v)		Duration (secs)^	Flow Rate (l/hr)	Relative Pressure (Pa)	PID (ppm)		Atmospheric Pressure (mb)	Water Level (m bgl)	Water Level (m AoD)	Depth of Pipe (m)	Comments	
			Peak	Steady		Peak	Steady	Minimum	Steady				Peak	Steady						
WS3		50	0.0	0.0	0.0	0.3	0.0	19.8	20.1	60	0.8	-0.31	-	-	999	DRY	-	3.000		
WS4		50	0.0	0.0	0.0	0.7	0.1	19.4	19.7	60	0.7	-0.37	-	-	999	DRY	-	1.500		
WS8		50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.000	WS was flooded	

Notes: NR = Not Recorded ^ For measurement of gas concentrations > = Above LEL WST = Water Sample Taken GL = Ground Level

Table 2: Gas and Groundwater Monitoring Data

Table 4: Comparison of Soil Chemical Analyses with GAC

Laboratory ID						20-34343	20-34343	20-34343	20-34343	20-34343
Sample ID			Client Sample ID:			1113385	1113386	1113387	1113388	1113390
Borehole			Sample Location:			WS3	WS4	WS5a	WS7	WS1
Depth			Top Depth (m):			0.18	1.00	0.30	0.35	0.80
			Bottom Depth (m):			0.48	1.20	0.47	0.50	0.90
Sample Date			Date Sampled (\$):			09-Dec-2020	10-Dec-2020	09-Dec-2020	10-Dec-2020	09-Dec-2020
Determinand	Accred.	SOP	Units	LOD	(mg/kg unless stated)					
ACM Type	U	2192		N/A		-	-	-	-	-
Asbestos Identification	U	2192	%	0.001		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A		-	-	-	-	-
Moisture	N	2030	%	0.020		15	8.9	8.4	16	16
pH	M	2010		N/A		10.5	10.6	9.5	8.5	8.8
Arsenic	M	2450	mg/kg	1.0	640	11	13	3.8	7.1	19
Beryllium	U	2450	mg/kg	1.0	12	< 1.0	< 1.0	< 1.0	< 1.0	2.1
Cadmium	M	2450	mg/kg	0.10	190	0.14	0.29	0.17	0.17	0.27
Copper	M	2450	mg/kg	0.50	68000.00	20	41	9.1	21	48
Mercury	M	2450	mg/kg	0.10	58vap (25.8)	0.10	< 0.10	< 0.10	0.13	0.12
Nickel	M	2450	mg/kg	0.50	980	17	14	7.7	19	35
Lead	M	2450	mg/kg	0.50	2300	91	190	38	52	60
Selenium	M	2450	mg/kg	0.20	12000	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Vanadium	U	2450	mg/kg	5.0	9000	21	19	9.1	29	50
Zinc	M	2450	mg/kg	0.50	730000	100	110	29	45	59
Chromium (Trivalent)	N	2490	mg/kg	1.0	8600	14	13	7.5	17	20
Chromium (Hexavalent)	N	2490	mg/kg	0.50	33	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Fraction of Organic Carbon	M	2625		0.0010		0.0082	0.0090	0.0043	0.0060	0.082
Calculated SOM from FOC						1.414	1.552	0.741	1.034	14.138
Calculated TOC from FOC						0.820	0.900	0.430	0.600	8.200
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	5900sol (568)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	17000sol (322)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	4800vap (190)	< 1.0	< 1.0	< 1.0	< 1.0	63
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	23000vap (118)	< 1.0	< 1.0	20	< 1.0	86
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	82000sol (59)	< 1.0	< 1.0	35	< 1.0	210
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0		< 1.0	< 1.0	42	< 1.0	190
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	1700000	13	53	250	13	430
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.00	1700000	< 1.0	< 1.0	< 1.0	< 1.0	200
Total Aliphatic Hydrocarbons:	N	2680	mg/kg	5.0		< 5.0	< 5.0	12	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	46000sol (2260)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	110000sol (1920)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	8100vap (1500)	< 1.0	< 1.0	17	< 1.0	28
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	28000sol (899)	< 1.0	< 1.0	99	< 1.0	140
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	37000	< 1.0	< 1.0	480	< 1.0	1400
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	28000	9.7	3.1	1200	9.9	4400
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	28000	65	32	3200	130	12000
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	28000	< 1.0	< 1.0	370	< 1.0	1000
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0		75	35	5400	140	19000
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0		87	88	5700	150	20000
Naphthalene	M	2700	mg/kg	0.10	460sol (183)	0.68	0.10	0.54	0.17	6.2
Acenaphthylene	M	2700	mg/kg	0.10	97000sol (212)	0.34	< 0.10	0.25	0.20	2.9
Acenaphthene	M	2700	mg/kg	0.10	97000sol (141)	2.6	0.26	2.2	< 0.10	26
Fluorene	M	2700	mg/kg	0.10	68000	2.0	0.24	1.7	0.87	19
Phenanthrene	M	2700	mg/kg	0.10	22000	13	1.8	12	9.1	140
Anthracene	M	2700	mg/kg	0.10	540000	3.4	0.45	2.9	< 0.10	41
Fluoranthene	M	2700	mg/kg	0.10	23000	19	3.7	14	18	250
Pyrene	M	2700	mg/kg	0.10	54000	20	4.0	14	18	270
Benzo[a]anthracene	M	2700	mg/kg	0.10	170	8.8	1.7	5.7	7.6	92
Chrysene	M	2700	mg/kg	0.10	350	9.2	2.1	5.8	0.22	90
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	45	3.3	1.6	2.1	2.1	140
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	1200	5.2	1.2	2.8	4.0	44
Benzo[a]pyrene	M	2700	mg/kg	0.10	35	8.6	1.8	5.4	7.8	89
Indeno[1,2,3-c,d]Pyrene	M	2700	mg/kg	0.10	510	5.9	1.3	3.6	5.0	55
Dibenzo[a,h]Anthracene	M	2700	mg/kg	0.10	3.6	< 0.10	0.16	< 0.10	< 0.10	13
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	4000	< 0.10	1.4	3.7	< 0.10	53
Total Of 16 PAH's	M	2700	mg/kg	2.0		100	22	77	73	1300
Benzene	M	2760	mg/kg	1.0	47	<0.001	<0.001	<0.001	<0.001	0.004
Toluene	M	2760	mg/kg	1.0	110000vap (1920)	<0.001	<0.001	<0.001	<0.001	0.017
Ethylbenzene	M	2760	mg/kg	1.0	13000vap (1220)	<0.001	<0.001	<0.001	<0.001	0.04
m&p-Xylene	M	2760	mg/kg	1.0	14000sol (1350)	<0.001	<0.001	<0.001	<0.001	0.21
o-Xylene	M	2760	mg/kg	1.0	15000sol (1120)	<0.001	<0.001	<0.001	<0.001	0.18
Total Phenols	M	2920	mg/kg	0.30	690dir (30000)	< 0.30	< 0.30	< 0.30	< 0.30	0.94

	Determinand concentration below the GAC
	Determinand concentration in exceedance of GAC
	Determinand concentration in exceedance of the vapour/solubility saturation limit.

NC: No published criteria

vap: Screening criteria presented exceed the vapour saturation limit, which is presented in brackets.

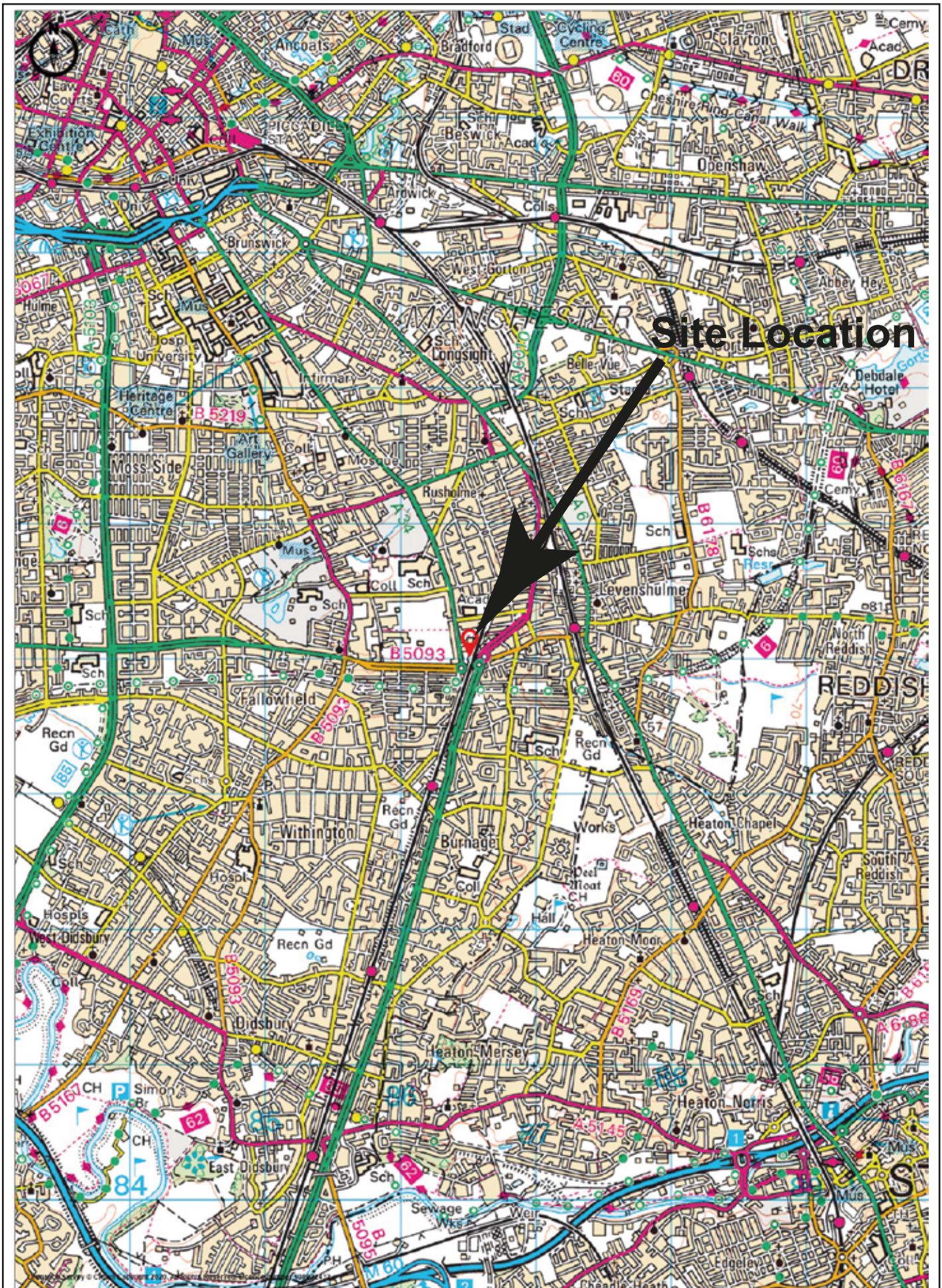
sol: Screening criteria presented exceed the solubility saturation limit, which is presented in brackets.

dir: Screening criteria based on threshold protective of direct skin contact (guideline in brackets based on health effects following long term exposure provided for illustration only).

(1): For assessment based on the use of the surrogate marker approach the GAC for Coal Tar must be used instead of benzo[a]pyrene.



FIGURES



Notes	Project Title	Scale	Drawn	Size
	Fallowfield Retail Park	as shown	GJ	A4
	Drawing Title	Date	Job No.	Drawing / Rev No.
	Site Location Plan	03.12.20	806	Fig1
Client		 		
Lidl Great Britain Ltd				



WS2

Window Sample Borehole

Notes

Project Title

Fallowfields Retail Park

Drawing Title

Exploratory Hole Location Plan

Client

Lidl Great Britain Ltd

Scale	Drawn	Size
as shown	PD	A4
Date	Job No.	Drawing /Rev No
04.01.21	806	01

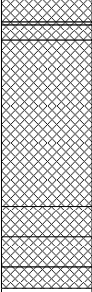
Remada



EXPLORATORY LOGS

Percussion Drilling Log

Project Name: Fallowfield Retail Park		Client: Lidl Great Britain Ltd		Date: 09/12/2020	
Location: Fallowfield Retail Park, Manchester		Contractor:			
Project No. : 806.02		Crew Name:		Drilling Equipment:	
Borehole Number WS1	Hole Type WS	Level 46.02m AoD	Logged By JM	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00 - 0.09	ES	52 (4,12/52 for 170mm)	0.09	45.93		MADE GROUND. Asphalt.	1
		0.15 - 0.70	B		0.10	45.92		MADE GROUND. Loose light brown slightly clayey very sandy angular to sub angular medium to coarse gravel of mixed lithologies including sandstone and brick. Sand is fine to medium.	
					0.15	45.87		MADE GROUND. Loose grey sandy angular to sub angular fine to medium gravel of concrete.	
								MADE GROUND. Loose brown slightly clayey gravelly fine to medium sand. Gravel is angular to sub angular fine to medium of concrete and occasional quartz.	
		0.80 - 0.90	ES		0.70	45.32		MADE GROUND. Medium dense reddish brown slightly clayey gravelly fine to medium sand. Gravel is angular to sub angular fine to medium of concrete.	
		0.80	SPT		0.80	45.22		MADE GROUND. Medium dense dark brown mottled black gravelly fine to medium sand. with slight hydrocarbon and burnt odours. Gravel is angular to sub angular fine to medium concrete.	
					0.90	45.12		MADE GROUND. Light brown gravelly fine to medium sand. Gravel is angular fine to medium of mixed lithologies.	
					0.97	45.05		End of Borehole at 0.970m	

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

- No groundwater encountered.
- Partial environmental sample taken from SPT shoe from 0.8 - 0.9m.

Percussion Drilling Log

Project Name: Fallowfield Retail Park		Client: Lidl Great Britain Ltd		Date: 09/12/2020	
Location: Fallowfield Retail Park, Manchester		Contractor:			
Project No. : 806.02		Crew Name:		Drilling Equipment:	
Borehole Number WS1a	Hole Type WS	Level 46.03m AoD	Logged By JM	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.12	45.91		MADE GROUND. Asphalt.	
					0.32	45.71		MADE GROUND. Loose light brown gravelly fine to medium sand. Gravel is angular to sub angular fine to coarse of mixed lithologies including concrete.	
					0.62	45.41		MADE GROUND. Loose grey sandy angular fine to coarse gravel of concrete. Sand is fine to medium.	
		0.80	SPT	50 (25 for 10mm/50 for 10mm)	0.80	45.23		MADE GROUND. Dark brown slightly clayey gravelly fine to medium sand. Gravel is angular fine to coarse of mixed lithologies including concrete.	
								End of Borehole at 0.800m	1
									2
									3
									4
									5

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

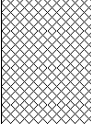
Remarks

1. No groundwater encountered.



Percussion Drilling Log

Project Name: Fallowfield Retail Park		Client: Lidl Great Britain Ltd		Date: 10/12/2020	
Location: Fallowfield Retail Park, Manchester		Contractor:			
Project No. : 806.02		Crew Name:		Drilling Equipment:	
Borehole Number WS2	Hole Type WS	Level 46.38m AoD	Logged By	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.18 - 0.80	B		0.18	46.20		MADE GROUND. Concrete. <i>Rebar at 0.06m - 6mm diameter.</i>	
					0.38	46.00		MADE GROUND. Loose light brown clayey sandy angular to sub angular fine to coarse gravel of concrete. Sand is fine to medium.	
		0.50 - 0.80	ES					MADE GROUND. Grey sandy angular fine to coarse gravel of concrete.	
					0.80	45.58		End of Borehole at 0.800m	

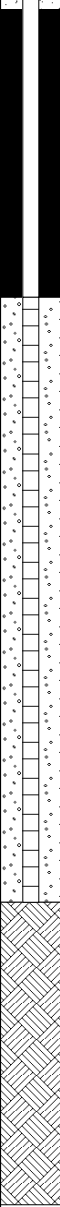
Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. No groundwater encountered.

Percussion Drilling Log

Project Name: Fallowfield Retail Park		Client: Lidl Great Britain Ltd		Date: 09/12/2020	
Location: Fallowfield Retail Park, Manchester		Contractor:			
Project No. : 806.02		Crew Name:		Drilling Equipment:	
Borehole Number WS3	Hole Type WS	Level 45.77m AoD	Logged By	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.18 - 0.48	ES		0.18	45.59		MADE GROUND. Concrete.	
		0.80	SPT	N=52 (12,13/13,13,13,13)				MADE GROUND. Brown / dark brown very gravelly fine to medium sand. Gravel is angular to sub angular fine to coarse of mixed lithologies including brick, occasional clinker, and rare glass and metal wire.	
		1.00 - 2.00	B		1.00	44.77		MADE GROUND. Dark brown slightly clayey gravelly fine to medium sand. Gravel is angular to sub angular fine to coarse of mixed lithologies including brick.	1
		2.00	SPT	N=6 (1,2/1,2,1,2)	1.85 2.00	43.92 43.77		MADE GROUND. Loose brown angular fine to medium gravel of mixed lithologies including brick. MADE GROUND. Dense dark brown slightly clayey gravelly fine to medium sand. Gravel is angular to sub angular fine to medium of mixed lithologies including brick and concrete.	2
		3.00	SPT	N=50 (10,10/12,12,13,13)					3
		4.00	SPT	50 (3,5/50 for 170mm)	4.00	41.77		End of Borehole at 4.000m	4
									5

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

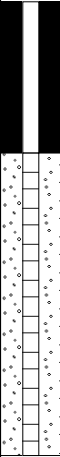
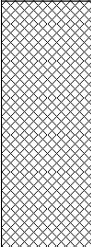
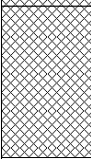
Remarks

1. No groundwater encountered.
2. Installed to 3.0m bgl. 1.0m plain pipe, 2.0m slotted pipe.
3. Borehole collapse from 4.0m to 3.0m.



Percussion Drilling Log

Project Name: Fallowfield Retail Park		Client: Lidl Great Britain Ltd		Date: 10/12/2020	
Location: Fallowfield Retail Park, Manchester		Contractor:			
Project No. : 806.02		Crew Name:		Drilling Equipment:	
Borehole Number WS4	Hole Type WS	Level 46.01m AoD	Logged By JM	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.17	45.84		Made Ground. Concrete. <i>Rebar at 0.08m - 6mm diameter.</i>	
		1.00 - 1.20 1.00	ES SPT	N=22 (7,7/7,7,4,4)	1.00	45.01		MADE GROUND. Loose brown very sandy angular fine to medium angular gravel of mixed lithologies including concrete. Sand is fine to medium.	1
		1.20 - 1.50	B					MADE GROUND. Dark brown very gravelly sand. Gravel is angular fine to medium of brick.	
		1.50	SPT	50 (25 for 5mm/50 for 10mm)	1.50	44.51		End of Borehole at 1.500m	2
									3
									4
									5

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

- No groundwater encountered.
- Installed to 1.5m bgl. 0.5m plain pipe, 1.0m slotted pipe.

Percussion Drilling Log

Project Name: Fallowfield Retail Park		Client: Lidl Great Britain Ltd		Date: 09/12/2020	
Location: Fallowfield Retail Park, Manchester		Contractor:			
Project No. : 806.02		Crew Name:		Drilling Equipment:	
Borehole Number WS5	Hole Type WS	Level 45.91m AoD	Logged By	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.15	45.76		MADE GROUND. Asphalt.	
					0.30	45.61		MADE GROUND. Loose brown slightly clayey gravelly fine to coarse sand. Gravel is sub angular to sub rounded fine to medium of mixed lithologies.	
								MADE GROUND. Dark grey mottled grey sandy angular to sub angular fine to coarse gravel of mixed lithologies including brick. Sand is fine to medium including pockets of black material.	
		0.70	SPT	0 (50 for 20mm/0 for 0mm)	0.70	45.21		End of Borehole at 0.700m	
									1
									2
									3
									4
									5

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

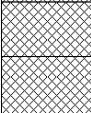
Remarks

1. No groundwater encountered.



Percussion Drilling Log

Project Name: Fallowfield Retail Park		Client: Lidl Great Britain Ltd		Date: 09/12/2020	
Location: Fallowfield Retail Park, Manchester		Contractor:			
Project No. : 806.02		Crew Name:		Drilling Equipment:	
Borehole Number WS5a	Hole Type WS	Level 45.91m AoD	Logged By JM	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.12	B ES		0.12	45.79		MADE GROUND. Asphalt.	1
		0.30 - 0.47 0.30 - 0.47			0.30	45.61		MADE GROUND. Loose light brown slightly clayey very sandy angular to sub angular medium to coarse gravel of mixed lithologies including sandstone, brick and concrete, with two cobbles of kerbstone.	
		0.80	SPT	50 (15,15/50 for 20mm)	0.80	45.11		MADE GROUND. Brown slightly clayey gravelly fine to coarse sand. Gravel is angular to sub angular fine to medium of mixed lithologies including brick.	
								End of Borehole at 0.800m	2
									3
									4
									5

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

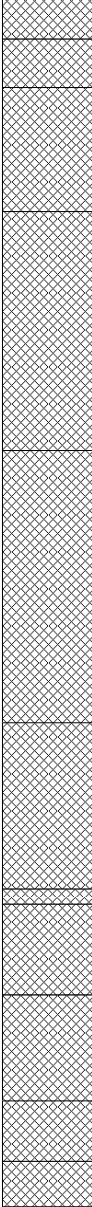
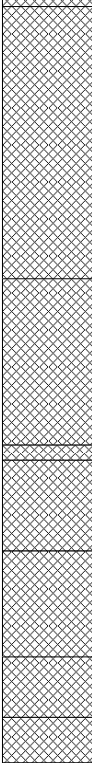
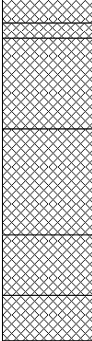
Remarks

1. No groundwater encountered.



Percussion Drilling Log

Project Name: Fallowfield Retail Park		Client: Lidl Great Britain Ltd		Date: 10/12/2020	
Location: Fallowfield Retail Park, Manchester		Contractor:			
Project No. : 806.02		Crew Name:		Drilling Equipment:	
Borehole Number WS6	Hole Type WS	Level 45.91m AoD	Logged By	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
		Depth (m)	Type	Results							
		1.00	SPT	N=19 (2,2/3,6,5,5)	0.14	45.77		MADE GROUND. Asphalt.	1		
					0.30	45.61		MADE GROUND. Yellowish brown gravelly fine to medium sand. Gravel is angular to sub angular fine tom medium of concrete.			
								MADE GROUND. Brown mottled grey slightly clayey very gravelly fine to medium sand. Gravel is angular to sub angular fine to coarse of concrete.			
					0.71	45.20					
								MADE GROUND. Medium dense dark brown clayey gravelly fine to medium sand with frequent small pockets of black material. Gravel is angular fine to medium of brick and concrete.			
								<u>Reddish brown.</u>			
		2.00	SPT	N=20 (2,3/5,5,5,5)	1.50	44.41		<u>Pocket of grey gravelly fine to coarse sand.</u>	2		
								MADE GROUND. Medium dense brown clayey gravelly fine to medium sand with occasional pockets of black sand. Gravel is angular to sub angular fine to medium of brick and concrete.			
		3.00	SPT	N=6 (2,1/2,1,2,1)	2.95	42.96		MADE GROUND. Reddish brown clayey fine to medium sand.	3		
					3.00	42.91		MADE GROUND. Soft orangeish brown and brown clay.			
								MADE GROUND. Soft orangeish brown and brown sandy clay. Sand is fine to medium.			
					3.30	42.61		MADE GROUND. Brown clayey fine to medium sand.			
					3.65	42.26		MADE GROUND. Brown fine to medium sand.			
					3.85	42.06		MADE GROUND. Light brown fine to medium sand.			
		4.00	SPT	50 (10,12/50 for 80mm)	4.00	41.91		End of Borehole at 4.000m	4		

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. No groundwater encountered.



Percussion Drilling Log

Project Name: Fallowfield Retail Park		Client: Lidl Great Britain Ltd		Date: 10/12/2020	
Location: Fallowfield Retail Park, Manchester		Contractor:			
Project No. : 806.02		Crew Name:		Drilling Equipment:	
Borehole Number WS7	Hole Type WS	Level 46.12m AoD	Logged By JM	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.07 - 0.51	B		0.20	45.92		Grass over dark brown clayey fine to medium sandy TOPSOIL.	1
		0.35 - 0.50	ES		0.35	45.77		MADE GROUND. Loose light brown fine to medium sand.	
								MADE GROUND. Brown clayey fine to medium sand.	
		0.50	SPT	50 (25 for 5mm/50 for 10mm)	0.50 0.51	45.62 45.61		MADE GROUND. Grey mottled brown sandy angular to sub angular fine to medium gravel of concrete. Sand is fine to medium. End of Borehole at 0.510m	
									2
									3
									4
									5

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

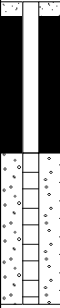
Remarks

1. No groundwater encountered.



Percussion Drilling Log

Project Name: Fallowfield Retail Park		Client: Lidl Great Britain Ltd		Date: 10/12/2020	
Location: Fallowfield Retail Park, Manchester		Contractor:			
Project No. : 806.02		Crew Name:		Drilling Equipment:	
Borehole Number WS8	Hole Type WS	Level 45.95m AoD	Logged By JM	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00 - 0.08	ES		0.08	45.87		MADE GROUND. Asphalt.	
								MADE GROUND. Loose brown very gravelly fine to medium sand. Gravel is angular to sub rounded fine to medium of mixed lithologies including concrete and brick.	
		0.50 - 1.00	B		0.50	45.45		MADE GROUND. Dark brown slightly clayey gravelly sand. Gravel is angular to sub angular fine to coarse of mixed lithologies including brick and concrete.	
								<u>Cobble of brick.</u>	
		1.00	SPT	50 (10,12/50 for 10mm)	1.00	44.95		End of Borehole at 1.000m	1
									2
									3
									4
									5

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. No groundwater encountered.
2. Installed to 1.0m bgl. 0.5m plain pipe, 0.5m slotted pipe.





APPENDIX A

SPT Calibration Certificate

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING (UK) LTD
AINLEYS INDUSTRIAL ESTATE
ELLAND
WEST YORKSHIRE
HX5 9JP

SPT Hammer Ref: DART428
Test Date: 27/01/2020
Report Date: 27/01/2020
File Name: DART428.spt
Test Operator: CM

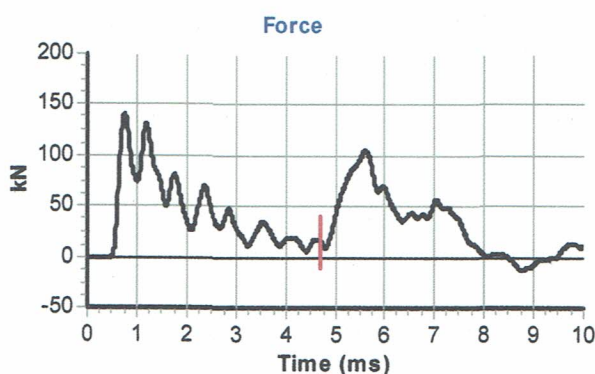
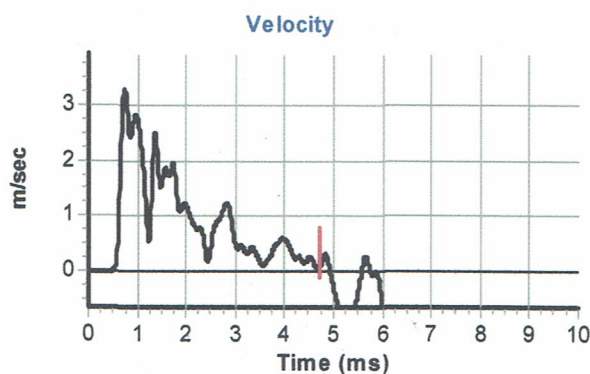
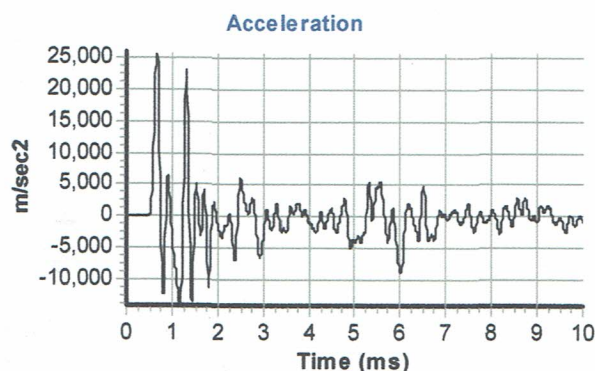
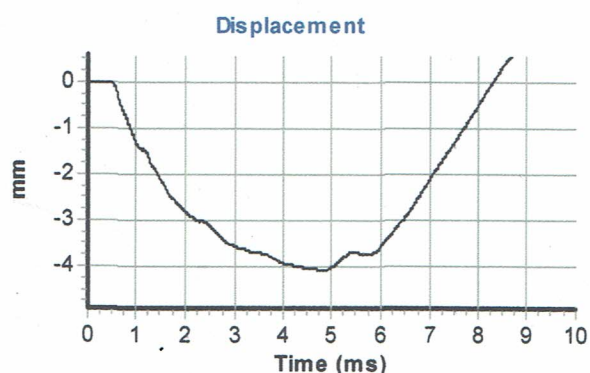
Instrumented Rod Data

Diameter d_r (mm): 54
Wall Thickness t_r (mm): 6.5
Assumed Modulus E_a (GPa): 208
Accelerometer No.1: 7080
Accelerometer No.2: 11609

SPT Hammer Information

Hammer Mass m (kg): 63.5
Falling Height h (mm): 760
SPT String Length L (m): 10.0

Comments / Location



Calculations

Area of Rod A (mm²): 970
Theoretical Energy E_{theor} (J): 473
Measured Energy E_{meas} (J): 309

Energy Ratio E_r (%): **65**

Signed: C. McCLUSKEY
Title: FITTER

The recommended calibration interval is 12 months



Appendix B

Falling Head Infiltration Test

Date:

09/02/2021

By:

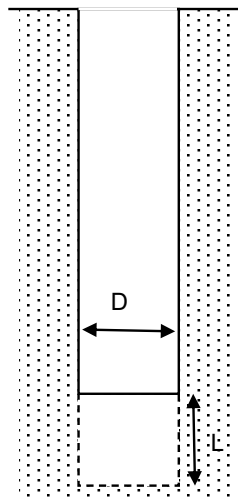
PD

Checked:

GJ

Falling Head Permeability in accordance with BS 5930

Calculation of Intake Factor (F)



Area of base

$$A = 0.0020 \text{ m}^2$$

Diameter

$$D = \begin{array}{l} 50 \text{ mm} \\ 0.05 \text{ m} \end{array}$$

Length

$$L = \begin{array}{l} 2000 \text{ mm} \\ 2 \text{ m} \end{array}$$

$$F = \frac{2 \pi L}{\ln [(L/D) + \sqrt{1 + (L/D)^2}]}$$

$$F = \frac{12.566}{4.382}$$

F =	2.868
------------	--------------

Calculation Sheet 3 of 3	LIDL GREAT BRITAIN LTD		Remada	
	Fallowfield Retail Park, Manchester			
	806.02			
		Date: 09/02/2021	By: PD	Checked: GJ
<p>Falling Head Permeability in accordance with BS 5930</p> <p>Standpipe in WS3 - Test 1</p> <p>At time = 0 mins (t_1) Depth to water = 0.56 t_1 0 sec</p> <p>Depth to base of borehole = 3</p> <p>Depth of Water (H_1) = 2.44</p> <p>At time = 60 min (t_2) Depth to water = 1.71 t_2 3600 sec</p> <p>Depth to base of borehole = 3</p> <p>Depth of Water (H_2) = 1.29</p> <p> $k = \frac{A}{F(t_2 - t_1)} \ln \frac{H_1}{H_2}$ </p> <p> $k = \frac{0.0020}{10323.38} \ln \frac{2.44}{1.29}$ </p> <p>k = 1.21E-07 m/s</p>				

Date:

09/02/2021

By:

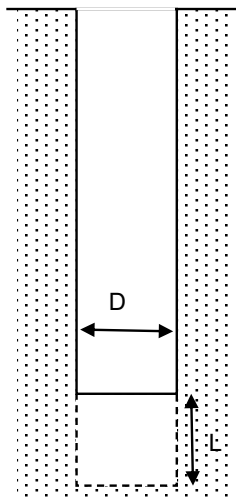
PD

Checked:

GJ

Falling Head Permeability in accordance with BS 5930

Calculation of Intake Factor (F)



Area of base

$$A = 0.0020 \text{ m}^2$$

Diameter

$$D = \begin{array}{l} 50 \text{ mm} \\ 0.05 \text{ m} \end{array}$$

Length

$$L = \begin{array}{l} 1000 \text{ mm} \\ 1 \text{ m} \end{array}$$

$$F = \frac{2 \pi L}{\ln \left[\left(\frac{L}{D} \right) + \sqrt{1 + \left(\frac{L}{D} \right)^2} \right]}$$

$$F = \frac{6.283}{3.690}$$

F =	1.703
------------	--------------

Calculation Sheet 3 of 3	LIDL GREAT BRITAIN LTD		Remada	
	Fallowfield Retail Park, Manchester			
	806.02			
Falling Head Permeability in accordance with BS 5930 Standpipe in WS4 - Test 1		Date: 09/02/2021	By: PD	Checked: GJ
At time = 0 mins (t_1) Depth to water = 0 Depth to base of borehole = 1.5 Depth of Water (H_1) = 1.5 At time = 60 min (t_2) Depth to water = 1.16 Depth to base of borehole = 1.5 Depth of Water (H_2) = 0.34		t_1	0 sec	
$k = \frac{A}{F(t_2 - t_1)} \ln \frac{H_1}{H_2}$		t_2	3600 sec	
$k = \frac{0.0020}{6130.76} \ln \frac{1.5}{0.34}$				
<div style="border: 1px solid black; padding: 2px; display: inline-block;"> k = 4.75E-07 m/s </div>				



Appendix C

Dynamic Cone Penetrometer Test Results



APPENDIX D

Laboratory Chemical Analysis



2183

Final Report

Report No.:	20-34343-1		
Initial Date of Issue:	18-Dec-2020		
Client	Remada Ltd		
Client Address:	Forward House 17 High Street Henley in Arden B95 5AA		
Contact(s):	Greg Jones Peter Dickinson		
Project	806.02 Fallowfield Retail Park		
Quotation No.:		Date Received:	14-Dec-2020
Order No.:	806.02	Date Instructed:	14-Dec-2020
No. of Samples:	8		
Turnaround (Wkdays):	5	Results Due:	18-Dec-2020
Date Approved:	18-Dec-2020		
Approved By:			
Details:	Glynn Harvey, Technical Manager		

Results - Miscellaneous Solid

Project: 806.02 Fallowfield Retail Park

Client: Remada Ltd	Chemtest Job No.:				20-34343	20-34343
Quotation No.:	Chemtest Sample ID.:				1113383	1113389
	Client Sample ID.:				WS1	WS8
	Sample Location:				WS1	WS8
	Sample Type:				MISCSOLID	MISCSOLID
	Top Depth (m):				0.00	0.00
	Bottom Depth (m):				0.09	0.08
	Date Sampled:				09-Dec-2020	10-Dec-2020
Determinand	Accred.	SOP	Units	LOD		
Naphthalene	N	2700	mg/kg	0.10	< 0.10	< 0.10
Acenaphthylene	N	2700	mg/kg	0.10	< 0.10	< 0.10
Acenaphthene	N	2700	mg/kg	0.10	< 0.10	< 0.10
Fluorene	N	2700	mg/kg	0.10	< 0.10	< 0.10
Phenanthrene	N	2700	mg/kg	0.10	< 0.10	< 0.10
Anthracene	N	2700	mg/kg	0.10	< 0.10	< 0.10
Fluoranthene	N	2700	mg/kg	0.10	< 0.10	< 0.10
Pyrene	N	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[a]anthracene	N	2700	mg/kg	0.10	< 0.10	< 0.10
Chrysene	N	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	N	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	N	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[a]pyrene	N	2700	mg/kg	0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	N	2700	mg/kg	0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	N	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	N	2700	mg/kg	0.10	< 0.10	< 0.10
Coronene	N	2700	mg/kg	0.10	< 0.10	< 0.10
Total Of 17 PAH's	N	2700	mg/kg	2.0	< 2.0	< 2.0
Moisture	N		%	0.10	< 0.10	< 0.10

Results - Soil

Project: 806.02 Fallowfield Retail Park

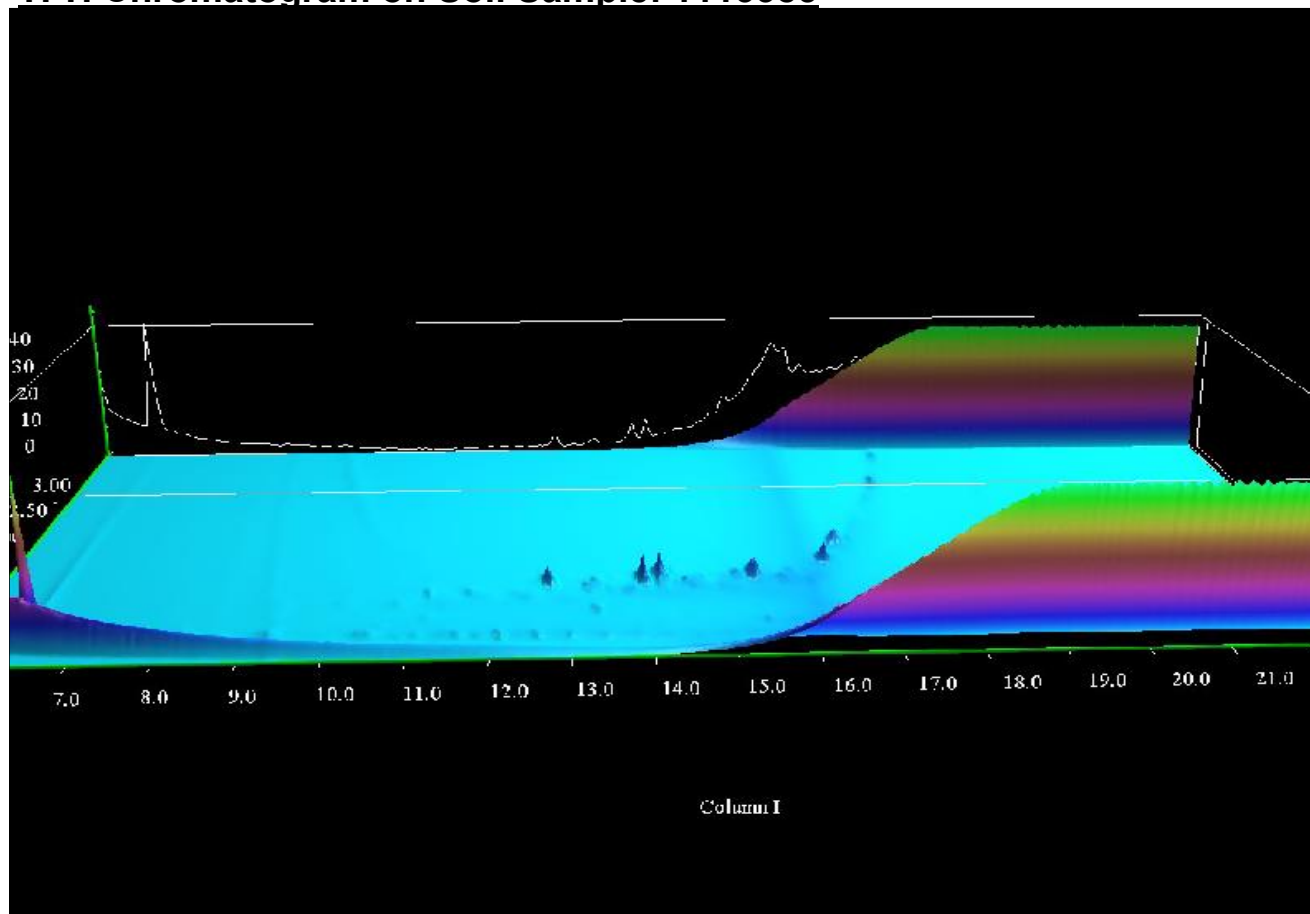
Client: Remada Ltd	Chemtest Job No.:					20-34343	20-34343	20-34343	20-34343	20-34343	20-34343
Quotation No.:	Chemtest Sample ID.:					1113384	1113385	1113386	1113387	1113388	1113390
	Client Sample ID.:					WS2	WS3	WS4	WS5a	WS7	WS1
	Sample Location:					WS2	WS3	WS4	WS5a	WS7	WS1
	Sample Type:					SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):					0.50	0.18	1.00	0.30	0.35	0.80
	Bottom Depth (m):					0.80	0.48	1.20	0.47	0.50	0.90
	Date Sampled:					10-Dec-2020	09-Dec-2020	10-Dec-2020	09-Dec-2020	10-Dec-2020	09-Dec-2020
	Asbestos Lab:						COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD							
ACM Type	U	2192		N/A		-	-	-	-	-	-
Asbestos Identification	U	2192		N/A		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A		-	-	-	-	-	-
Moisture	N	2030	%	0.020	3.2	15	8.9	8.4	16	16	
Chromatogram (TPH)	N			N/A		See Attached	See Attached	See Attached	See Attached	See Attached	
pH	U	2010		4.0	8.8	10.5	10.6	9.5	8.5	8.8	
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40		1.6	1.3	0.47	< 0.40	0.75	
Magnesium (Water Soluble)	N	2120	g/l	0.010	< 0.010		< 0.010				
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.055		0.78				
Total Sulphur	U	2175	%	0.010	0.084		0.15				
Chloride (Water Soluble)	U	2220	g/l	0.010	< 0.010		0.017				
Nitrate (Water Soluble)	N	2220	g/l	0.010	0.022		0.031				
Ammonium (Water Soluble)	U	2120	g/l	0.01	< 0.01		< 0.01				
Sulphate (Acid Soluble)	U	2430	%	0.010	0.085		0.44				
Arsenic	U	2450	mg/kg	1.0		11	13	3.8	7.1	19	
Beryllium	U	2450	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	2.1	
Cadmium	U	2450	mg/kg	0.10		0.14	0.29	0.17	0.17	0.27	
Copper	U	2450	mg/kg	0.50		20	41	9.1	21	48	
Mercury	U	2450	mg/kg	0.10		0.10	< 0.10	< 0.10	0.13	0.12	
Nickel	U	2450	mg/kg	0.50		17	14	7.7	19	35	
Lead	U	2450	mg/kg	0.50		91	190	38	52	60	
Selenium	U	2450	mg/kg	0.20		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	
Vanadium	U	2450	mg/kg	5.0		21	19	9.1	29	50	
Zinc	U	2450	mg/kg	0.50		100	110	29	45	59	
Chromium (Trivalent)	N	2490	mg/kg	1.0		14	13	7.5	17	20	
Chromium (Hexavalent)	N	2490	mg/kg	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
Fraction of Organic Carbon	U	2625		0.0010		0.0082	0.0090	0.0043	0.0060	0.082	
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	63	
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0		< 1.0	< 1.0	20	< 1.0	86	
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0		< 1.0	< 1.0	35	< 1.0	210	
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0		< 1.0	< 1.0	42	< 1.0	190	
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0		13	53	250	13	430	
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	200	
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0		13	53	350	13	1200	

Results - Soil

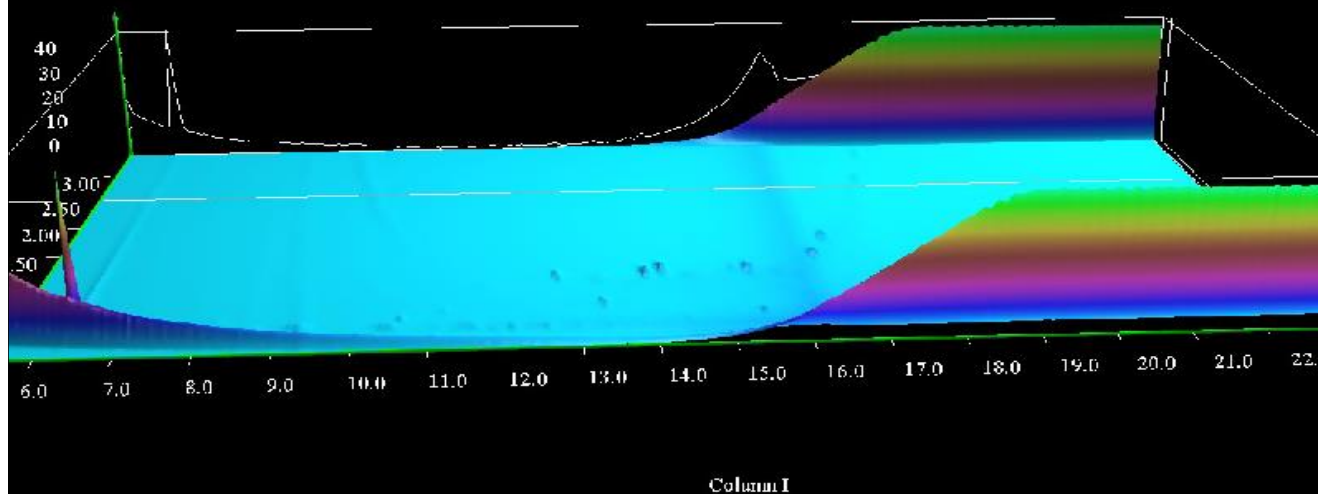
Project: 806.02 Fallowfield Retail Park

Client: Remada Ltd	Chemtest Job No.:					20-34343	20-34343	20-34343	20-34343	20-34343	20-34343
Quotation No.:	Chemtest Sample ID.:					1113384	1113385	1113386	1113387	1113388	1113390
	Client Sample ID.:					WS2	WS3	WS4	WS5a	WS7	WS1
	Sample Location:					WS2	WS3	WS4	WS5a	WS7	WS1
	Sample Type:					SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):					0.50	0.18	1.00	0.30	0.35	0.80
	Bottom Depth (m):					0.80	0.48	1.20	0.47	0.50	0.90
	Date Sampled:					10-Dec-2020	09-Dec-2020	10-Dec-2020	09-Dec-2020	10-Dec-2020	09-Dec-2020
	Asbestos Lab:						COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD							
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0		< 1.0	< 1.0	17	< 1.0	< 1.0	28
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0		< 1.0	< 1.0	99	< 1.0	< 1.0	140
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0		< 1.0	< 1.0	480	< 1.0	< 1.0	1400
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0		9.7	3.1	1200	9.9	9.9	4400
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0		65	32	3200	130	130	12000
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0		< 1.0	< 1.0	370	< 1.0	< 1.0	1000
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0		75	35	5400	140	140	19000
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0		87	88	5700	150	150	20000
Naphthalene	U	2700	mg/kg	0.10		0.68	0.10	0.54	0.17	0.17	6.2
Acenaphthylene	U	2700	mg/kg	0.10		0.34	< 0.10	0.25	0.20	0.20	2.9
Acenaphthene	U	2700	mg/kg	0.10		2.6	0.26	2.2	< 0.10	< 0.10	26
Fluorene	U	2700	mg/kg	0.10		2.0	0.24	1.7	0.87	0.87	19
Phenanthrene	U	2700	mg/kg	0.10		13	1.8	12	9.1	9.1	140
Anthracene	U	2700	mg/kg	0.10		3.4	0.45	2.9	< 0.10	< 0.10	41
Fluoranthene	U	2700	mg/kg	0.10		19	3.7	14	18	18	250
Pyrene	U	2700	mg/kg	0.10		20	4.0	14	18	18	270
Benzo[a]anthracene	U	2700	mg/kg	0.10		8.8	1.7	5.7	7.6	7.6	92
Chrysene	U	2700	mg/kg	0.10		9.2	2.1	5.8	0.22	0.22	90
Benzo[b]fluoranthene	U	2700	mg/kg	0.10		3.3	1.6	2.1	2.1	2.1	140
Benzo[k]fluoranthene	U	2700	mg/kg	0.10		5.2	1.2	2.8	4.0	4.0	44
Benzo[a]pyrene	U	2700	mg/kg	0.10		8.6	1.8	5.4	7.8	7.8	89
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10		5.9	1.3	3.6	5.0	5.0	55
Dibenz(a,h)Anthracene	U	2700	mg/kg	0.10		< 0.10	0.16	< 0.10	< 0.10	< 0.10	13
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10		< 0.10	1.4	3.7	< 0.10	< 0.10	53
Total Of 16 PAH's	U	2700	mg/kg	2.0		100	22	77	73	73	1300
Benzene	U	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	3.6
Toluene	U	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	17
Ethylbenzene	U	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	40
m & p-Xylene	U	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	210
o-Xylene	U	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	180
Total Phenols	U	2920	mg/kg	0.30		< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	0.94

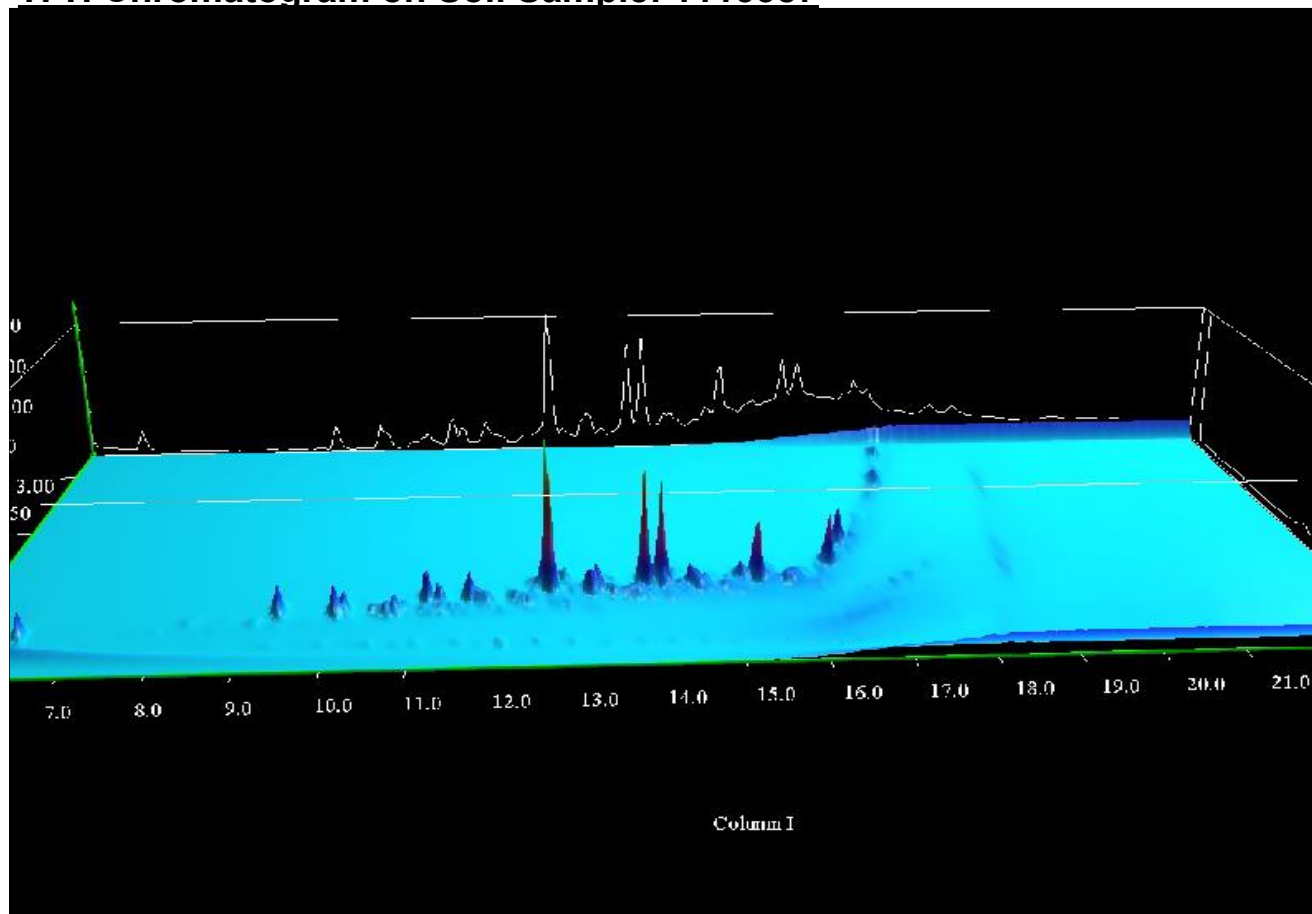
TPH Chromatogram on Soil Sample: 1113385



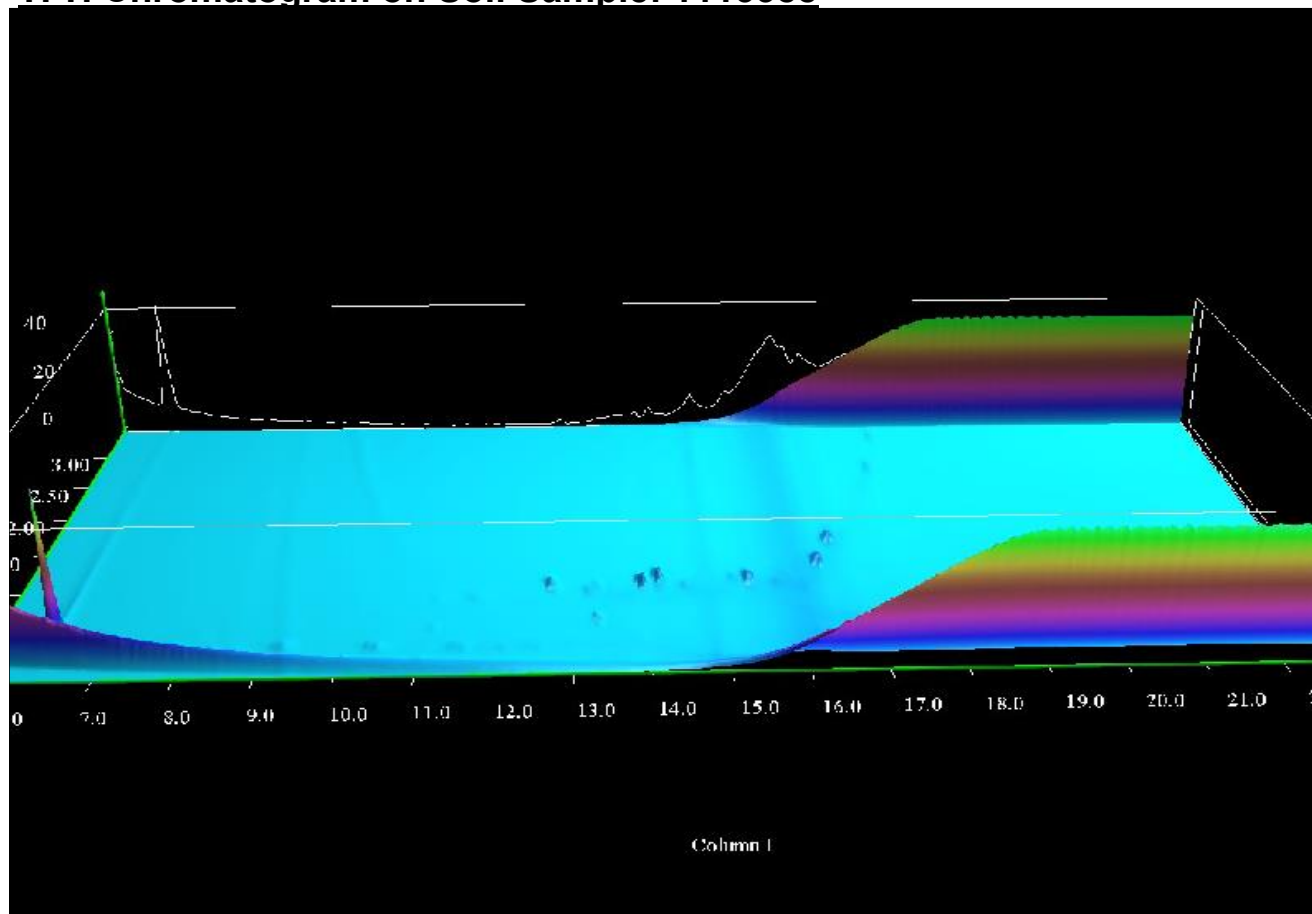
TPH Chromatogram on Soil Sample: 1113386



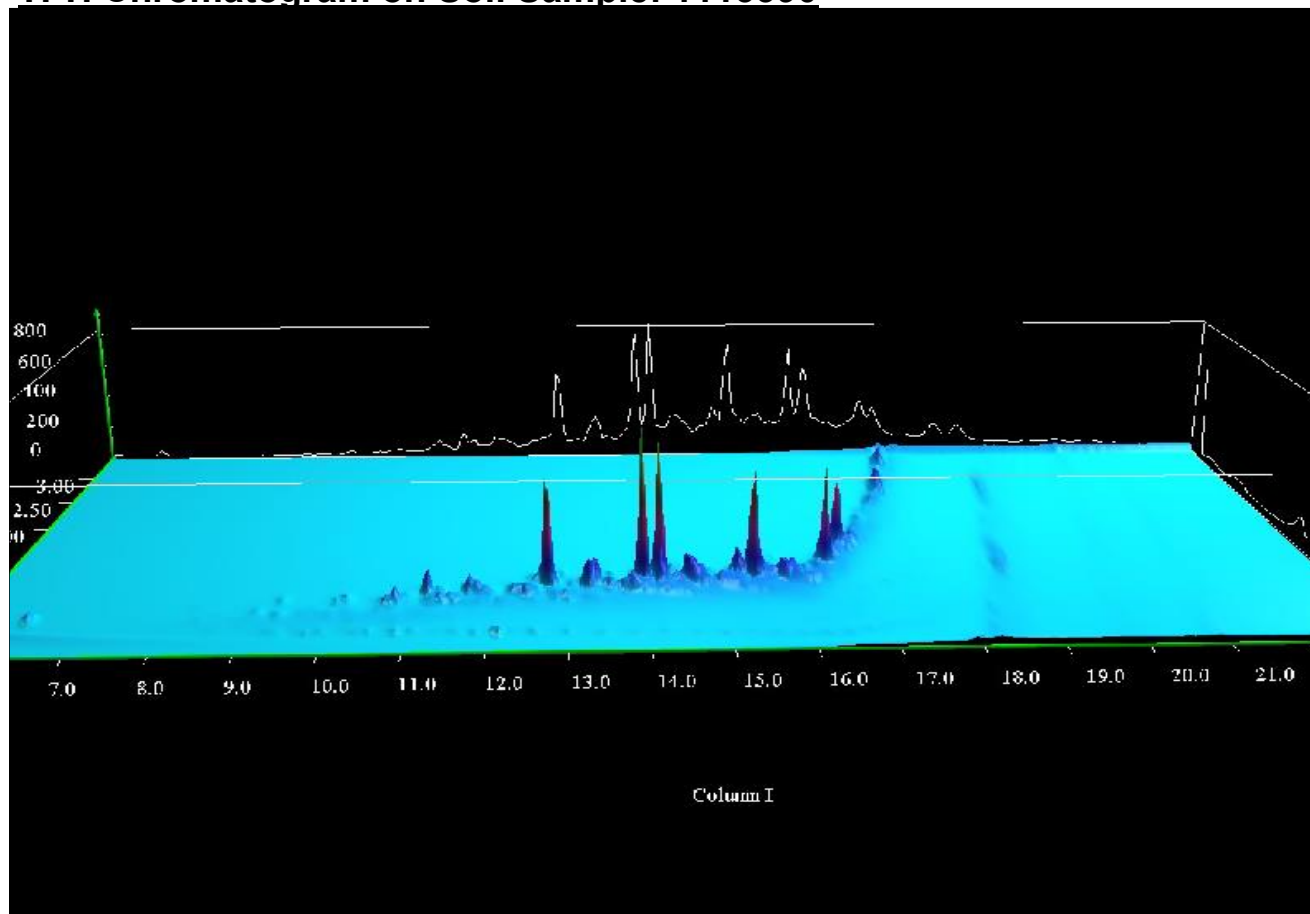
TPH Chromatogram on Soil Sample: 1113387



TPH Chromatogram on Soil Sample: 1113388



TPH Chromatogram on Soil Sample: 1113390



Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measurement by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenzo[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com



APPENDIX E

Laboratory Geotechnical Tests



LABORATORY REPORT



4043

Contract Number: PSL21/0380

Report Date: 22 January 2021

Client's Reference: 806.02

Client Name: Remada Limited
Forward House
17 High Street
Henley-in-Arden
Warwickshire
B95 5AA

For the attention of: Peter Dickinson

Contract Title: Fallowfield Retail Park, Manchester

Date Received: 12/1/2021

Date Commenced: 12/1/2021

Date Completed: 22/1/2021

Notes: Opinions and Interpretations are outside the UKAS Accreditation

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

Checked and Approved Signatories:

A Watkins
(Director)

L Knight
(Senior Technician)

R Berriman
(Quality Manager)

S Eyre
(Senior Technician)

S Royle
(Laboratory Manager)

H Daniels
(Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
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Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

4043

PSL
Professional Soils Laboratory

Fallowfield Retail Park, Manchester

Contract No:

PSL21/0380

Client Ref:

806.02

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

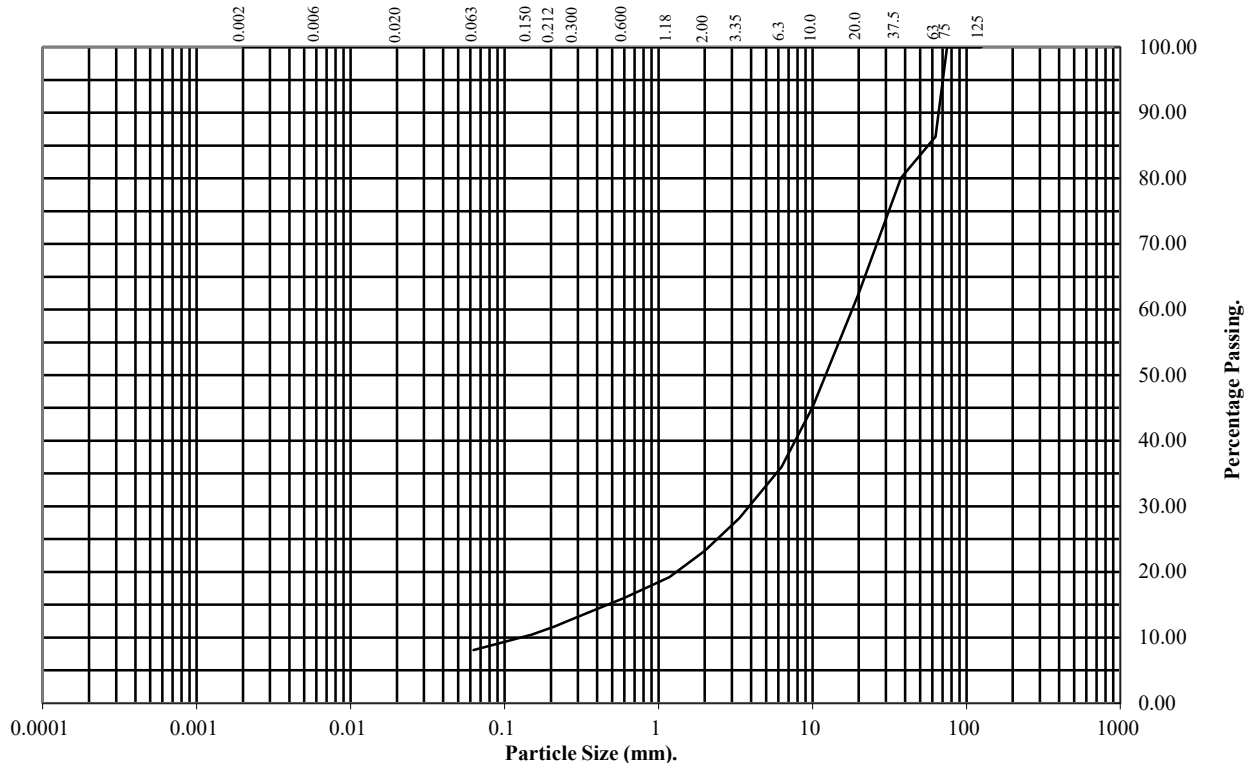
Hole Number: WS1

Top Depth (m): 0.15

Sample Number:

Base Depth(m): 0.70

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	86
37.5	80
20	62
10	45
6.3	36
3.35	28
2	23
1.18	19
0.6	16
0.3	13
0.212	12
0.15	10
0.063	8

Soil Fraction	Total Percentage
Cobbles	14
Gravel	63
Sand	15
Silt/Clay	8

Remarks:

See Summary of Soil Descriptions



PSL
Professional Soils Laboratory

Fallowfield Retail Park, Manchester

Contract No:

PSL21/0380

Client Ref:

806.02

PARTICLE SIZE DISTRIBUTION TEST

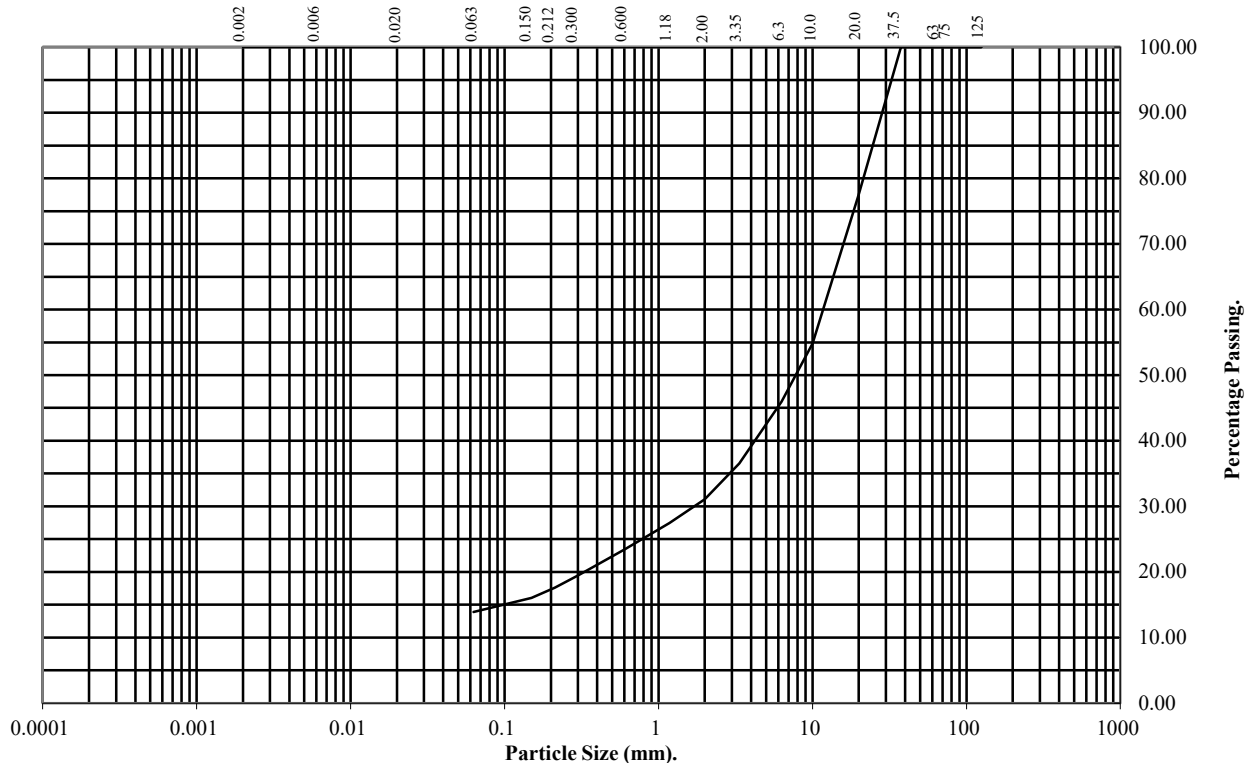
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **WS2** Top Depth (m): **0.18**

Sample Number: Base Depth(m): **0.80**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	78
10	55
6.3	46
3.35	37
2	31
1.18	27
0.6	23
0.3	19
0.212	18
0.15	16
0.063	14

Soil Fraction	Total Percentage
Cobbles	0
Gravel	69
Sand	17
Silt/Clay	14

Remarks:

See Summary of Soil Descriptions



PSL
Professional Soils Laboratory

Fallowfield Retail Park, Manchester

Contract No:
PSL21/0380
Client Ref:
806.02

PARTICLE SIZE DISTRIBUTION TEST

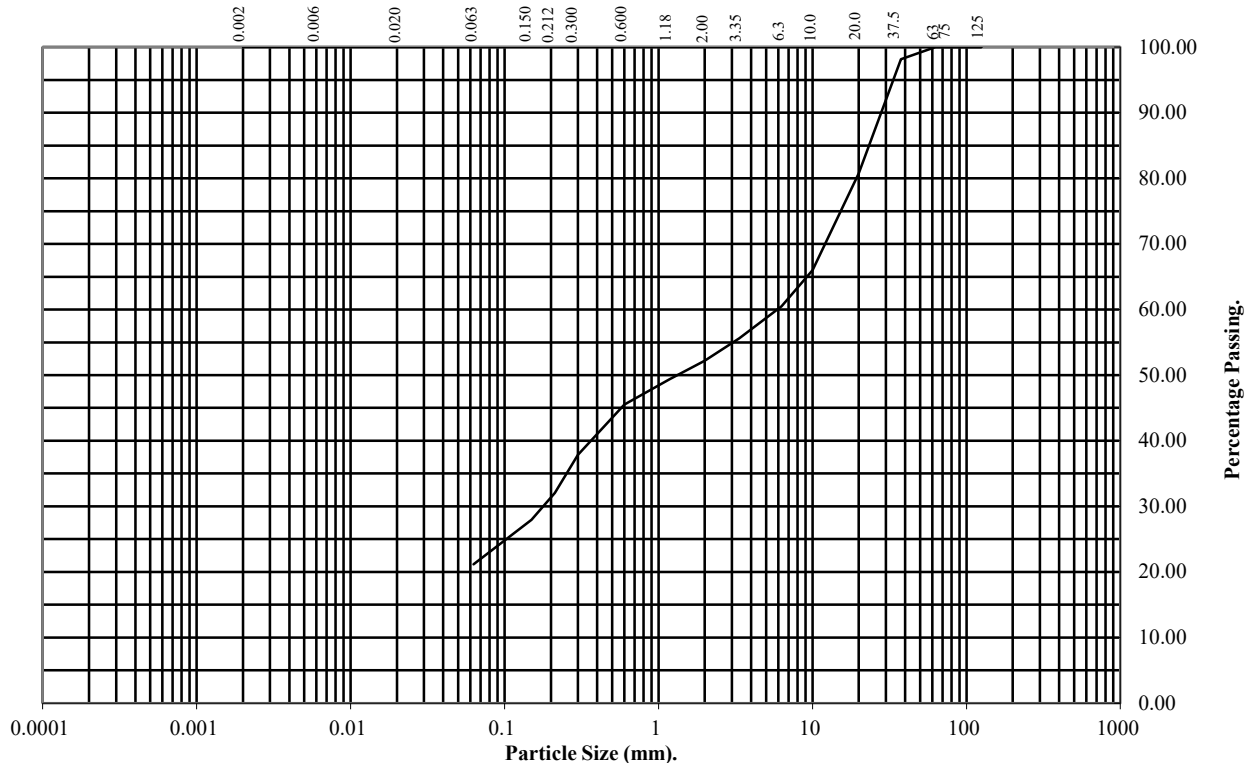
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **WS3** Top Depth (m): **1.00**

Sample Number: Base Depth(m): **2.00**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	98
20	81
10	66
6.3	60
3.35	56
2	52
1.18	49
0.6	46
0.3	38
0.212	32
0.15	28
0.063	21

Soil Fraction	Total Percentage
Cobbles	0
Gravel	48
Sand	31
Silt/Clay	21

Remarks:

See Summary of Soil Descriptions



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Fallowfield Retail Park, Manchester

Contract No:
PSL21/0380
Client Ref:
806.02

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

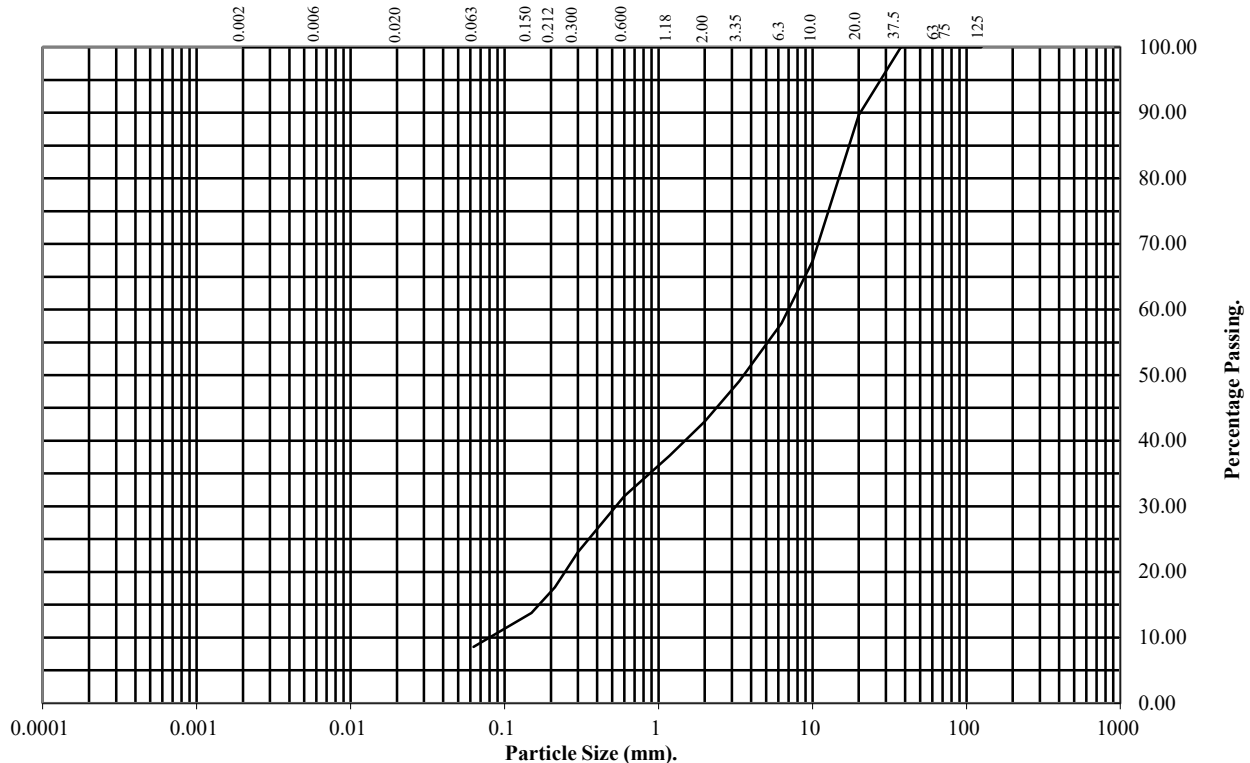
Hole Number: WS4

Top Depth (m): 1.20

Sample Number:

Base Depth(m): 1.50

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	90
10	67
6.3	58
3.35	49
2	43
1.18	38
0.6	32
0.3	23
0.212	18
0.15	14
0.063	9

Soil Fraction	Total Percentage
Cobbles	0
Gravel	57
Sand	34
Silt/Clay	9

Remarks:

See Summary of Soil Descriptions



PSL
Professional Soils Laboratory

Fallowfield Retail Park, Manchester

Contract No:
PSL21/0380
Client Ref:
806.02

PARTICLE SIZE DISTRIBUTION TEST

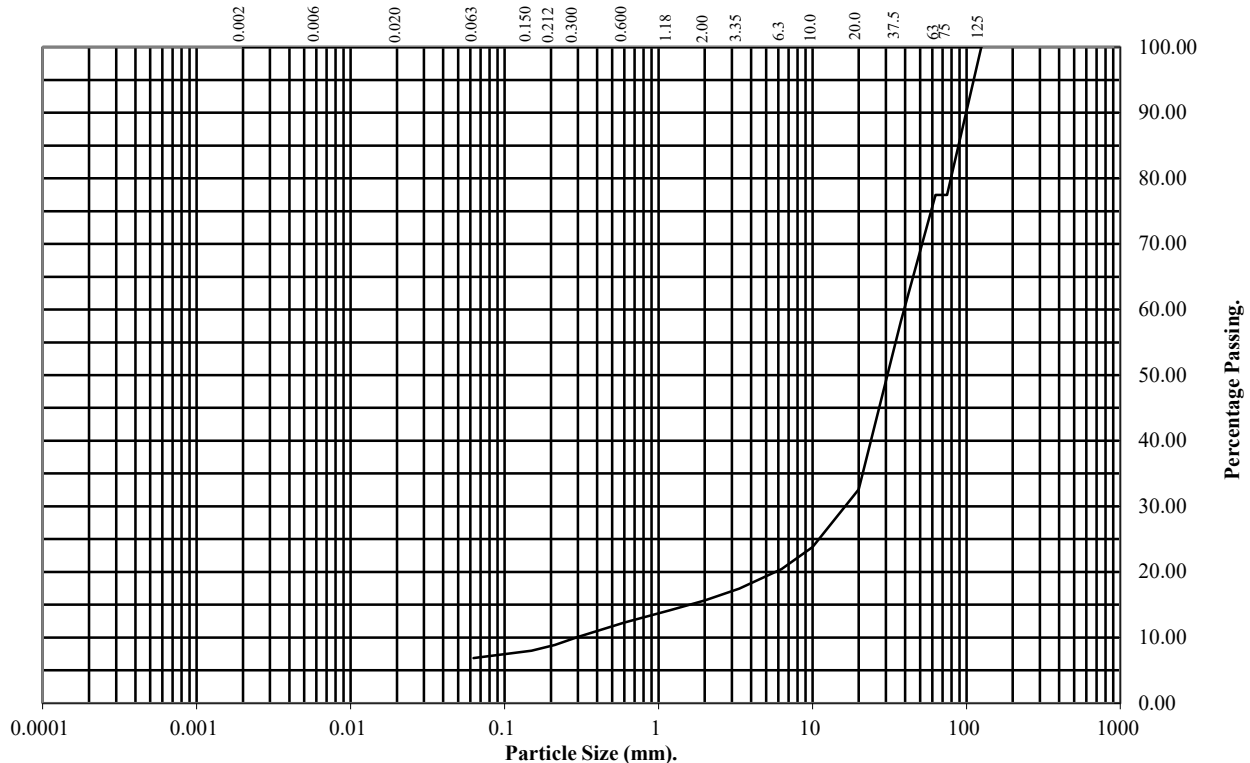
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **WS5** Top Depth (m): **0.30**

Sample Number: Base Depth(m): **0.70**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	77
63	77
37.5	58
20	33
10	24
6.3	20
3.35	17
2	16
1.18	14
0.6	12
0.3	10
0.212	9
0.15	8
0.063	7

Soil Fraction	Total Percentage
Cobbles	23
Gravel	61
Sand	9
Silt/Clay	7

Remarks:

See Summary of Soil Descriptions



PSL
Professional Soils Laboratory

Fallowfield Retail Park, Manchester

Contract No:
PSL21/0380
Client Ref:
806.02

PARTICLE SIZE DISTRIBUTION TEST

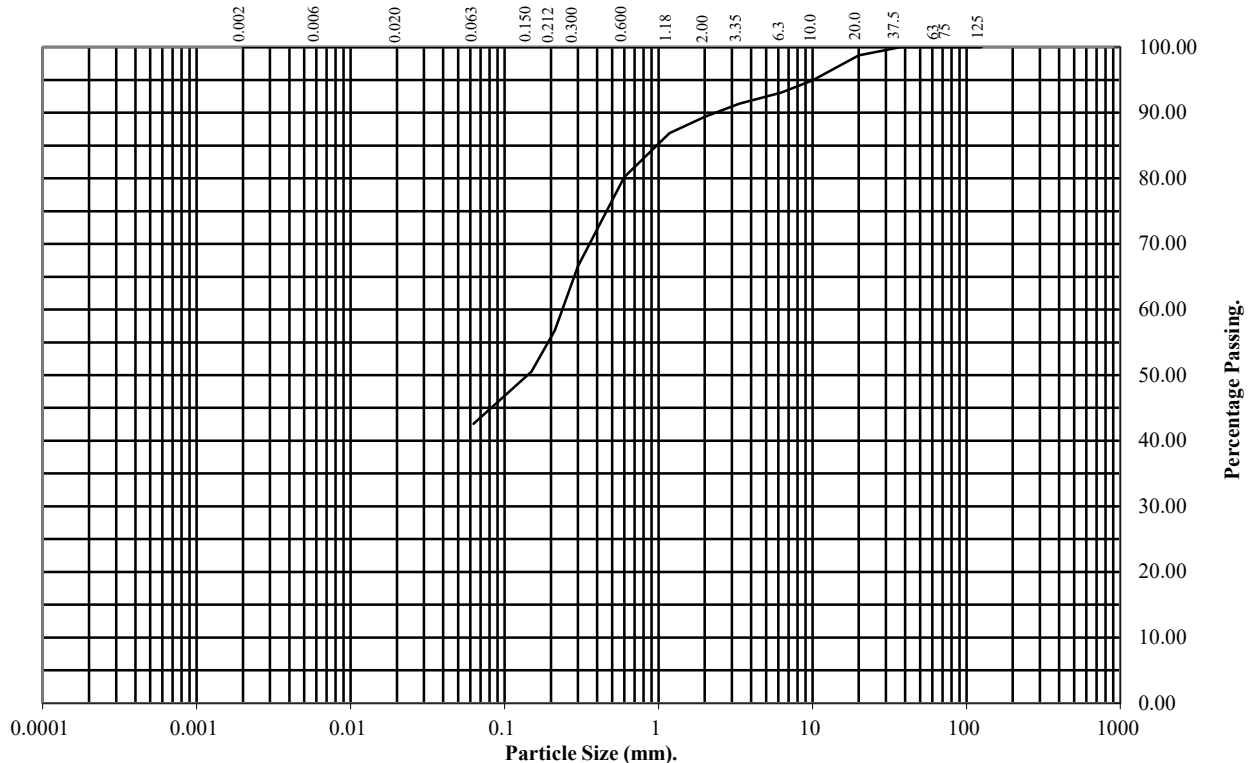
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **WS6** Top Depth (m): **1.00**

Sample Number: Base Depth(m): **2.00**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	99
10	95
6.3	93
3.35	91
2	89
1.18	87
0.6	80
0.3	67
0.212	57
0.15	51
0.063	43

Soil Fraction	Total Percentage
Cobbles	0
Gravel	11
Sand	46
Silt/Clay	43

Remarks:

See Summary of Soil Descriptions



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Professional Soils Laboratory

Fallowfield Retail Park, Manchester

Contract No:
PSL21/0380
Client Ref:
806.02

PARTICLE SIZE DISTRIBUTION TEST

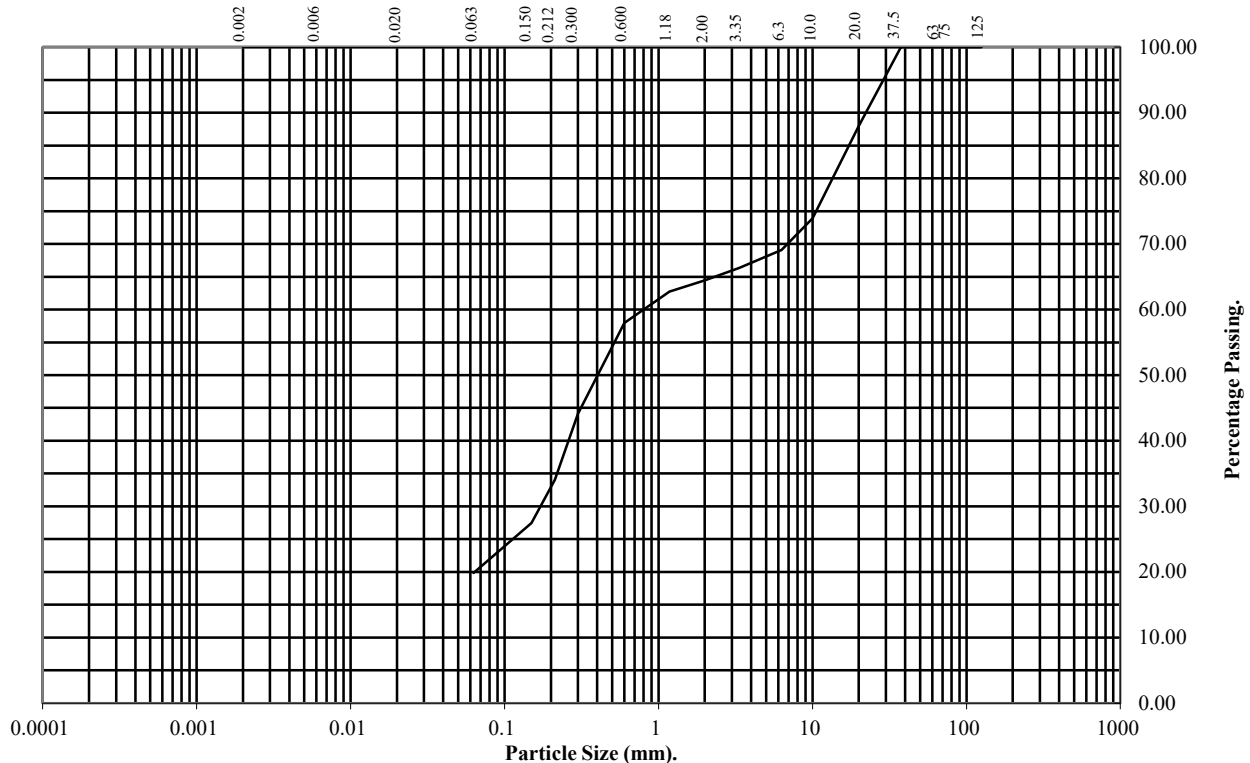
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **WS7** Top Depth (m): **0.07**

Sample Number: Base Depth(m): **0.51**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	88
10	74
6.3	69
3.35	66
2	64
1.18	63
0.6	58
0.3	44
0.212	34
0.15	27
0.063	20

Soil Fraction	Total Percentage
Cobbles	0
Gravel	36
Sand	44
Silt/Clay	20

Remarks:

See Summary of Soil Descriptions



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Professional Soils Laboratory

Fallowfield Retail Park, Manchester

Contract No:
PSL21/0380
Client Ref:
806.02

PARTICLE SIZE DISTRIBUTION TEST

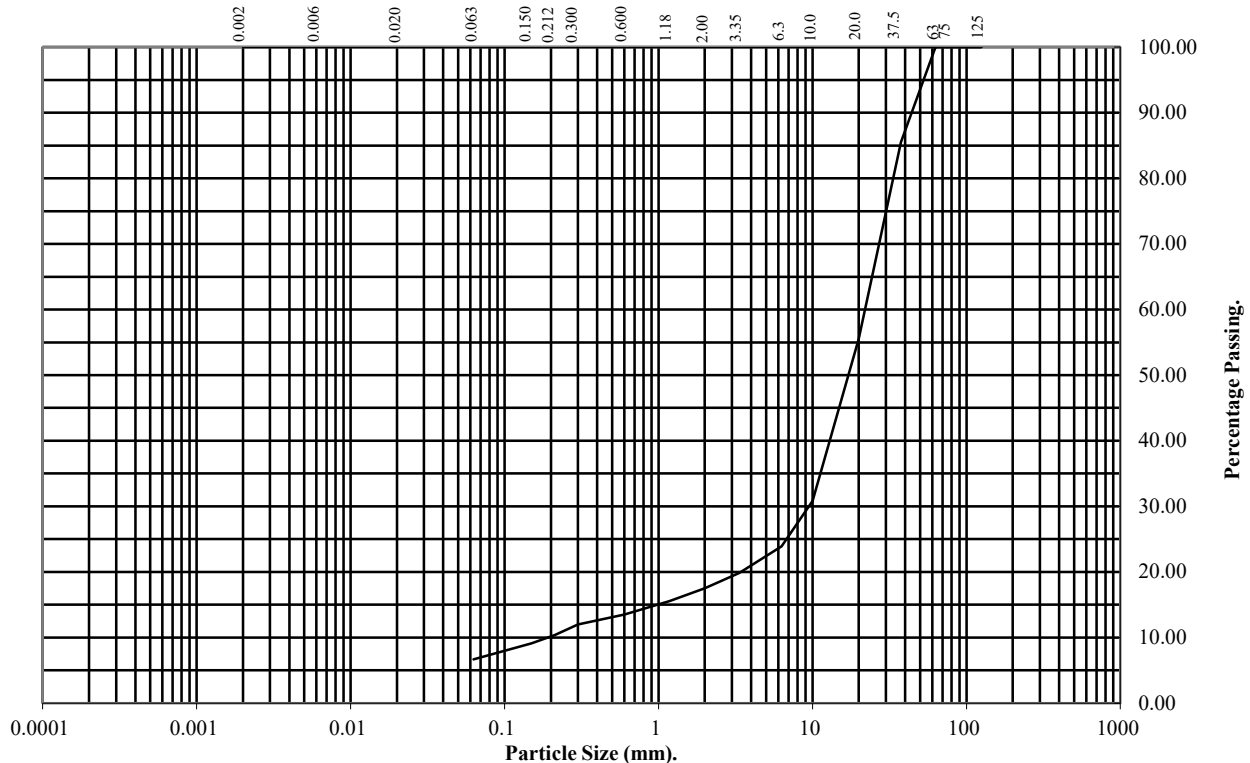
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **WS8** Top Depth (m): **0.50**

Sample Number: Base Depth(m): **1.00**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	86
20	56
10	31
6.3	24
3.35	20
2	17
1.18	16
0.6	14
0.3	12
0.212	10
0.15	9
0.063	7

Soil Fraction	Total Percentage
Cobbles	0
Gravel	83
Sand	10
Silt/Clay	7

Remarks:

See Summary of Soil Descriptions



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Fallowfield Retail Park, Manchester

Contract No:
PSL21/0380
Client Ref:
806.02

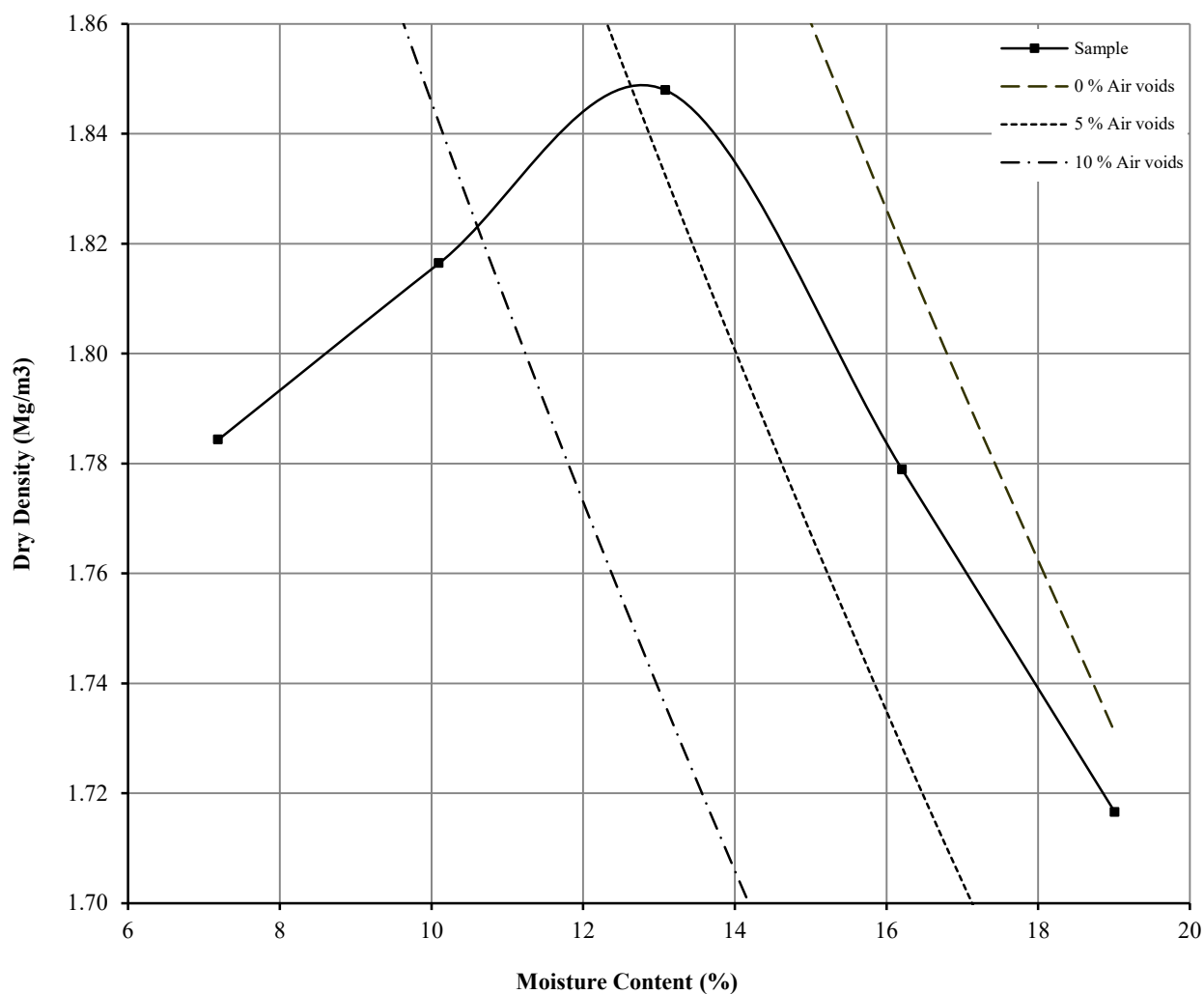
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : Clause 3.4 : 1990

Hole Number: WS3 Top Depth (m) : 1.00

Sample Number: Base Depth (m) : 2.00

Sample Type: B



Initial Moisture Content:	19	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m ³):	2.58	Assumed	Material Retained on 37.5 mm Test Sieve (%):	2
Maximum Dry Density (Mg/m ³):	1.85		Material Retained on 20.0 mm Test Sieve (%):	17
Optimum Moisture Content (%):	13			
Remarks See summary of soil descriptions				



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Fallowfield Retail Park, Manchester

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Client Ref
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DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : Clause 3.4 : 1990

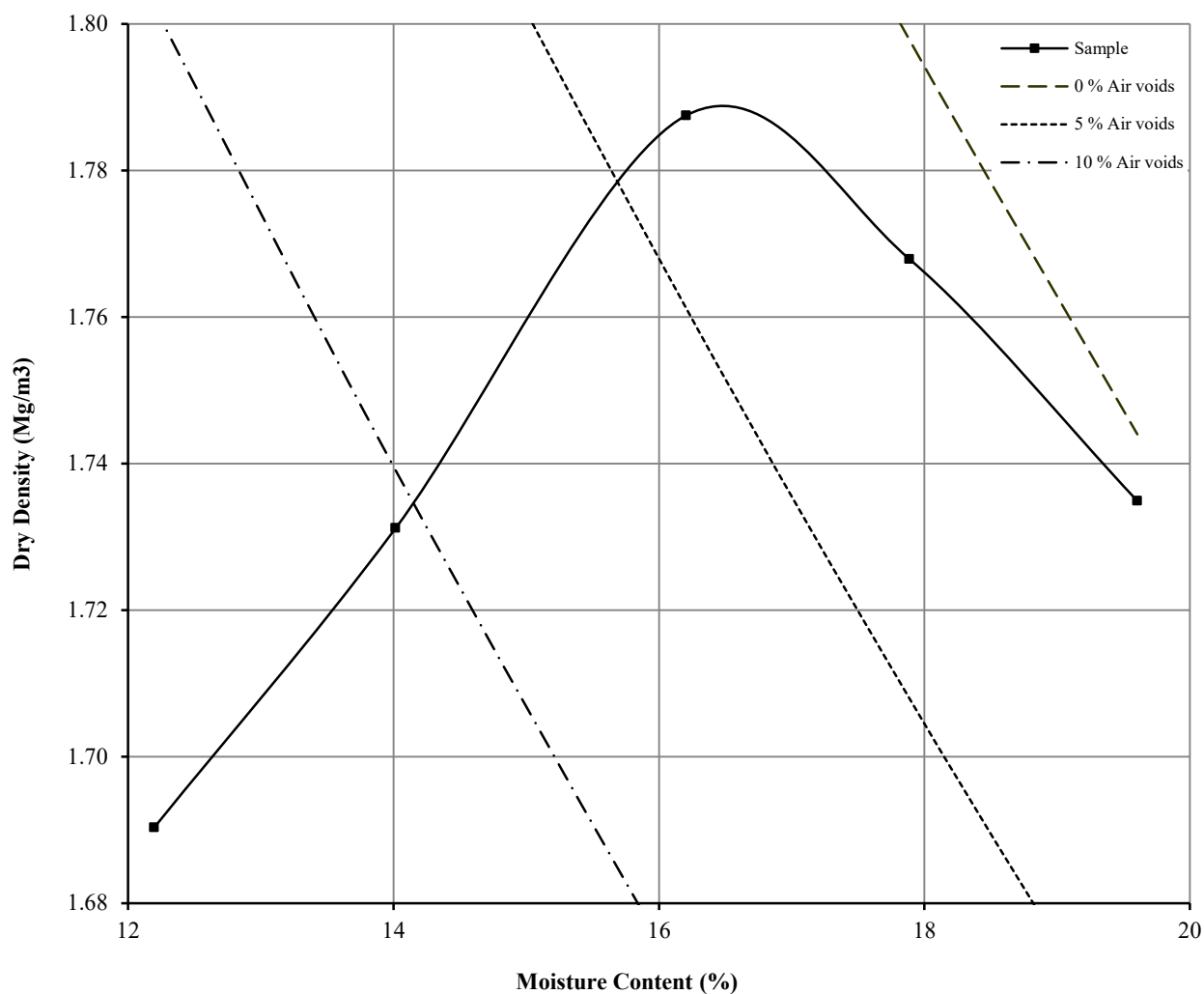
Hole Number: WS4

Top Depth (m) : 1.20

Sample Number:

Base Depth (m) : 1.50

Sample Type: B



Initial Moisture Content:	14	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m ³):	2.65	Assumed	Material Retained on 37.5 mm Test Sieve (%):	0
Maximum Dry Density (Mg/m ³):	1.79		Material Retained on 20.0 mm Test Sieve (%):	10
Optimum Moisture Content (%):	16			
Remarks See summary of soil descriptions				



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Fallowfield Retail Park, Manchester

Contract
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DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : Clause 3.4 : 1990

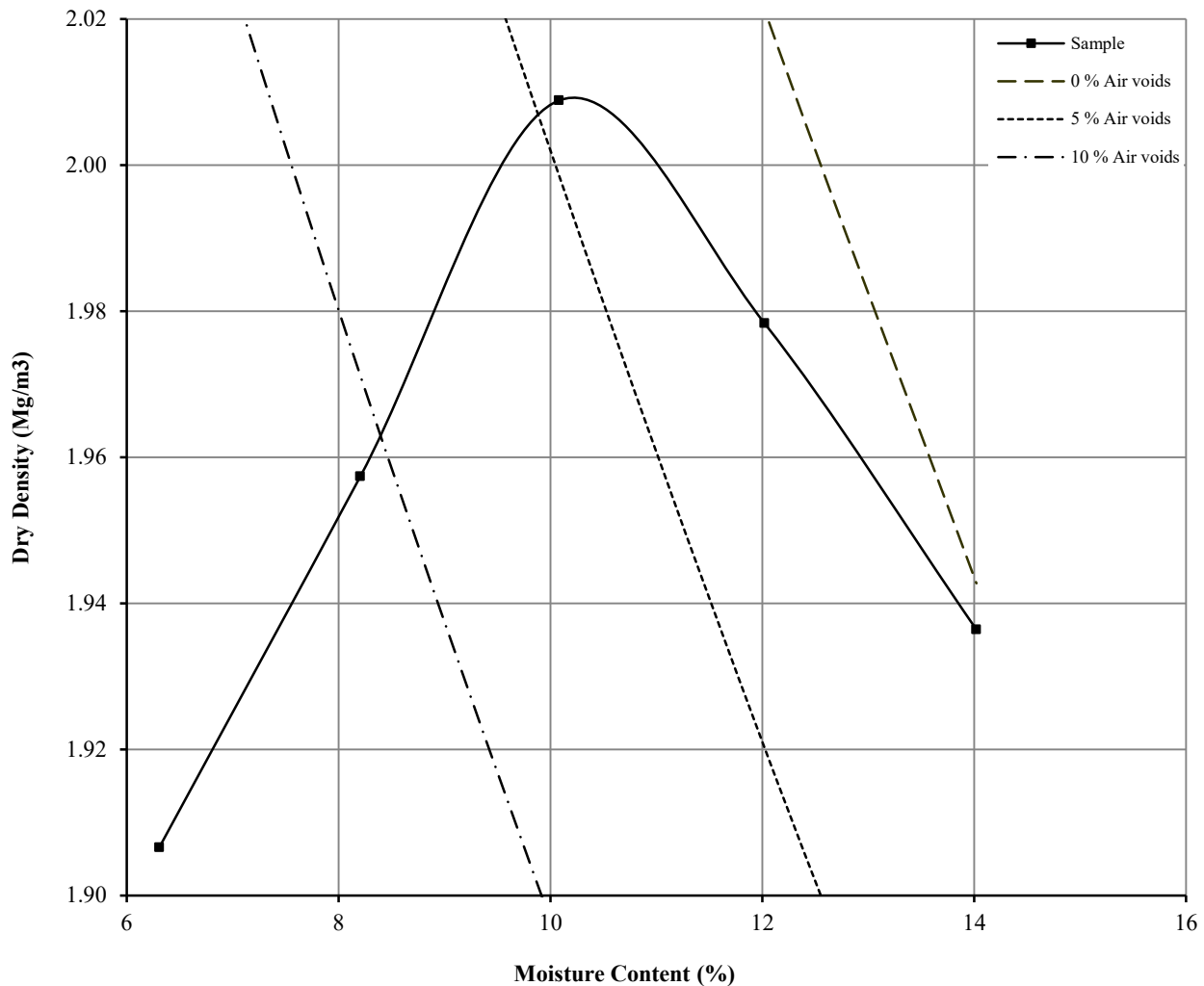
Hole Number: **WS8**

Top Depth (m) : **0.50**

Sample Number:

Base Depth (m) : **1.00**

Sample Type: **B**



Initial Moisture Content:	8.2	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.67	Assumed	Material Retained on 37.5 mm Test Sieve (%):	14
Maximum Dry Density (Mg/m3):	2.01		Material Retained on 20.0 mm Test Sieve (%):	30
Optimum Moisture Content (%):	10			
Remarks See summary of soil descriptions				



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Professional Soils Laboratory

Fallowfield Retail Park, Manchester

Contract
PSL21/0380
Client Ref
806.02



2531



ANALYTICAL TEST REPORT

Contract no: 92687
Contract name: Fallowfield Retail Park, Manchester
Client reference: PSL21/0380
Clients name: Professional Soils Laboratory
Clients address: 5/7 Hexthorpe Road
Doncaster
DN4 0AR

Samples received: 21 January 2021

Analysis started: 21 January 2021

Analysis completed: 28 January 2021

Report issued: 28 January 2021

Notes: Opinions and interpretations expressed herein are outside the UKAS accreditation scope.
Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.
All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing.
Methods, procedures and performance data are available on request.
Results reported herein relate only to the material supplied to the laboratory.
This report shall not be reproduced except in full, without prior written approval.
Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

Key: U UKAS accredited test
M MCERTS & UKAS accredited test
\$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing

Approved by:

Rachael Burton
Customer Support Squad Leader

Chemtech Environmental Limited

SOILS

Lab number			92687-1	92687-2
Sample id			WS3	WS4
Depth (m)			1.00-2.00	1.20-1.50
Date sampled			09/12/2020	09/12/2020
Test	Method	Units		
pH	CE004 ^U	units	10.9	9.4
Magnesium (2:1 water soluble)	CE061	mg/l Mg	<1	40
Chloride (2:1 water soluble)	CE049 ^U	mg/l Cl	122	16
Nitrate (2:1 water soluble)	CE049 ^U	mg/l NO ₃	4.4	22
Sulphate (2:1 water soluble)	CE061	mg/l SO ₄	362	675

Chemtech Environmental Limited

METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE004	pH	Based on BS 1377, pH Meter	As received	U	-	units
CE061	Magnesium (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry		1	mg/l Mg
CE049	Chloride (2:1 water soluble)	Aqueous extraction, IC-COND	Dry	U	1	mg/l Cl
CE049	Nitrate (2:1 water soluble)	Aqueous extraction, IC-COND	Dry	U	1	mg/l NO ₃
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry		10	mg/l SO ₄

Chemtech Environmental Limited

DEVIATING SAMPLE INFORMATION

Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
92687-1	WS3	1.00-2.00	Y	All (EHT)
92687-2	WS4	1.20-1.50	Y	All (EHT)