PHASE 2
GROUND INVESTIGATION

Lidl Great Britain Ltd

Briton Ferry Road, Neath

Client: Lidl Great Britain Ltd

Remada Ltd
www.remada.co.uk

769.02.02
March 2022

Executive Summary

Remada was appointed by Lidl Great Britain Ltd to undertake an intrusive Ground Investigation for a proposed store extension at Briton Ferry Road, Neath, South Wales SA11 1AS at the location indicated in ***Figure 1.***

Background

Lidl provided a ground investigation report by Opus for the adjacent site and appointed Remada to prepare a Coal Mining Risk Assessment, report 769.01.01. Information within these reports indicates that the site was developed on low lying marshland for the Japan Works and / or Crythan Works

Remada's report 769.01.01 states that published geology mapping indicates that the site is underlain by superficial *tidal deposits comprising clay, silt & sand associated with the River Nedd to south and west. Glaciofluvial deposits (sand & gravel) are recorded just to the north but no superficial deposits are present to the west.*

Bedrock in the vicinity of the site comprised the Pennant Sandstone Formation. This parent unit has an approximate thickness of 1000m with units of grey mudstone, coal seams and seatearth subdivided into successive members that are defined by key coal horizons that in the vicinity of the site outcrop perpendicular to the Neath Disturbance. The Hughes Member sandstone (a child unit of the Pennant Sandstone Formation) is recorded directly beneath the store footprint.

Intrusive Investigation

The investigation comprised three (3 No.) cable tool boreholes and three (3 No.) trial pits to expose existing foundations. The investigation was undertaken on the 23rd and 24th July 2020 at the locations indicated on ***Figure 2.***

Two of the hand dug trial pits HDTP2 and HDTP3 exposed a spread footing bearing on made ground at a depth 0.75m bgl and with an estimated approximate width of 1.5m. HDTP1 exposed concrete that extended beyond the maximum excavation depth of 1.3m but stepped out only 0.1m indicative of a pile cap.

Made Ground comprised asphalt surfacing to a depth of 0.1m overlying sub-base to 0.4m in turn overlying a medium dense gravelly ashy fine to medium sand, gravel is wood, brick, coal and fragments of concrete. Superficial deposits were observed as soft to firm sandy or silty clay at a depth of between 2.6 and 3.0m.

Beneath the made ground soft to firm, occasionally sandy, silty clay was encountered to depths of between 3.45 and 5.0m bgl. In borehole BH1-B a slight organic odour was noted. The clay has been interpreted as Tidal Flat Deposits, as indicated to be present on the BGS map.

Beneath the Tidal Flat Deposits dense becoming very dense slightly sandy predominantly angular to subangular fine to coarse gravel comprising mudstone and shale. While the gravel was predominantly angular to subangular, the gravel was also noted to be rounded within BH1-B. There are two potential interpretations for this material: Glaciofluvial Deposits, or weathered bedrock. Given that the materials encountered comprised predominantly angular or subangular mudstone and shale it is considered that this material is more likely to represent a zone of weathered bedrock.

Human Health Assessment

The results of soil chemical analysis were compared to Human Health Generic Assessment Criteria for commercial land use. None of the analytes tested were detected at concentrations that exceeded the human health GAC 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. However, the contaminants identified are of low solubility and mobility and as such are unlikely to present a risk to groundwater beneath the site

Waste Classification

In general, the results of the chemical analyses indicate that the material would be classified as non-hazardous waste. While Waste Acceptance Criteria (WAC) analysis has not been undertaken, the concentrations of the fraction of organic carbon (FOC) indicate that the soil arisings would have Total Organic Carbon (TOC) concentrations of greater than 3% and be classed as non-hazardous. The reported concentration of chrysotile asbestos fibres sampled in HDTP3 are less than the threshold concentration for hazardous waste. A full assessment of metal concentrations has not been undertaken however the results of the chemical analysis indicate that the made ground would be classified as non-hazardous waste.

One sample of bituminous surfacing was analysed for concentrations of PAH compounds and indicated that the concentrations of PAHs were low (total maximum PAH 17 concentration being below the MDL of 2mg/kg). The maximum 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 Coal Mining Risk Assessment, Remada 769.01.01 did not identify a potential for unrecorded shallow worked sems to be present beneath the site. All three cable tool boreholes proved the full depth of made ground and encountered a soft to firm CLAY to a maximum depth of 5.5m in BH2. The results of undrained shear strength tests on U100 samples produced Cu values of 17 to 34 kPa for the CLAY. All three boreholes refused in a gravel/shale of mudstone at between 4.5 and 6m bgl. Groundwater monitoring has recorded that all wells were dry.

In order to prevent differential settlement between the existing store and proposed extension all foundations should bear on the same strata. The made ground and underlying soft to firm slightly organic clay would produce unacceptable amounts of total and differentials settlement and consequently piled foundations are required.

Either ground improvement in the form of vibro concrete columns or piled foundations are considered necessary to transfer foundation loads to a suitable bearing layer. Concrete columns would require a depth in the order of 6m and advice should be sought from a specialist ground improvement contractor. Driven piles are unlikely to be acceptable due to vibration of the existing store and therefore either bored or CFA piles should be considered, however it may not be possible to socket CFA piles into the bedrock. Bored piles would require casing through made ground and alluvium and be socketed into the competent bearing strata in order to transfer loads. Rapid excavation of the pile sockets in weak rock is recommended to minimise the potential for deterioration in the walls which could result in the swelling of the mudstone. After formation, the pile should be concreted immediately, preferably on the same day.

Floor slabs should be suspended and bearing on the piled foundations.

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 2 and therefore ground gas protection measures will be required within the proposed buildings.

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Issue No /	*Date*	*Prepared By*	*Technical Review*	*Authorised*
01	*21.08.2018*	*P Dickinson*		
02	*30.03.2022*	*P Dickinson*		

1 INTRODUCTION

Remada Ltd was commissioned by Lidl Great Britain Ltd (hereafter 'the Client') to undertake an intrusive Ground Investigation for the proposed new store at Briton Ferry Road, Neath, South Wales SA11 1AS 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 extension 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 footprint

1.2 Scope of Work

The scope of the investigation is generally in accordance with BS10175:2011+A2 2017 and layout of this report has been designed with the Environment Agency's CLR11[(1)] in mind and guidance issued by the Environment Agency for land contamination reports.

Due to the study site's positioning within Wales, the scope was also designed in line with the Welsh Land Contamination Working Group's Development of Land Affected by Contamination: A Guide for Developers version 3: May 2017. This guidance represents the culmination of a co-operative effort involving the Welsh Local Government Association (WLGA) and Natural Resources Wales (NRW). For the purpose of this report, any references to the Environment Agency (EA) should be seen as interchangeable with NRW.

The initial scope of work comprised:

- Three (3 No) cable percussive boreholes to target depths of 10m including SPTs;
- Three (3 No) combined groundwater and gas monitoring standpipes installed within the boreholes;
- Three (3 No) hand excavated pits to expose the existing foundations;
- Suite of geotechnical classification and strength tests;
- 3 No soil sample suites for chemical analysis of CLEA metals, asbestos, speciated hydrocarbons, cyanide and phenols to delineate any potential soil contamination;
- 4 No ground gas and groundwater monitoring visits to satisfy planning requirements; and
- Combined Factual & Interpretative Geoenvironmental Report.

A supplementary phase of investigation in March 2022 comprised:

- 3 No groundwater samples for chemical analysis of dissolved CLEA metals, Total Petroleum Hydrocarbons (TPHCWG) and Polyaromatic Hydrocarbons (PAH-16).

1.3 Previous Reports

The following report has been previously prepared for the site by Remada:

- Coal Mining Risk Assessment, Remada Ltd, Report 769.01.01, issued in May 2020.

The following report was provided by the Client for review:

- Geo-Environmental Investigation Report Briton Ferry Road, Neath January 2016, Opus CC/J-B0756.00 (R01).

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 BACKGROUND INFORMATION

2.1 Summary of Coal Mining Risk Assessment – Remada Ltd

The pertinent findings of Remada's Coal Mining Risk Assessment (report Ref: 769.01.01, issued in May 2020) are reproduced below:

2.1.1 Site Setting

The existing Lidl store occupies an irregular but very broadly triangular plot of land to the west of Briton Ferry Road (A474). The rectangular store footprint is situated to the rear of the site and parallel with railway line beyond. Lidl shares a site access from the main road with another retail unit to north and the two units are separated by an access road that serves a delivery bay to the rear. The remaining site area is given over to customer car parking. The site has an elevation of approximately 10m AOD is situated in the valley floor to the east of the River Nedd.

A review of historic maps did not identify the presence of shafts or adits within the site or vicinity of the site.

2.1.2 Geological Mapping

BGS Sheet 247 Swansea (Bedrock) indicates that the site is located less than 500m south-east of the Neath Disturbance that trends North-East to South-West.

The bedrock in the vicinity of the site is formed of the Pennant Sandstone Formation. This parent unit has an approximate thickness of 1000m with units of grey mudstone, coal seams and seatearth subdivided into successive members that are defined by key coal horizons that in the vicinity of the site outcrop perpendicular to the Neath Disturbance.

The Hughes Member sandstone (a child unit of the Pennant Sandstone Formation) is recorded directly beneath the store footprint. The BGS generalised vertical section indicates it has a thickness of 265m with the following vertical succession of coal seams: Coal, Westernmoor, Mountain Coal and Garlant. The vertical separation between the Westernmoor and Mountain coal is approximately 80m and the general angle and direction of dip is between 12° to 15° to the north north-east. The Westernmoor coal seam outcrops less than 125m to the north of the site and it is estimated that underlying Mountain Coal seam would be present at a depth of 80 to 100m beneath the site.

2.1.3 Mining

The site is located within an area which may be affected by coal mining activity. A review of the Coal Authority website indicates that the site is located within a development high risk area.

The Coal Authority Consultants Mining Report did not identify past underground mining or a probability of unrecorded shallow workings beneath the site. The nearest mine entry is an adit 1km to south-east of the site.

2.2 Summary of Geo-Environmental Investigation Report – Opus Ltd

The report investigated the retail unit land immediately to the north the existing Lidl store and was utilised by Remada to assist with the design of the ground investigation. Opus' report presented a review of an earlier report by Earth Science Partnership (2002).

2.2.1 Site History

The earliest available historical map within Opus' report dated 1881 record the site as low lying marsh land in the north and the Japan Works in the south. The marsh land was subsequently developed as an extension of the Melin Crythan Works to the north whilst the works to south was present on the 1983 map but replaced by the current store building in the subsequent map dated 2006.

2.2.2 Published Geology, Hydrogeology

Age	Stratigraphic Name	Description
Holocene Epoch (QH)	Landscaped Ground (Undivided)	The site is shown to have Landscaped Ground at the near surface.
Holocene Epoch (QH)	Tidal Flat Deposits	Tidal Flat Deposits form superficial deposits across the site, and normally comprises "*consolidated soft silty clay, with layers of sand, gravel and peat*".
Westphalian D Sub-age (CD)	Hughes Member	The Hughes Member is the recorded bedrock geology across the site, and is listed as "*green-grey, lithic arenites ("Pennant sandstones"), with thin mudstone/siltstone and seatearth interbeds, and mainly thin coals*".

The Environment Agency classifies the superficial deposits underlying the site as Secondary Undifferentiated Aquifer. The Environment Agency classifies the bedrock underlying the site as Secondary A Aquifer.

2.2.3 Radon

The site is in an area where less than 1% of homes are above the radon action level and where no radon protective measures are necessary.

2.2.4 Ground Conditions

Earth Science Partnership

The ground investigation comprised seven trial pits and two light cable percussion boreholes, and found that the ground conditions comprised Made Ground to depths of 3.25m to 3.60m bgl, underlain by Alluvial superficial deposits to depths of 5.95m to 7.30m bgl, and further underlain by Fluvio-glacial gravels. Concrete obstructions were identified in five of the exploratory holes. The maximum depth of the trial pits was to 3.50m bgl and the boreholes was to 15.45m bgl.

Earth Science Partnership (ESP)also refer to having sight of Rotary Open Hole Borehole Logs produced by Atkins for the local area which indicate the presence of Fluvio-glacial gravels to depths of 40m bgl. ESP conclude that despite the geological map interpretation, the Westernmoor Coal Seam is likely to be eroded from beneath the site and is no longer present.

Opus

Eight window sample boreholes (WS1-WS7) were advanced across the site using a small, tracked, light percussion window sampling rig on 3rd and 4th December 2015. These were located to provide adequate coverage to characterise the ground conditions beneath the available areas of the site. The window sample boreholes were advanced to depths of between 0.40m and 5.00m below ground level (bgl).

In the area of the car park, the Made Ground generally comprised a thin layer of asphalt, underlain by grey gravel sub-base, and further underlain by ashy, sandy gravel and cobbles. Constituents included brick, metal, sandstone and slag. The Made Ground in this area was penetrated to a maximum depth of 1.20m bgl, and a concrete slab was identified at 0.40m bgl in WS7.

To the rear of the commercial units, the Made Ground generally comprised ashy, gravel and sand, with occasional cobbles of brick and concrete. The base of the Made Ground was proven to the rear of the existing building at a depth of 4.7m bgl in WS3.

Natural strata was encountered beneath the Made Ground in WS3, and comprised grey, very soft consistency, very low strength CLAY.

2.2.5 Chemical Analysis - Soils

Opus

The results of the chemical testing of soil samples have been reviewed in accordance with the current legislative framework and criteria to assess the risk to human health. Soil Organic Matter (SOM) analysis has also been undertaken to enable the determination of appropriate screening values for organic contaminants. The average SOM% value for the site is 3.0% therefore screening values applicable for 3% SOM have been used within the generic screening assessment.

No metal, PAH, Cyanide, Phenol, TPH, BTEX, MTBE or VOC concentrations were found to exceed their adopted screening values in any of the tested soil samples. However, Asbestos fibres were identified with the Made Ground in WS1, WS3 and WS6, in addition to a bulk sample in WS1. Hence, it is considered that there is requirement for remedial action with respect to asbestos to be undertaken as part of the proposed development of the site with respect to human health.

2.2.6 Ground Gas

Opus

A maximum carbon dioxide concentration of 1.1% v/v and peak flow of 2.0 l/hr has been recorded in the single monitoring visit undertaken to date. No detectable concentration of methane has been recorded across all monitoring wells.

In line with the recommendations provided in CIRIA 665, a preliminary GSV of 0.022 l/hr has been calculated for carbon dioxide. The GSV's for carbon dioxide put the site within 'Characteristic Situation 1' (Very Low Risk) in accordance with CIRIA 665.

2.2.7 Outline Conceptual Site Model

An Outline Conceptual Site Model based on the information in Opus' report is presented as **Table 1.**

2.3 Unexploded Ordnance (UXO) Risk Assessment

A non-specialist UXO screening exercise has been carried out for the site by considering (a) any evidence of UK defence activities on or near the site evident from the gathered desk study information and (b) the unexploded aerial delivered ordnance (UXO) regional risk maps produced by Zetica.

There is no indication of former military use from the desk study. Furthermore, the Zetica risk map indicates the site to be in an area where the UXO risk is low. A copy of the map is presented in **Appendix A.**

2.4 Site Walkover

The opportunity was taken to inspect the entire site on 23rd July 2020 by Remada Ltd prior to the commencement of the intrusive works, as recorded in the photographs below.

Photo 1: View northwards of the southern façade of the existing Lidl store building in July 2020.

Photo 2: View westwards of the eastern façade of the existing Lidl store building in July 2020.

Photo 3: View south-westwards across the southern car park area in July 2020, with the off-site Esso Mile End fuel filling station beyond.

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 **Lidl Store** **Japan Works** **Marshland developed as Crythan Works** ***Off-site Sources*** **Retail Units** **Works** **Roads**	Asbestos / Metals As, Be, Cd, Cu, Cr (VI), Cr (III) Hg, Ni, Se, Va, Zn, *Boron, TPH /PAH/PCBs.*	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 Leachate	Occupants of the development / building fabric Adjacent /Nearby residents during construction Crythan Brook to River Nedd Secondary A & Undiff Aquifers	Direct Soil Ingestion	Yes	To be assessed (TBA)	Potential risk	(To be assessed (TBA)	(To be assessed (TBA)
				Indoor Dust ingestion	Yes	TBC	Potential risk	TBC	TBC
				Skin Contact with Soils	Yes	TBC	Potential risk	TBC	TBC
				Skin Contact with Dust	Yes	TBC	Potential risk	TBC	TBC
				Inhalation of Outdoor Dust	Yes	TBC	Potential risk	TBC	TBC
				Inhalation of Outdoor Vapours	Yes	TBC	Potential risk	TBC	TBC
				Inhalation of Indoor Vapours	Yes	TBC	Potential risk	TBC	TBC
				Ingestion via permeated water supply pipework	Yes	TBC	Potential risk	TBC	TBC
				Inhalation of ground gas	Yes	TBC	Potential risk	TBC	TBC
				Inhalation of radon gas	No	Low Probability Radon Area	Negligible	None	Negligible
				Leachate/ run-off to Crythan Brook	Yes	TBC	Potential risk	TBC	TBC
				Leaching to Secondary Aquifer in Superficial Deposits Secondary A Aquifer in Bedrock	Yes	TBC	Potential risk	TBC	TBC

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

At the time of Remada's intrusive investigation, the proposed development incorporated an extension of the existing Lidl store to the south-west, south and east. Three (3 No) cable percussive holes were proposed to a depth of 10m or refusal, targeting the proposed expanded store footprint. Three (3 No) hand excavated inspection pits were conducted along the southern and eastern exterior walls of the existing store to ascertain its foundation design.

The investigation was undertaken on 23rd and 24th July 2020 at the locations indicated on **Figure 2**. Four (4 No) ground gas monitoring visits were scheduled for the site in general accordance with the guidance provided by C665 and BS8576:2013.

However, since the completion of Remada's investigation, the proposed layout of the site has been modified which has resulted in the updating of this Phase 2 Ground Investigation Report. The proposed development at the time of writing in March 2022 is for '*demolition of existing buildings [Lidl store and adjacent Poundstretcher store] and replacement with a Class A1 foodstore with associated carparking, landscaping, engineering and drainage works'*. The position of Remada's exploratory holes and the previous Opus window sample boreholes in relation to the proposed new layout is indicated on **Figure 2.**

All exploratory holes were logged by a suitably qualified Geo-environmental Engineer in general accordance with the recommendations of BS5930:2015+A1:2020. Detailed descriptions, together with relevant comments, are given in the **Exploratory Hole Logs**.

3.2 Buried Service Clearance

Buried service plans were reviewed prior to any fieldwork activities commencing. The Client provided Remada with EDI Survey Ltd's Topographic and Services Survey drawing No. 14433/T/01-02 Rev A, dated November 2015, in advance of the intrusive works.

During the subsequent intrusive works, a visual check and buried services survey using a Cable Avoidance Tool (CAT) and Signal Generator (Genny) was carried out at each exploratory hole location.

3.3 Intrusive Investigation

3.3.1 Cable Percussive Boreholes

Three cable percussive boreholes (BH1, BH2 and BH3) were advanced to a target depth of 10m below existing ground level (bgl). However, suspected concrete obstructions were encountered within two of the cable percussive borehole positions; in BH1 below 1.4m bgl and in BH3 at 1.2m bgl, resulting in their relocation as BH1B and BH3-B.

Combined Groundwater and Ground Gas monitoring standpipes were installed in BH1-B, BH2 and BH3-B.

Standard Penetration Tests (SPTs) in the cable percussive boreholes were carried out at regular 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.

3.3.2 Hand – Excavated Inspection Pits

Three inspection pits (HDTP1 – HDTP3) were hand-excavated alongside the existing building's walls on 23rd July 2020, in order to examine the design and composition of the foundations.

3.4 In-Situ Testing

3.4.1 Standard Penetration Tests

Standard Penetration Tests (SPTs) in the cable percussive boreholes were carried out at regular 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 N-values have been corrected based on the Energy Ratio of 87% for the SPT hammer on the cable percussive drilling rig. The SPT Hammer Energy Test Report, undertaken in accordance with BS EN ISO 22476-3:2005 is presented in **Appendix B.**

3.4.2 Hand Shear Vane

Hand shear vane tests were undertaken using an Impact SL810 and in general accordance with the manufacturer's instructions on selected samples of cohesive soils.

3.5 Soil Sampling

3.5.1 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.

3.5.2 Geotechnical

Geotechnical samples were collected at depths indicated on the trial pit and window sample logs with samples retrieved either by spade from the pit or 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.

3.6 Gas and Groundwater

3.6.1 Installations

Combined ground gas and groundwater monitoring standpipes were installed in three 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
BH1-B – 4.7m bgl	50mm HDPE	1.0 – 4.7	Made Ground & Natural Strata
BH2 – 5.3m bgl	50mm HDPE	1.0 – 5.3	Made Ground & Natural Strata
BH3-B – 6.0m bgl	50mm HDPE	1.0 – 6.0	Made Ground & Natural Strata

Table 2: Monitoring Well Installation Details

3.6.2 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.

In total four monitoring visits have been undertaken on-site on 29th July, 3rd August, 10th August and 17th August 2020. The results are presented on **Table 3.**

3.6.3 Well Development

On 14th March 2022, all accessible Opus and Remada monitoring wells were developed to remove drilling fluids and sediment from the wells.

3.6.4 Well Sampling

Water samples were recovered from Remada's BH1-B and BH2 and Opus's WS4 on 21st March 2022. Dedicated bailers were used for each monitoring well to prevent cross-contamination. Groundwater samples were collected in amber glass jars and amber glass vials and retained in a cool box for onwards transport to the laboratory.

3.7 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.

3.8 Laboratory Testing

3.8.1 Soil Chemical Analysis

Three (3 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, one sample of bituminous surfacing was analysed for PAH compounds.

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

3.8.2 Chemical Analysis - Groundwater

Three (3 No) groundwater samples were scheduled for the analysis of asbestos, arsenic, barium, beryllium, cadmium, chromium (III & VI), copper, mercury, nickel, lead, selenium, zinc, cyanide, fraction of organic carbon, Total Petroleum Hydrocarbons (TPHCWG), Polyaromatic Hydrocarbons (PAH), BTEX compounds (benzene, toluene, ethylbenzene and xylene) and phenols.

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

3.8.3 Geotechnical

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

- Four (4 No) Natural Moisture Contents;
- Four (4 No) Plasticity Indices;
- Three (3 No) Particle Size Distribution tests;

- Three (3 No) Quick Undrained Triaxial Compression Tests; and
- Three (3 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 Made Ground

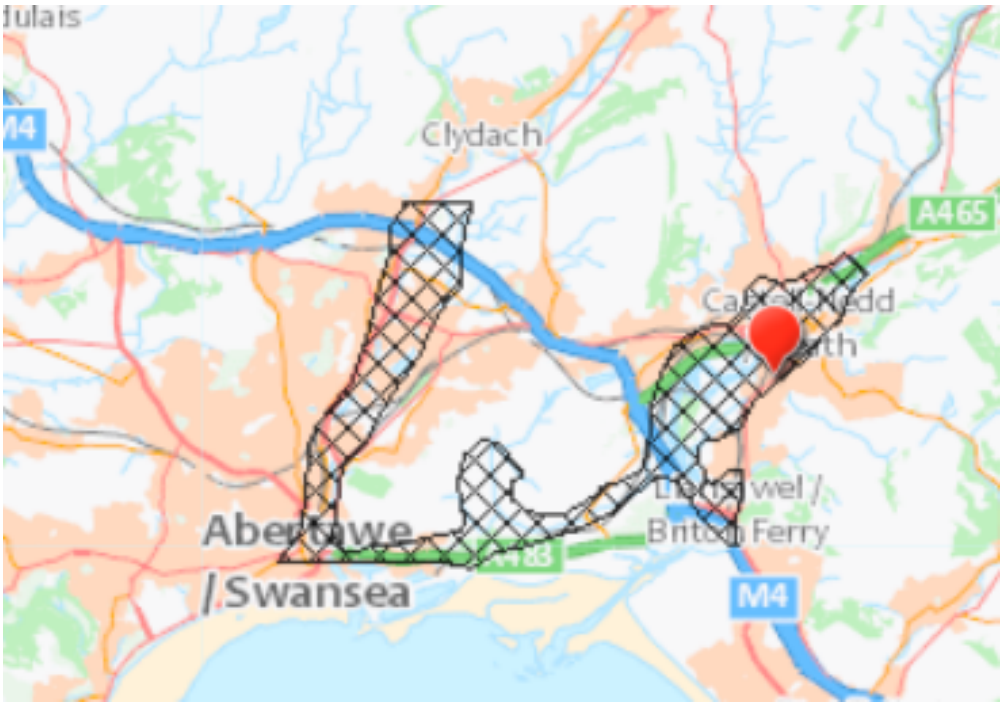
Made Ground was encountered within all eight exploratory hole locations and extended to depths of between 2.6m and 3.0m bgl, where proven. The Made Ground comprised asphalt surfacing to a depth of 0.1m overlying sub-base to 0.4m in turn overlying a medium dense gravelly ashy fine to medium sand, gravel is wood, brick, coal and fragments of concrete.

4.1.2 Natural Deposits

Beneath the made ground soft to firm, occasionally sandy, silty clay was encountered to depths of between 3.45 and 5.0m bgl. In borehole BH1-B a slight organic odour was noted. The clay has been interpreted as Tidal Flat Deposits, as indicated to be present on the BGS map.

Beneath the Tidal Flat Deposits dense becoming very dense slightly sandy predominantly angular to subangular fine to coarse gravel comprising mudstone and shale. While the gravel was predominantly angular to subangular, the gravel was also noted to be rounded within BH1-B. There are two potential interpretations for this material: Glaciofluvial Deposits, or weathered bedrock.

The information contained on the BGS website was further reviewed in order to provide an interpretation. The BGS Geoindex indicated that the site was located on the margins of a buried channel as indicated below:



Further information was provided on the 1:50,000 Scale map sheet 247 'Swansea', Bedrock and Superficial Edition, 2011. A plot of the thickness of superficial indicated that beneath the site the superficial deposits were likely to be in the order of 5 to 10m deep. In addition, a schematic cross section indicated that Glaciofluvial Sheet Deposits (sand and gravel) or Glaciolacustrine Deposits (silt and clay) could be present within the buried channel.

Given that the materials encountered comprised predominantly angular or subangular mudstone and shale it is considered that this material is more likely to represent a zone of weathered bedrock. It is considered that if the material had been moved then other material types would be present along side the presence of mudstone and shale. The site is indicated to lie on the margins of the buried channel with the anticipated thickness of superficial deposits being in the order of 5 to 10m. The Alluvium was found to extend to depths of 3.45 and 5.0m, which is slightly less than predicted but not significant enough to cast doubt on the interpretation.

4.1.3 Existing Foundations

Three trial pits (HDTP1 – HDTP3) were excavated by hand against the existing Lidl store building to depths of between 1.2m and 1.3m bgl on 23rd July 2020. The ground conditions logs are presented at the rear of this report.

Within trial pit HDTP1, brickwork extended down below ground level to 0.15m bgl. The face of the wall then stepped out 0.075m onto a concrete wall (likely pile cap), which extended down to a concrete footing at 0.18m bgl. The concrete stepped out 0.085m and was chased down to the base of the pit at 1.3m bgl, where it was still present.

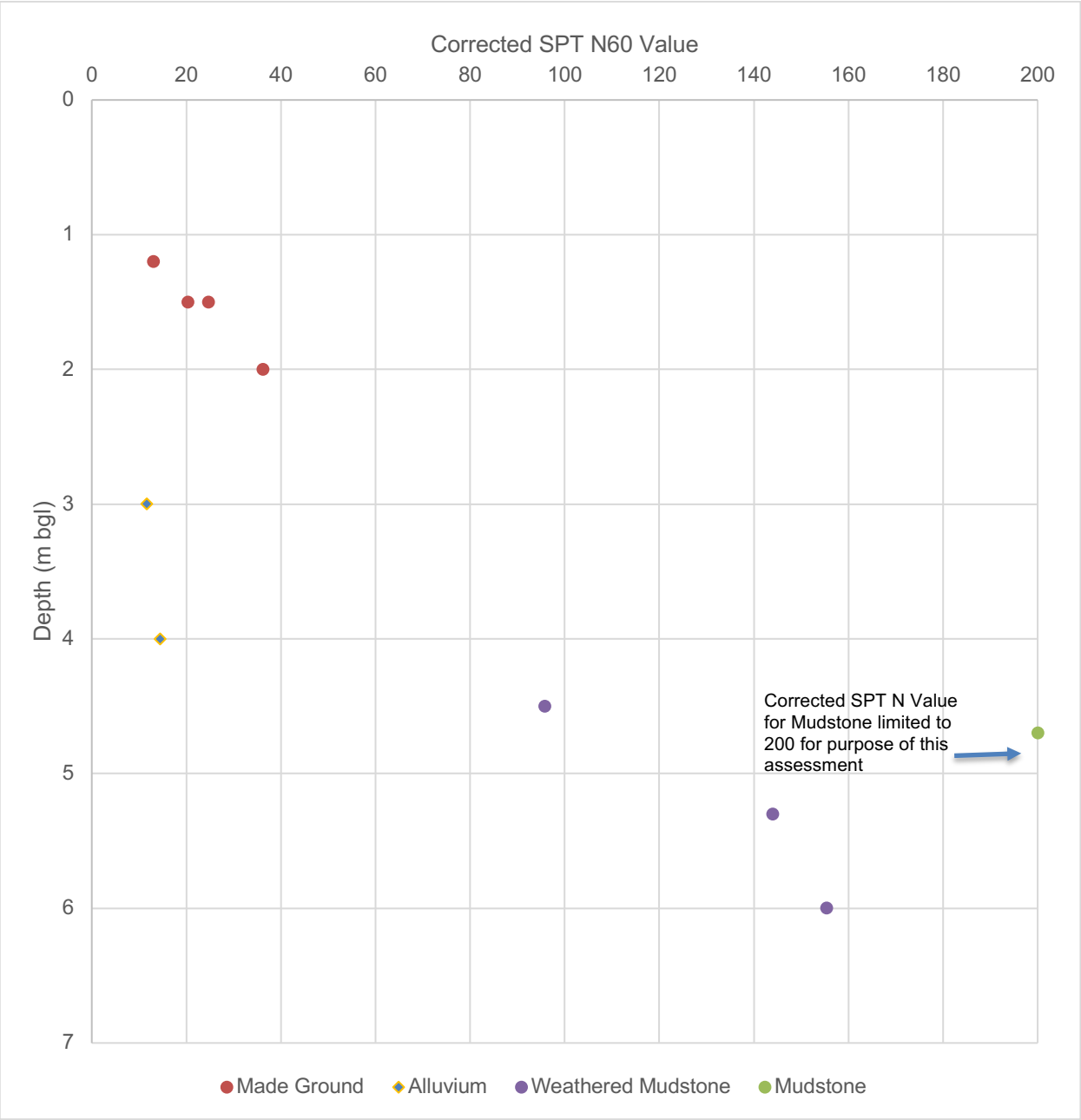
Within trial pit HDPT2, brickwork extended down below ground level to 0.15m bgl. The face of the wall then stepped out 0.29m on a concrete foundation, which extended down to 0.19m bgl. The concrete then stepped out a further 0.09m, before extending down to 0.68m bgl. A bulbous protrusion of this concrete was noted between 0.68m and 0.75m, stepping out a maximum of 0.18m. The entire foundation appeared to be bearing on made ground (light brown slightly gravelly coarse sand with moderate cobble content)

Within trial pit HDTP3, brickwork extended down below ground level to 0.17m bgl. The face of the wall then stepped out by 0.49m onto concrete, which extended down to 0.21m bgl. This concrete was underlain by blockwork to a basal depth of 0.61m bgl, which had stepped out by 0.09m. A bulbous protrusion of this concrete was noted between 0.61m and 0.75m, stepping out a maximum of 0.18m. The entire foundation appeared to be bearing on made ground (dark grey gravelly sand).

4.2 In-situ Testing

4.2.1 Standard Penetration Tests (SPTs)

In-situ SPTs were undertaken to assist with the interpretation of strata encountered. 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 Hand Shear Vane

It was not possible to achieve any successful field vane readings from recovered cohesive deposits during the intrusive investigation.

4.3 Soil Observations

Made Ground was recovered at all locations as a heterogeneous granular material containing a variety of materials including brick, concrete and ash.

There were no visible indicators of contamination including asbestos within the sampled soils.

4.4 Groundwater Observations

Groundwater was not observed in any of the trial holes or boreholes during Remada's intrusive investigation.

During the subsequent monitoring programme, groundwater was recorded within all three monitoring standpipes as summarised in the table below:

Location	Groundwater Level in Standpipe (m AOD)				
	1st Monitoring Visit	2nd Monitoring Visit	3rd Monitoring Visit	4th Monitoring Visit	Average
BH1-B	5.08	5.02	5.02	4.79	4.98
BH2	5.09	5.12	4.92	4.72	4.96
BH3-B	4.18	3.73	3.72	3.63	3.82

Table 4: Groundwater Levels during Monitoring Programme

4.5 Chemical Analysis

4.5.1 Soils

Results of Remada's soil chemical analysis are presented in **Table 5** at the end of the report and full laboratory certificates are presented in **Appendix C**. Results of the chemical analyses are summarised as follows.

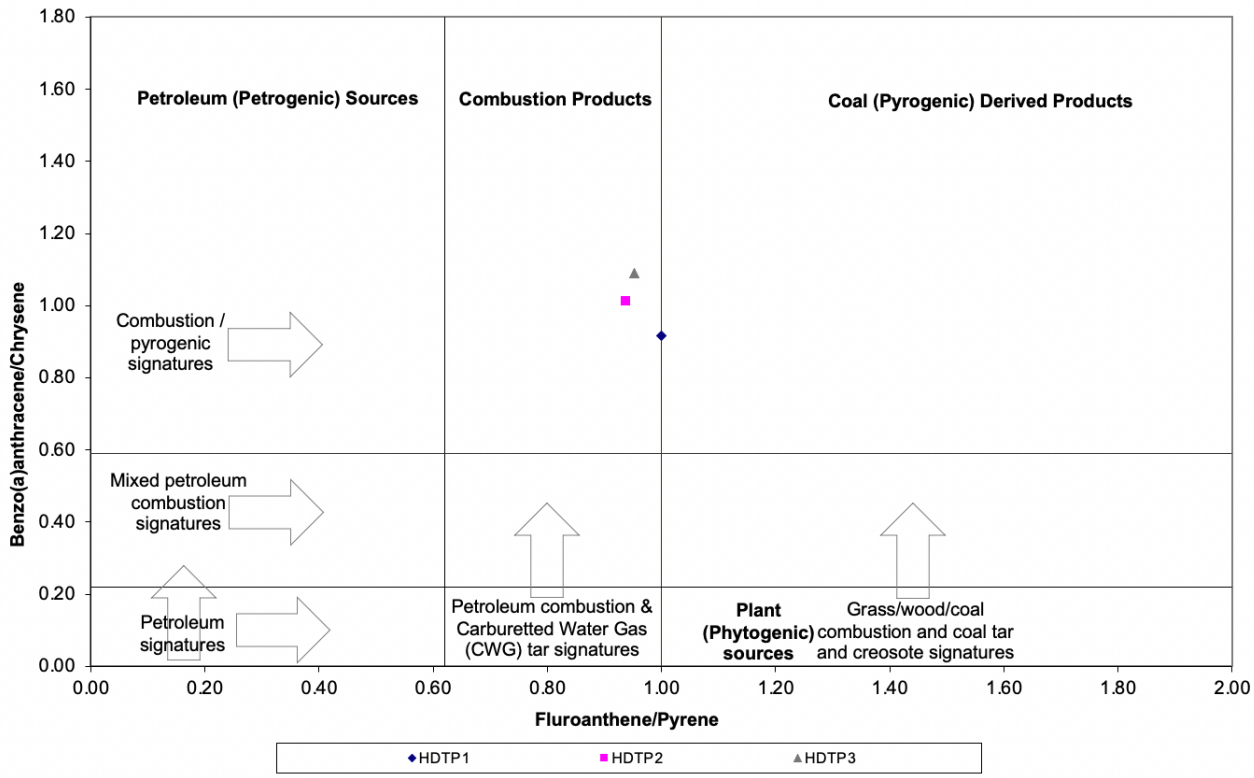
The average FOC and pH were 0.037 and 9.6 respectively. Asbestos was detected in the made ground sample from HDTP3 between 0.6 – 0.7m bgl, recorded as comprising chrysotile cement fibres/clumps with a total asbestos content of 0.005%.

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 three of the samples analysed (from HDTP1 – HDTP3). The hydrocarbons were generally heavy end within the aliphatic C16 to C35 carbon range. The maximum total petroleum hydrocarbons recorded was 450mg/kg within the sample from HDTP1 at 0.5m bgl. No BTEX compounds were identified above the MDL.

Concentrations of PAHs were detected above method detection limit (MDL) in all three of the samples analysed. The maximum concentration of 130mg/kg was encountered in both the sample from HDTP1 at 0.5m and from HDTP3 at 0.6 – 0.7m bgl.

In addition, the PAH concentrations have been plotted on a double ratio plot to provide an indication of the likely source of the PAHs. All of the samples that had detections of the four PAHs used have been plotted and all are indicated to be combustion/pyrogenic related PAHs.



Graph 2: PAH Double Ratio Plot

4.5.2 Groundwater

Results of the groundwater chemical analysis are presented in **Table 6** 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 concentration of Dissolved Organic Carbon (DOC) and pH were 75 ug/l and 7.7 respectively. Detectable concentrations of metals were identified in all five samples, although the concentrations of beryllium, cadmium, mercury, lead and Chromium (III and VI) were recorded below the laboratory method detection limit (MDL).

The concentrations of Total Petroleum Hydrocarbon (TPH) were recorded below the MDL in all three samples analysed.

The concentrations of Polyaromatic Hydrocarbons (PAH-16) were recorded below the MDL in all three samples analysed.

4.6 Geotechnical Testing

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

Laboratory test results produced:

- BH1-B @ 0.01 – 0.4m, Grey slightly clayey/silty slightly fine to coarse sandy fine to coarse GRAVEL (sub-base)
- BH1-B @ 3.0 -3.45m, Brown fine gravelly sandy silty CLAY, moisture content = 20%, Liquid Limit = 55%, Plastic Limit = 18%, percentage < 0.425 µm = 81%, Clay of High Plasticity, estimated Cu = 19 kPa.

- BH2 3.0 – 3.45m, Acid Soluble Sulphate = 0.25%, Aqueous Extract Sulphate 0.04 g/l, pH = 7.49, total sulphur 0.10%.
- BH3-B @ 3.0 - 3.45m, Brown silty CLAY, moisture content = 47%, Liquid Limit = 62%, Plastic Limit = 23%, percentage < 0.425 µm = 100%, Clay of High Plasticity, estimated Cu = 17 kPa.
- BH3-B @ 5.0 - 5.45m, Brown silty CLAY, moisture content = 34%, Liquid Limit = 65%, Plastic Limit = 30%, percentage < 0.425 µm = 100%, Clay of High Plasticity, estimated Cu = 34 kPa.
- BH3-B @ 5.5 to 5.8m, Grey slightly clayey/silty fine to coarse sandy fine to coarse GRAVEL, Acid Soluble Sulphate = 0.27%, Aqueous Extract Sulphate 0.04 g/l, pH = 7.86, total sulphur 0.11%.
- BH2 @ 3.0 to 3.45m, Blackish grey fine to medium gravelly silty CLAY, moisture content = 45%, Liquid Limit = 66%, Plastic Limit = 31%, percentage < 0.425 µm = 82%, Clay of High Plasticity.
- HDTP3 @ 0.4 – 0.8m, Dark brown slightly clayey/silty fine to coarse sandy fine to coarse GRAVEL, Acid Soluble Sulphate = 0.21%, Aqueous Extract Sulphate 0.03 g/l, pH = 7.32, total sulphur 0.09%.

4.7 Ground Gas Monitoring Results

The results of four rounds of ground gas monitoring are presented in **Table 3** and summarised below:

- Methane concentrations were recorded at a maximum steady state of 7.4% at BH3-B on 29th July 2020.
- Carbon dioxide concentrations were recorded at a maximum steady state concentration of 7.9% v/v in BH3-B on 10th August 2020;
- Oxygen concentrations were recorded at a minimum steady state concentration of 7.3% v/v in BH3 on 17th August 2020;
- Ground gas flow rates were recorded at a maximum negative flowrate of 0.7 litres per hour (l/hr) in BH2 on 3rd August 2020.
- Atmospheric pressure at the time of sampling varied between a high of 1019 millibar (mbar) on 10th August 2020 and a low of 1001 mbar on 17th August 2020. The monitoring visits were undertaken during rising and falling atmospheric pressure trends over the previous 48 hours.

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. The average of three FOC values 0.037 giving a Soil Organic Matter (SOM) of 6%. In order to present a conservative assessment, the SOM content of 6% has been adopted for the assessment.

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 5**.

<u>TPH, PAH & BTEX</u>

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

<u>Metals & Inorganics Excluding Asbestos</u>

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

<u>Asbestos</u>

A concentration of 0.005% chrysotile asbestos was identified in HDTP3.

5.3 Controlled Waters Risk Assessment

5.3.1 Sensitivity – Groundwater

The site is not indicated to be within a Groundwater Source Protection Zone. The superficial Tidal Flat Deposits underlying the site are designated as Secondary Undifferentiated Aquifers, where it is not possible to designate it as ‘A’ or ‘B’. The Hughes Member bedrock underlaying the site is designated as a Secondary ‘A’ Aquifer. There are no groundwater abstractions recorded within 1km of the site.

5.3.2 Sensitivity – Surface Waters

The nearest surface water feature is the Cryddan Brook present along the north-western boundary of the site. There are no surface water abstractions recorded within 1km of the site.

Investigation has revealed that the site is underlain by a Secondary Aquifer in the superficial deposits and Secondary A Aquifer in the bedrock.

5.3.3 Comparison with EQS Levels

The concentrations of contaminants with groundwater sampled from have been compared with the Water Framework Directive Regulations 2015 Schedule 3 General Quality of Groundwater as an applicable Environmental Quality Standards (EQS) for Secondary Aquifers. The AA-EQS level has been adopted.

A comparison of groundwater chemical analysis with EQS levels (and Drinking Water Regulation 2016 levels) is presented as **Table 6.** No exceedances of the EQS levels were identified.

5.3.4 Risk Assessment

The results of the soil chemical analysis undertaken has identified that concentrations of metals and inorganic contaminants are within the range that would be expected for 'typical' made ground. Detectable concentrations of TPH and PAHs were encountered in some samples. However, the contaminants identified are of low solubility and mobility and as such are unlikely to present a risk to groundwater beneath the site.

The groundwater was encountered at depths of between 1.66m and 3.6m bgl within Remada's standpipes in the southern area of the site during the 2020 monitoring programme. During Opus' investigation in the northern area of the site in December 2015, groundwater was encountered in their borehole WS3 at a depth of 1.9m bgl. Standing groundwater levels recorded in the monitoring wells in WS3 and WS4A in December 2015 were 2.52m and 2.0m bgl respectively.

Post-development, the site will continue to be predominantly covered by a retail building and areas of hardstanding. Consequently, the risk of leaching of contaminants as a result of infiltration of groundwater is limited. Therefore, the risk to controlled waters from contaminants within the made ground at the site is considered to be low and does not warrant further consideration at this stage.

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 = Gas Concentration (% v/v) x 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 event.

- Methane GSV = 7.4% v/v x 0.7 l/hr = 0.05 l/hr
- Carbon Dioxide GSV = 7.9% v/v x 0.7 l/hr = 0.05 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 greater than these typical limits it is considered that the Characteristic Situation 2 classification is appropriate for the site. Therefore, gas protection measures are necessary for the proposed development.

5.5 Revised Conceptual Site Model

A revised Conceptual Site Model is presented as **Table 7** below.

5.6 Waste Classification

5.6.1 Bituminous Surfacing

One sample of bituminous surfacing was analysed for concentrations of PAH compounds. The purpose of this analysis was to determine if the sample 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 from the sample from BH1-B indicate that the concentrations of PAHs were low (total maximum PAH 17 concentration being below the method detection limit of 2mg/kg). The maximum 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.

5.6.2 Total Concentrations

In general, the results of the chemical analysis indicate that the material would be classified as non-hazardous waste.

While Waste Acceptance Criteria (WAC) analysis has not been undertaken, the assessment has initially included determination of the Fraction of Organic Carbon (FOC) which can be converted to Total Organic Carbon (TOC) by multiplying the result by 100. A TOC limit of 3% is placed on waste destined for disposal in an inert landfill. Concentrations of greater than 3% TOC were measured in shallow made ground from HDTP1 and HDTP3 indicating that the made ground would be classified as non-hazardous.

The reported concentration of chrysotile asbestos fibres sampled in HDTP3 are less than the threshold concentration for hazardous waste.

For each individual sample, the sum concentration of TPH is <500 mg/kg and sum concentration of BTEX <1mg/kg, but the sum concentration of PAH >100 mg/kg, indicating the made ground would be non-hazardous due to hydrocarbons.

A full assessment of metal concentrations has not been undertaken however the results of the chemical analysis indicate that the made ground would be classified as non-hazardous waste.

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 (Un-mitigated)	Proposed Remediation (Mitigation) Measures	Residual Risk Estimation
On-site Sources **Lidl Store** **Japan Works** **Marshland developed as Crythan Works** ***Off-site Sources*** **Retail Units** **Works** **Roads**	Asbestos / Metals As, Be, Cd, Cu, Cr (VI), Cr (III) Hg, Ni, Se, Va, Zn, *Boron, TPH /PAH/PCBs.*	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 /Nearby residents during construction	Direct Soil Ingestion	Yes	No recorded exceedance of GAC in soils.	Very low	Hardstanding to cover retail site minimising direct contact	Negligible
				Indoor Dust ingestion	Yes	< GAC	Negligible	As above	Negligible
				Skin Contact with Soils	Yes	< GAC	Negligible	N/A	Negligible
				Skin Contact with Dust	Yes	< GAC	Negligible	N/A	Negligible
				Inhalation of Outdoor Dust	Yes	< GAC	Negligible	N/A	Negligible
				Inhalation of Outdoor Vapours	Yes	< GAC	Negligible	N/A	Negligible
				Inhalation of Indoor Vapours	Yes	< GAC	Negligible	N/A	Negligible
				Ingestion via permeated water supply pipework	Yes	< GAC	Negligible	N/A	Negligible
				Inhalation of ground gas	Yes	CS2	Low	N/A	Negligible
				Inhalation of radon gas	No	Low Probability Radon Area	Negligible	None	Negligible
			Crythan Brook to River Nedd	Leachate/ run-off to Crythan Brook	Yes	< GAC	Negligible	Hardstanding to prevent precipitation infiltration and leaching.	Negligible
		Leachate	Secondary A / Principal Aquifer	Leaching to Secondary Aquifer in Superficial Deposits Secondary A Aqufier in Bedrock	Yes	< GAC	Negligible	As above.	Negligible

Table 7: 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

Lidl propose to redevelop the existing store as indicated in **Figure 3,** incorporating an existing Lidl store in the southern area and an existing *Poundstretcher* store in the northern area. Opus' ground investigation targeted the northern area of the site, whereas Remada's intrusive investigation was focussed on the southern area. Window sample logs within Opus' ground investigation report for the adjacent building did not prove the full depth of made ground and consequently three cable tool borehole were proposed to determine the depth the competent strata. In addition, three trial pits were excavated to expose the existing store foundations.

Two of the hand dug trial pits HDTP2 and HDTP3 exposed a spread footing bearing on made ground at a depth 0.75m bgl and with an estimated approximate width of 1.5m. HDTP1 exposed concrete that extended beyond the maximum excavation depth of 1.3m but stepped out only 0.1m indicative of a pile cap.

All three cable tool boreholes proved the full depth of made ground and encountered a soft to firm CLAY to a maximum depth of 5.5m in BH2. The results of undrained shear strength tests on U100 samples produced Cu values of 17 to 34 kPa for the CLAY. All three boreholes refused in a gravel/shale of mudstone at between 4.5 and 6m bgl. Groundwater monitoring has recorded that all wells were dry.

The Coal Mining Risk Assessment, Remada 769.01.01 did not identify a potential for unrecorded shallow worked sems to be present beneath the site.

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 Foundations

In order to prevent differential settlement between the existing store and proposed extension all foundations should bear on the same strata. The made ground and underlying soft to firm slightly organic clay would produce unacceptable amounts of total and differentials settlement and consequently an alternative foundation solution will be required such as ground improvement or piled foundations.

Due to the close proximity of the existing store, there is the potential for vibrations to cause damage to existing structures. If ground improvement or driven piles are adopted then assurances will need to be sought from the specialist contractor to ensure that the installation technique does not damage nearby structures.

Ground improvement techniques such as vibro-replacement stone or concrete columns could be considered for the site. Both ground improvement techniques involve inserting a vibrating poker into the ground, which displaces the soil. The resultant void is then infilled with either stone or concrete. Vibro-replacement stone columns may provide a potential pathway for the migration of ground gas, which could be produced from the underlying Alluvium and therefore consideration may need to be given to utilising vibro-replacement concrete columns instead.

In order for concrete columns to work effectively they will need to penetrate the full thickness of the made ground and cohesive Alluvium. Therefore a column depth in the order of 6m bgl should be anticipated. Beneath the cohesive materials a dense granular layer was encountered, that has been interpreted as weathered bedrock, that would provide a suitable bearing layer for the concrete columns. It is recommended that specialist advice is sought from a ground improvement contractor with regard to the suitability of this technique in these ground conditions and the anticipated achievable bearing capacities. If either of these techniques is selected, it is recommended that appropriate insitu testing is specified in order to assess the performance of these foundations.

If a piled foundation solution is adopted then either driven or replacement piles (bored or continuous flight auger (CFA)) piles could be utilised. Driven piles have the advantage of improving the density of the ground, but are unlikely to be suitable due to the potential for unacceptable vibrations. CFA piles may not be suitable as it will be necessary to install sockets into the bedrock, which may not be achievable. Alternatively consideration could be given to bored piles. To install bored piles a void is formed which is then filled with concrete. The sides of the shaft will need to be supported, normally by the use of casing. Support will be required through the made ground and the Alluvium. The majority of the working load will be provided by the end resistance in a rock socket. The rock socket needs to be sufficiently deep to support the sides the pile. Care needs to be taken to remove debris from the base of the rock socket prior to forming the pile. Rapid excavation of the pile sockets in weak rock is recommended to minimise the potential for deterioration in the walls which could result in the swelling of the mudstone. After formation, the pile should be concreted immediately, preferably on the same day.

6.3 Floor Slab

The proposed floor slab should be suspended on the pile foundations.

6.4 Excavations and Temporary Works

Side slopes within the Made Ground and the underlying natural soft clay 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.

The ground investigation took place following a period of dry weather and seepages may occur in excavations.

6.5 Protection of Buried Concrete

In accordance with BRE SD1 for buried concrete in a brownfield site with static groundwater, analysis of selected samples for water soluble sulphate returned values of up to 0.64 g/l and pH >7.3. A total potential sulphate value of 0.84% was also calculated (3 x total sulphur). 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 & RECOMMENDATIONS

7.1 Conclusions

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

7.1.1 Phase 2 Site Investigation

The proposed development at the time of writing in March 2022 is for '*demolition of existing buildings [Lidl store and adjacent Poundstretcher store] and replacement with a Class A1 foodstore with associated carparking, landscaping, engineering and drainage works'*. Borehole logs within Opus' ground investigation report for the adjacent building did not prove the full depth of made ground and consequently three cable tool boreholes were proposed to determine the depth the competent strata. In addition, three trial pits were excavated to expose the existing store foundations.

Two of the hand dug trial pits HDTP2 and HDTP3 exposed a spread footing bearing on made ground at a depth 0.75m bgl and with an estimated approximate width of 1.5m. HDTP1 exposed concrete that extended beyond the maximum excavation depth of 1.3m but stepped out only 0.1m indicative of a pile cap.

Made Ground comprised asphalt surfacing to a depth of 0.1m overlying sub-base to 0.4m in turn overlying a medium dense gravelly ashy fine to medium sand, gravel is wood, brick, coal and fragments of concrete. Superficial deposits were observed as soft to firm sandy or silty clay at a depth of between 2.6 and 3.0m.

Beneath the made ground soft to firm, occasionally sandy, silty clay was encountered to depths of between 3.45 and 5.0m bgl. In borehole BH1-B a slight organic odour was noted. The clay has been interpreted as Tidal Flat Deposits, as indicated to be present on the BGS map.

Beneath the Tidal Flat Deposits dense becoming very dense slightly sandy predominantly angular to subangular fine to coarse gravel comprising mudstone and shale. While the gravel was predominantly angular to subangular, the gravel was also noted to be rounded within BH1-B. There are two potential interpretations for this material: Glaciofluvial Deposits, or weathered bedrock. Given that the materials encountered comprised predominantly angular or subangular mudstone and shale it is considered that this material is more likely to represent a zone of weathered bedrock.

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

7.1.3 Water Resources Risk Assessment

The results of the soil chemical analysis have 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 soil samples. However, the contaminants identified are of low solubility and mobility and as such are unlikely to present a risk to groundwater beneath the site. The concentrations of contaminants within the groundwater sampled from three standpipes have been compared with the Water Framework Directive Regulations and no exceedances of the EQS levels were identified.

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. Therefore, the risk to groundwater from contaminants within the made ground at the site is considered to be low and does not warrant further consideration.

7.1.4 Waste Classification

In general, the results of the chemical analyses indicate that the material would be classified as non

hazardous waste. While Waste Acceptance Criteria (WAC) analysis has not been undertaken, the concentrations of the fraction of organic carbon (FOC) indicate that the soil arisings would have Total Organic Carbon (TOC) concentrations of greater than 3% and be classed as non-hazardous. The reported concentration of chrysotile asbestos fibres sampled in HDTP3 are less than the threshold concentration for hazardous waste. A full assessment of metal concentrations has not been undertaken however the results of the chemical analysis indicate that the made ground would be classified as non-hazardous waste.

One sample of bituminous surfacing was analysed for concentrations of PAH compounds. The results from the sample from BH1-B indicate that the concentrations of PAHs were low (total maximum PAH 17 concentration being below the method detection limit of 2mg/kg). The maximum 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.

7.2 Recommendations

The Coal Mining Risk Assessment, Remada 769.01.01 did not identify a potential for unrecorded shallow worked sems to be present beneath the site. All three cable tool boreholes proved the full depth of made ground and encountered a soft to firm CLAY to a maximum depth of 5.5m in BH2. The results of undrained shear strength tests on U100 samples produced Cu values of 17 to 34 kPa for the CLAY. All three boreholes refused in a gravel/shale of mudstone at between 4.5 and 6m bgl and groundwater monitoring has recorded that all wells were dry.

In order to prevent differential settlement between the existing store and proposed extension all foundations should bear on the same strata. The made ground and underlying soft to firm slightly organic clay would produce unacceptable amounts of total and differentials settlement and consequently piled foundations are required.

Either ground improvement in the form of vibro-concrete columns or piled foundations are considered necessary to transfer foundation loads to a suitable bearing layer. Concrete columns would require a depth in the order of 6m and advice should be sought from a specialist ground improvement contractor. Driven piles are unlikely to be acceptable due to vibration of the existing store and therefore either bored or CFA piles should be considered, however it may not be possible to socket CFA piles into the bedrock. Bored piles would require casing through made ground and alluvium and be socketed into the competent bearing strata in order to transfer loads. Rapid excavation of the pile sockets in weak rock is recommended to minimise the potential for deterioration in the walls which could result in the swelling of the mudstone. After formation, the pile should be concreted immediately, preferably on the same day.

Floor slabs should be suspended and bearing on the piled foundations.

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 2 and therefore ground gas protection measures will be required within the proposed buildings.

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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' 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' 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 3: Gas Groundwater Monitoring Data

GAS & GROUNDWATER MONITORING DATA

Remada

SITE	Briton Ferry Road, Neath, SA11 1AS		
PROJECT No.	769.02	**Atmospheric & Ground Conditions**	
		Atmospheric Pressure Variations During Visit	**Ground Surface Conditions**
Carried Out by:	Idris Shafqat	1016mb	Dry
Date:	29.07.2020		
Instrument Details	GA 5000 G501261	**Atmospheric Pressure Trend Over Previous 48hrs**	**Weather Conditions**
		Rising	Sunny, warm, blue skies

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					
BH1-B		50	0.1	0.1	2.0	1.5	1.1	9.3	12.2	60	-0.2	0.02	-	-	1016	1.660	-		
BH2		50	0.1	0.0	0.0	0.6	0.4	15.3	18.7	60	-0.4	0.16	-	-	1016	1.980	-		
BH3-B		50	11.6	7.4	148.0	4.7	3.9	9.2	10.6	60	-0.5	0.23	-	-	1016	3.050	-		

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

GAS & GROUNDWATER MONITORING DATA

Remada

SITE	Briton Ferry Road, Neath, SA11 1AS		
PROJECT No.	769.02	**Atmospheric & Ground Conditions**	
		Atmospheric Pressure Variations During Visit	**Ground Surface Conditions**
Carried Out by:	Idris Shafqat	1014mb	Dry
Date:	03.08.2020		
Instrument Details	GA 5000 G501261	**Atmospheric Pressure Trend Over Previous 48hrs**	**Weather Conditions**
		Rising	Sunny, warm, blue skies

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					
BH1-B		50	0.1	0.1	2.0	1.7	1.2	7.1	10.4	60	-0.5	0.24	-	-	1014	1.720	-		
BH2		50	0.1	0.0	0.0	1.3	1.1	10.0	10.4	60	-0.7	0.52	-	-	1014	1.950	-		
BH3-B		50	7.9	4.7	94.0	5.1	5.0	8.6	8.9	60	-1.0	0.77	-	-	1014	3.500	-		

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

GAS & GROUNDWATER MONITORING DATA

Remada

SITE	Briton Ferry Road, Neath, SA11 1AS		
PROJECT No.	769.02	**Atmospheric & Ground Conditions**	
		Atmospheric Pressure Variations During Visit	**Ground Surface Conditions**
Carried Out by:	Idris Shafqat	1019mb	Dry
Date:	10.08.2020		
Instrument Details	GA 5000 G501261	**Atmospheric Pressure Trend Over Previous 48hrs**	**Weather Conditions**
		Rising	Sunny, warm, blue skies

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					
BH1-B		50	0.1	0.1	2.0	0.7	0.3	18.3	18.5	60	-0.3	1019	-	-	1019	1.720	-		
BH2		50	0.1	0.1	2.0	0.7	0.1	15.0	18.3	60	-0.5	1019	-	-	1019	2.150	-		
BH3-B		50	11.0	5.7	114.0	5.2	7.9	8.3	11.0	60	-0.6	1019	-	-	1019	3.510	-		

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

GAS & GROUNDWATER MONITORING DATA

Remada

SITE	Briton Ferry Road, Neath, SA11 1AS		
PROJECT No.	769.02	**Atmospheric & Ground Conditions**	
		Atmospheric Pressure Variations During Visit	**Ground Surface Conditions**
Carried Out by:	Idris Shafqat	1001mb	Wet
Date:	17.08.2020		
Instrument Details	GA 5000 G501261	**Atmospheric Pressure Trend Over Previous 48hrs**	**Weather Conditions**
		Falling	Cold, windy, wet, raining

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					
BH1-B		50	0.2	0.1	2.0	2.5	1.4	3.1	10.2	60	0.0	-0.24	-	-	1001	1.950	-		
BH2		50	0.1	0.1	2.0	1.3	0.3	10.6	14.9	60	-0.2	0.05	-	-	1001	2.350	-		
BH3-B		50	9.8	7.4	148.0	5.7	4.4	6.6	7.3	60	-0.2	0.26	-	-	1001	3.600	-		

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

Table 3: Comparison of Soil Chemical Analyses with GAC

Chemtest Sample ID.:			**LQM /CIEH Commercial GAC 6% SOM**	1040112	1040113	1040114
Sample Location:				HDTP1	HDTP2	HDTP3
Sample Type:				SOIL	SOIL	SOIL
Top Depth (m):				0.50	0.75	0.60
Bottom Depth (m):					0.85	0.70
Date Sampled:				23-Jul-2020	23-Jul-2020	23-Jul-2020
Determinand	**Units**	**LOD**				
ACM Type		N/A		-	-	Cement,
Asbestos Identification	%	0.001		No Asbestos	No Asbestos	Chrysotile
ACM Detection Stage		N/A		-	-	Stereo Microscopy
Asbestos by Gravimetry	%	0.001				0.005
Total Asbestos	%	0.001				0.005
Moisture	%	0.020		9.0	7.6	8.9
Soil Colour		N/A		Brown	Brown	Brown
Other Material		N/A		Stones	Stones	Stones
Soil Texture		N/A		Sand	Sand	Sand
pH		4.0		9.8	9.7	9.4
Boron (Hot Water Soluble)	mg/kg	0.40	240000	0.83	1.2	0.66
Magnesium (Water Soluble)	g/l	0.010		< 0.010	< 0.010	< 0.010
Sulphate (2:1 Water Soluble)	g/l	0.010		0.16	0.64	0.042
Total Sulphur	%	0.010		0.28	0.10	0.11
Chloride (Water Soluble)	g/l	0.010		0.020	0.011	0.023
Nitrate (Water Soluble)	g/l	0.010		< 0.010	< 0.010	< 0.010
Ammonium (Water Soluble)	g/l	0.01		< 0.01	< 0.01	< 0.01
Sulphate (Acid Soluble)	%	0.010		0.15	0.28	0.092
Arsenic	mg/kg	1.0	640	35	21	36
Beryllium	mg/kg	1.0	12	2.0	< 1.0	< 1.0
Cadmium	mg/kg	0.10	190	0.66	< 0.10	1.2
Copper	mg/kg	0.50	68000	99	7.7	130
Mercury	mg/kg	0.10	58	0.72	< 0.10	12
Nickel	mg/kg	0.50	980	30	9.8	41
Lead	mg/kg	0.50	2300	350	17	230
Selenium	mg/kg	0.20	12000	0.43	< 0.20	0.55
Vanadium	mg/kg	5.0	9000	160	28	58
Zinc	mg/kg	0.50	730000	350	30	690
Chromium (Trivalent)	mg/kg	1.0	8600	240	20	160
Chromium (Hexavalent)	mg/kg	0.50	33	< 0.50	< 0.50	< 0.50
Fraction of Organic Carbon		0.0010		0.059	0.0030	0.050
Total Organic Carbon	%			5.9	0.3	5.0
Soil Organic Matter (TOCx	%			10.1	0.5	8.6
Aliphatic TPH >C5-C6	mg/kg	1.0	12000^{sol}	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	mg/kg	1.0	40000^{sol}	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	mg/kg	1.0	11000^{vap}	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	mg/kg	1.0	47000^{vap}	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	mg/kg	1.0	90000^{sol}	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	mg/kg	1.0	1800000	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	mg/kg	1.0	1800000	7.2	< 1.0	< 1.0
Aliphatic TPH >C35-C44	mg/kg	1.0	1800000	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	mg/kg	5.0		7.2	< 5.0	< 5.0
Aromatic TPH >C5-C7	mg/kg	1.0	86000^{sol}	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	mg/kg	1.0	180000^{vap}	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	mg/kg	1.0	17000^{vap}	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	mg/kg	1.0	34000^{sol}	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	mg/kg	1.0	38000	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	mg/kg	1.0	28000	8.4	16	8.0
Aromatic TPH >C21-C35	mg/kg	1.0	28000	430	150	120
Aromatic TPH >C35-C44	mg/kg	1.0	28000	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	mg/kg	5.0		440	170	120
Total Petroleum Hydrocarbons	mg/kg	10.0		450	170	120
Naphthalene	mg/kg	0.10	1100^{sol} (432)	0.77	0.30	0.58
Acenaphthylene	mg/kg	0.10	100000	1.1	0.14	0.25
Acenaphthene	mg/kg	0.10	100000	1.2	0.48	1.1
Fluorene	mg/kg	0.10	71000	1.2	0.49	1.2
Phenanthrene	mg/kg	0.10	23000	7.0	5.8	11
Anthracene	mg/kg	0.10	540000	2.5	2.0	2.9
Fluoranthene	mg/kg	0.10	23000	14	15	20
Pyrene	mg/kg	0.10	54000	14	16	21
Benzo[a]anthracene	mg/kg	0.10	180	11	8.3	12
Chrysene	mg/kg	0.10	350	12	8.2	11
Benzo[b]fluoranthene	mg/kg	0.10	45	20	9.4	15
Benzo[k]fluoranthene	mg/kg	0.10	1200	6.6	3.5	5.4
Benzo[a]pyrene	mg/kg	0.10	36	14	7.8	11
Indeno(1,2,3-c,d)Pyrene	mg/kg	0.10	510	11	4.5	6.5
Dibenz(a,h)Anthracene	mg/kg	0.10	3.6	4.2	1.2	2.0
Benzo[g,h,i]perylene	mg/kg	0.10	4000	12	4.3	5.5
Total Of 16 PAH's	mg/kg	2.0		130	87	130
Benzene	µg/kg	1.0	90	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1.0	180000^{vap}	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1.0	27000^{vap}	< 1.0	< 1.0	< 1.0
m & p-Xylene	µg/kg	1.0	30000^{sol}	< 1.0	< 1.0	< 1.0
o-Xylene	µg/kg	1.0	33000^{sol}	< 1.0	< 1.0	< 1.0
Total Phenols	mg/kg	0.30		< 0.30	< 0.30	< 0.30

Values in bold denote > selected GAC

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.

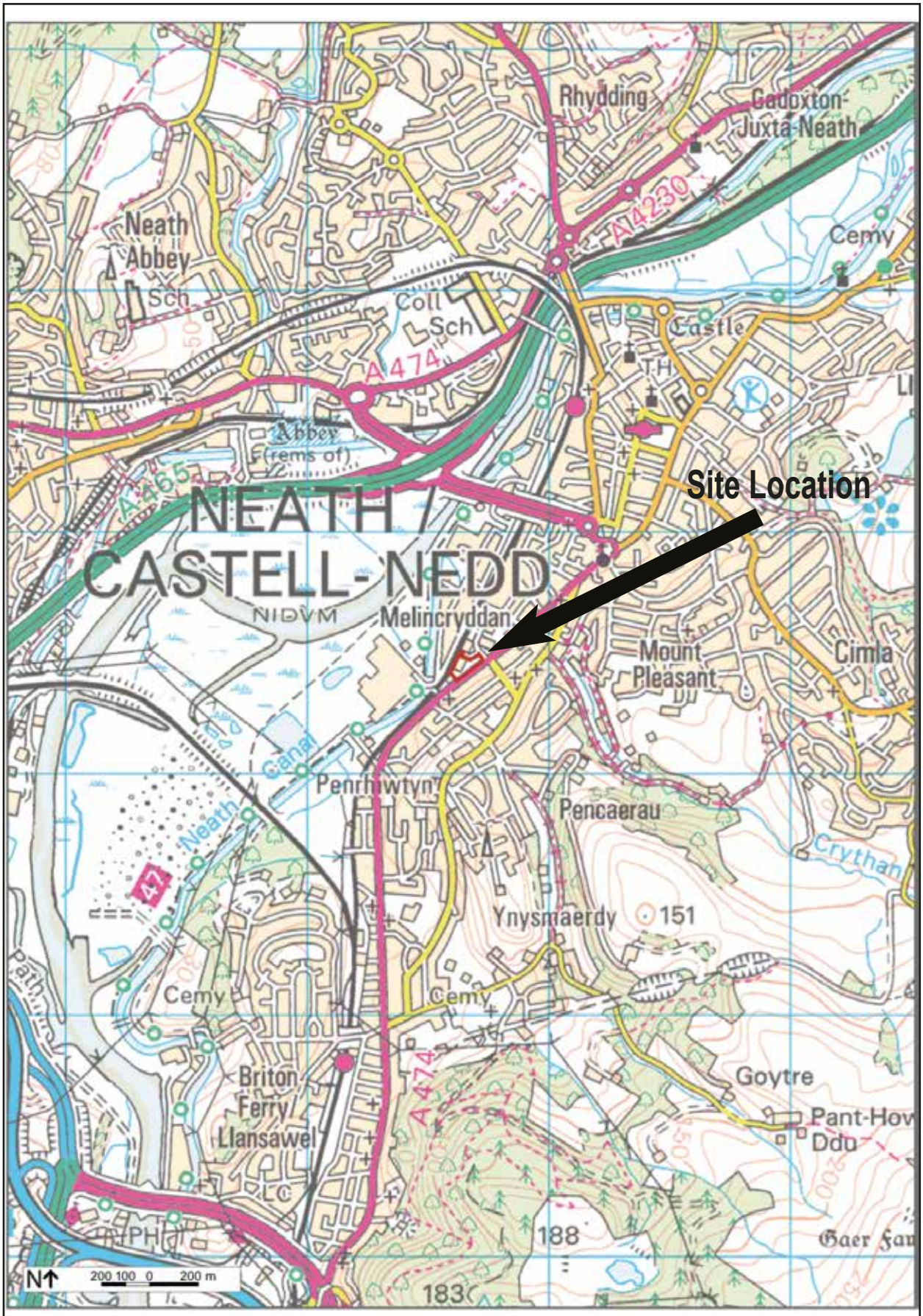
Table 6 Comparison of Groundwater Chemical Analyses with EQS

Client: Remada Ltd	Water Framework Directive Regs 2015 Schedule 3 General Quality of Groundwater (Annual Average µg/l)	Drinking Water Regulations 2016 (µg/l)			22-11218	22-11218	22-11218
Quotation No.:					1398215	1398216	1398217
					WS1B	WS2	WS4
					WATER	WATER	WATER
					21-Mar-2022	21-Mar-2022	21-Mar-2022
Determinand			**Units**	**LOD**			
pH				**N/A**	**7.6**	**7.7**	**7.7**
Arsenic (Dissolved)	50	10	µg/l	1.0	18	1.4	1.2
Boron (Dissolved)	2000	1000	µg/l	20	150	150	79
Beryllium (Dissolved)			µg/l	1.0	< 1.0	< 1.0	< 1.0
Cadmium (Dissolved)	0.09	5	µg/l	0.080	< 0.11	< 0.11	< 0.11
Copper (Dissolved)		2000	µg/l	1.0	< 0.50	1.1	4.6
Mercury (Dissolved)	0.07***	1	µg/l	0.50	< 0.05	< 0.05	< 0.05
Nickel (Dissolved)		20	µg/l	1.0	< 0.50	3.2	1.9
Lead (Dissolved)		10	µg/l	1.0	< 0.50	< 0.50	< 0.50
Selenium (Dissolved)		10	µg/l	1.0	< 0.50	0.61	< 0.50
Vanadium (Dissolved)			µg/l	1.0	< 0.50	< 0.50	1.1
Zinc (Dissolved)		5000	µg/l	1.0	12	12	37
Chromium (Trivalent)	4.7	50	µg/l	20	< 20	< 20	< 20
Chromium (Hexavalent)	3.4	50	µg/l	20	< 20	< 20	< 20
Dissolved Organic Carbon			**mg/l**	**2.0**	**90**	**94**	**41**
Aliphatic TPH >C5-C6			µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C6-C8			µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C8-C10			µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C10-C12			µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C12-C16			µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C16-C21			µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C21-C35			µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C35-C44			µg/l	0.10	< 0.10	< 0.10	< 0.10
Total Aliphatic Hydrocarbons			µg/l	5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7			µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C7-C8			µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C8-C10			µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C10-C12			µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C12-C16			µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C16-C21			µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C21-C35			µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C35-C44			µg/l	0.10	< 0.10	< 0.10	< 0.10
Total Aromatic Hydrocarbons			µg/l	5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons			**µg/l**	**10**	**< 10**	**< 10**	**< 10**
Naphthalene	130		µg/l	0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene			µg/l	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene			µg/l	0.10	< 0.10	< 0.10	< 0.10
Fluorene			µg/l	0.10	< 0.10	< 0.10	< 0.10
Phenanthrene			µg/l	0.10	< 0.10	< 0.10	< 0.10
Anthracene	0.1		µg/l	0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	0.12		µg/l	0.10	< 0.10	< 0.10	< 0.10
Pyrene			µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene			µg/l	0.10	< 0.10	< 0.10	< 0.10
Chrysene			µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	0.017		µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	0.017		µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	0.27		µg/l	0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	N/A		µg/l	0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene			µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	0.0082		µg/l	0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's			**µg/l**	**2.0**	**< 2.0**	**< 2.0**	**< 2.0**
Phenol			mg/l	0.0050	< 0.0050	< 0.0050	< 0.0050

Solubilty of Benzene in water =. 1780 ug/l. TPH concentrations as Benzene are greater than the limit of solublity

Less than EQS
LOD>EQS
>EQS

FIGURES



Notes

Project Title	Scale	Drawn	Size
Briton Ferry Road, Neath	as shown	PD	A4
Drawing Title	**Date**	**Job No.**	**Drawing /Rev No.**
Figure 1: Site Location Plan	12.05.20	769	01
Client			
Lidl Great Britain Ltd			

Remada

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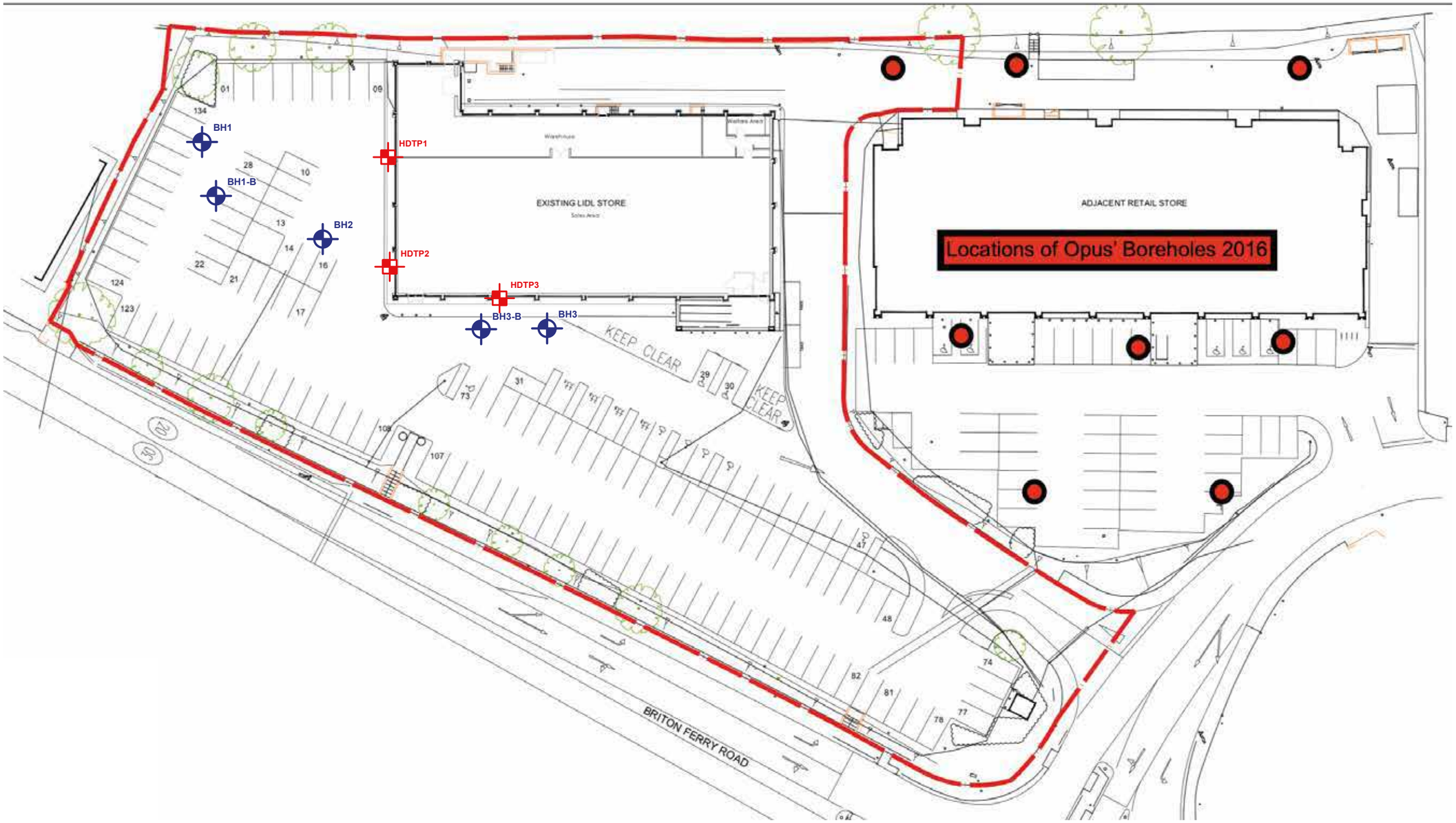


Legend

BH1 Cable Percussive Borehole Position

HDTP Hand Excavated Inspection Pit

Notes

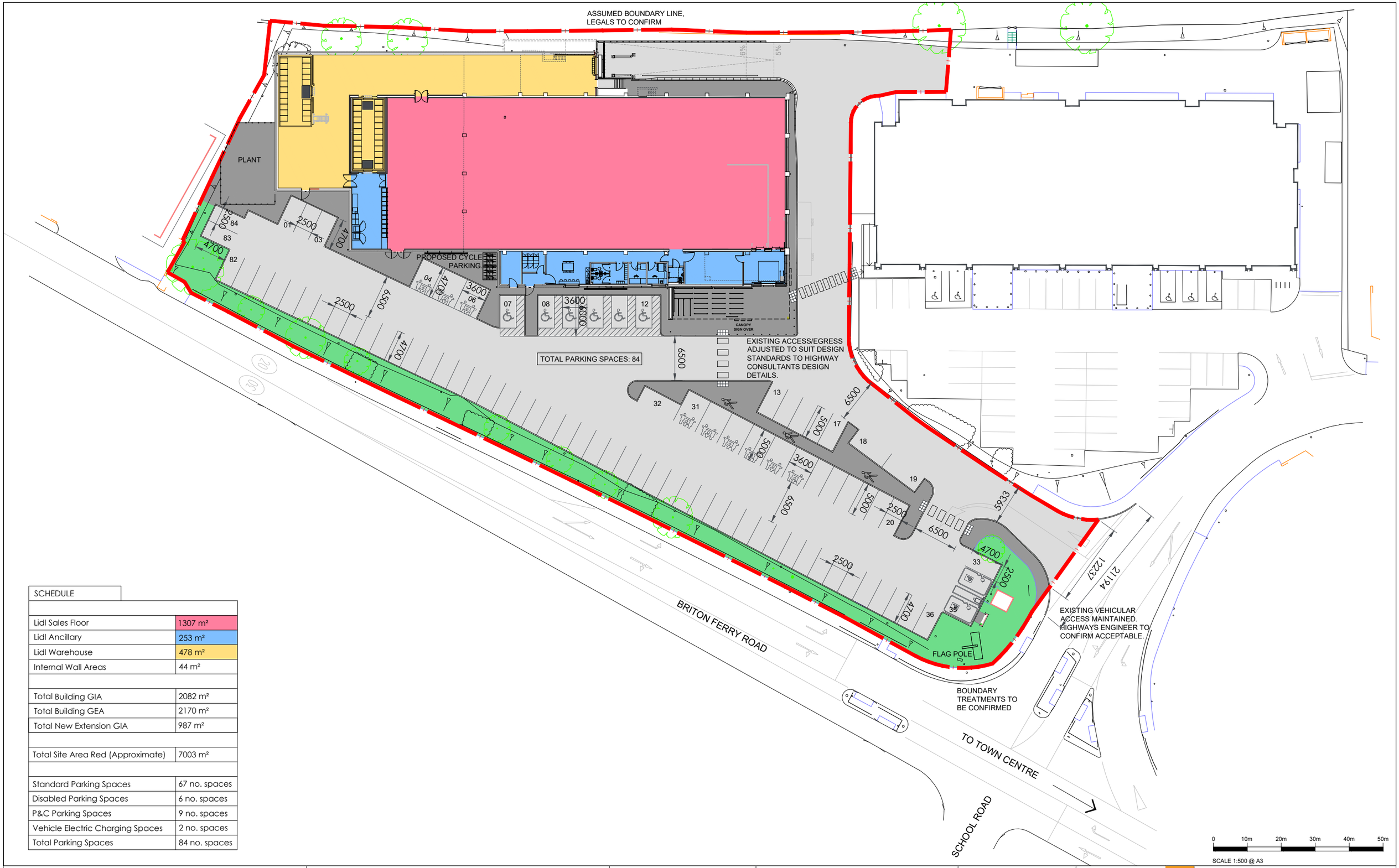
Project Title
Briton Ferry Road, Neath

Drawing Title
Figure 2: Exploratory Hole Location Plan

Client
Lidl Great Britain Ltd

Scale	Drawn	Size
as shown	PD	A4
Date	Job No.	Drawing /Rev No
28.07.20	769.02	01

Remada



SCHEDULE	
Lidl Sales Floor	1307 m²
Lidl Ancillary	253 m²
Lidl Warehouse	478 m²
Internal Wall Areas	44 m²
Total Building GIA	2082 m²
Total Building GEA	2170 m²
Total New Extension GIA	987 m²
Total Site Area Red (Approximate)	7003 m²
Standard Parking Spaces	67 no. spaces
Disabled Parking Spaces	6 no. spaces
P&C Parking Spaces	9 no. spaces
Vehicle Electric Charging Spaces	2 no. spaces
Total Parking Spaces	84 no. spaces

RIBA Chartered Practice · CIAT Registered Practice · RICS

IMPORTANT INFORMATION
Dimensions to be confirmed on site prior to start of works and ODAS to be informed of discrepancies immediately. No dimensions to be scaled from this drawing.
All materials and works are to be carried out in accordance with current British Standards, Euro Codes, Planning Approval, current Building Regulations and Codes of Practice as appropriate.
Party Wall Act - Notices under the Party Wall Act are to be served by the property owner or appointed third party by property owner.
Health and Safety - CDM 2015 Regulations apply to all construction works to be carried out and apply to designers, contractors and the client. As such all parties have duties under these regulations.

Notes

Rev	Date	Description	Revised By	Checked By
A	20.08.2020	CAR PARK AMENDED	OGH	DGH

Revisions

Client:
LIDL GREAT BRITAIN LTD.
WATERTON INDUSTRIAL ESTATE,
BRIDGEND, CF31 3PH

Project Name:
BRITON FERRY_NEATH

Drawing Title:
PROPOSED SITE PLAN

Drawing Status: PLANNING

Project No: 19230
Drawing No: AD110 Rev A
Drawn By: OGH
Checked By: DGH
Date: JAN 2020
Scale @ A3: 1:500
Scale @ A1: 1:250

ARCHITECTURE

ONE DESIGN ARCHITECTURAL SERVICES
One Design Architectural Services Ltd
Unit 1 Merchants Quay,
Phase II, Ashley Lane, Shipley,
West Yorkshire, BD17 7DB
Tel: 01274 591188
www.onedesignarchs.com
mail@onedesignarchs.com
Registered in England & Wales No: 8355643

EXPLORATORY HOLE LOGS

Remada

Remada Ltd
Forward House
B95 5AA

BOREHOLE LOG

Project				BOREHOLE No
Briton Ferry Road, Neath SA11 1AS				**BH1**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
769.02	23-07-20	6.73	E 274,606.0 N 196,412.0	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water	STRATA					
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Geology	Instrument/ Backfill
				6.63		0.10	MADE GROUND: Asphalt.		
0.30	D			6.33		0.40	MADE GROUND: Brownish grey gravelly fine to medium sand. Gravel is angular to subangular of mudstone and quartz.		
0.50	D					(1.00)	MADE GROUND: Dark grey mottled brown gravelly ashy fine to medium sand. Gravel is angular to subangular fine to coarse of mixed lithologies including rare wood fragments, brick, slag and coal.		
				5.33		1.40			
1.40	D					(0.40)	MADE GROUND: Concrete fragments.		
				4.93		1.80			

Boring Progress and Water Observations						Chiselling			Water Added	
Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To

GENERAL REMARKS

Terminated within concrete at 1.8m bgl; unable to progress despite chiselling.

Backfilled with arisings.

Position relocated 6m to south-east (see corresponding log for BH1-B)

All dimensions in metres Scale 1:43.75	Client Lidl Great Britain Ltd	Method/ Plant Used Dando 2000	Logged By PD

Report ID: AGS4 UK BH || Project: 769.02 LIDL NEATH.GPJ || Library: GINT STD AGS 4_0.GLB || Date: 26 July 2020

Remada

Remada Ltd
Forward House
B95 5AA

BOREHOLE LOG

Project				BOREHOLE No
Briton Ferry Road, Neath SA11 1AS				**BH1-B**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
769.02	23-07-20	6.75	E 274,612.0 N 196,412.0	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water				STRATA		
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Geology	Instrument/ Backfill
0.00-0.10	ES			6.65		0.10	MADE GROUND: Asphalt.		
0.10-0.40	B						MADE GROUND: Brownish grey gravelly fine to medium sand. Gravel is angular to subangular of mudstone and quartz.		
0.30	D			6.35		0.40			
0.50	D						MADE GROUND: Medium dense dark grey mottled brown gravelly ashy fine to medium sand. Gravel is angular to subangular fine to coarse of mixed lithologies including rare wood fragments, brick, slag and coal.		
1.00	D								
1.50		N14				(2.20)			
				4.15		2.60			
2.60	D						Firm brown mottled grey slightly sandy to sandy CLAY with slight organic odour.		
3.00-3.45	U					(0.85)			
				3.30		3.45			
3.50	D						Dense brownish grey slightly clayey slightly sandy subangular to rounded fine to coarse GRAVEL of mudstone and shale.		
						(1.05)			
				2.25		4.50			
				2.05		4.70	Dark grey mottled reddish brown MUDSTONE/SHALE, recovered as dense sandy angular to subangular fine to coarse GRAVEL.		
4.70		N50/ 21 mm							

Boring Progress and Water Observations						Chiselling			Water Added	
Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To

GENERAL REMARKS

Chiselling required to progress below 4.5m bgl.

Installation to 4.7m bgl; 1.0m plain pipe, 3.7m slotted pipe.

All dimensions in metres Scale 1:43.75	Client Lidl Great Britain Ltd	Method/ Plant Used Dando 2000	Logged By PD

Report ID: AGS4 UK BH || Project: 769.02 LIDL NEATH.GPJ || Library: GINT STD AGS 4_0.GLB || Date: 26 July 2020

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Remada Ltd
Forward House
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BOREHOLE LOG

Project				BOREHOLE No
Briton Ferry Road, Neath SA11 1AS				**BH2**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
769.02	23-07-20	7.01	E 274,626.0 N 196,420.0	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water	STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION			
				6.91		0.10	MADE GROUND: Asphalt.			
0.30	D			6.61		0.40	MADE GROUND: Brownish grey gravelly fine to medium sand. Gravel is angular to subangular of mudstone and quartz.			
0.50	D						MADE GROUND: Medium dense dark grey mottled brown gravelly ashy fine to medium sand. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, slag and coal.			
1.50		N17				(2.60)				
				4.01		3.00				
3.00-3.45 3.00	B	N8				(1.00)	Soft to firm grey mottled dark grey silty CLAY.			
				3.01		4.00				
4.50 4.50	D	N50/ 227 mm				(1.30)	Dense becoming very dense dark grey slightly sandy angular to subangular fine to coarse GRAVEL of mudstone and shale.			
				1.71		5.30				
5.30 5.30	D	N50/ 151 mm								

Boring Progress and Water Observations						Chiselling			Water Added	
Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To

GENERAL REMARKS

Chiselling required to progress between 5.2m and 5.3m bgl (1 hour).

Installation to 5.3m bgl; 1.0m plain pipe, 4.3m slotted pipe.

All dimensions in metres Scale 1:43.75	Client Lidl Great Britain Ltd	Method/ Plant Used Dando 2000	Logged By PD

Report ID: AGS4 UK BH || Project: 769.02 LIDL NEATH.GPJ || Library: GINT STD AGS 4_0.GLB || Date: 26 July 2020

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BOREHOLE LOG

Project				BOREHOLE No
Briton Ferry Road, Neath SA11 1AS				**BH3**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
769.02	23-07-20	7.20	E 274,648.0 N 196,443.0	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water				STRATA		
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Geology	Instrument/ Backfill
				7.10		0.10	MADE GROUND: Asphalt.		
0.20	D			6.80		0.40	MADE GROUND: Brownish grey gravelly fine to medium sand. Gravel is angular to subangular of mudstone and quartz.		
0.40	D					(0.80)	MADE GROUND: Dark grey mottled brown gravelly ashy fine to medium sand. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, slag and coal.		
				6.00		1.20			

Boring Progress and Water Observations						Chiselling			Water Added	
Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To

GENERAL REMARKS

Terminated within concrete at 1.2m bgl; unable to progress despite chiselling.

Backfilled with arisings.

Position relocated 6m to south-west (see corresponding log for BH3-B)

All dimensions in metres Scale 1:43.75	Client Lidl Great Britain Ltd	Method/ Plant Used Dando 2000	Logged By PD

Report ID: AGS4 UK BH || Project: 769.02 LIDL NEATH.GPJ || Library: GINT STD AGS 4_0.GLB || Date: 26 July 2020

Remada

Remada Ltd
Forward House
B95 5AA

BOREHOLE LOG

Project				BOREHOLE No
Briton Ferry Road, Neath SA11 1AS				**BH3-B**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
769.02	23-07-20 24-07-20	7.20	E 274,643.0 N 196,434.0	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water				STRATA		
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Geology	Instrument/ Backfill
				7.10		0.10	MADE GROUND: Asphalt.		
0.20	D			6.80		0.40	MADE GROUND: Brownish grey gravelly fine to medium sand. Gravel is angular to subangular of mudstone and quartz.		
0.50	D					(0.80)	MADE GROUND: Medium dense dark grey mottled brown gravelly ashy fine to medium sand. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, slag and coal.		
				6.00		1.20			
1.20		N9					MADE GROUND: Concrete fragments.		
				5.70		1.50			
2.00		N25				(1.50)	MADE GROUND: Medium dense dark grey mottled brown gravelly ashy fine to medium sand. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, slag and coal.		
				4.20		3.00			
3.00-3.45	U						Soft to firm greyish brown silty CLAY.		
4.00		N10				(2.50)			
5.00-5.45	U								
				1.70		5.50			
						(0.50)	Dense becoming very dense dark grey slightly sandy angular to subangular fine to coarse GRAVEL of mudstone and shale.		
				1.20		6.00			
6.00		N50/ 140 mm							

Boring Progress and Water Observations						Chiselling			Water Added	
Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To

GENERAL REMARKS

Chiselling required to progress below 5.5m bgl.

Installation to 6.0m bgl; 1.0m plain pipe, 5.0m slotted pipe.

All dimensions in metres Scale 1:43.75	Client Lidl Great Britain Ltd	Method/ Plant Used Dando 2000	Logged By PD

Report ID: AGS4 UK BH || Project: 769.02 LIDL NEATH.GPJ || Library: GINT STD AGS 4_0.GLB || Date: 26 July 2020

Trial Pit Log

Project Name: BRITON FERRY ROAD	Client: Lidl Great Britain Ltd	Date: 23/07/2020
Location: Neath	Contractor:	Co-ords: E274614.00 N196434.00
Project No. : 769.02	Crew Name:	Equipment: Hand digging tools.

Location Number	Location Type	Level	Logged By	Scale	Page Number
HDTP1	IP	7.42m AoD	PD	1:13	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.05	7.42		MADE GROUND: Concrete paving slab.
					0.10	7.37		MADE GROUND Light brown fine sand.
								MADE GROUND: Dark grey gravelly sand with low cobble content and rare boulders. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, shale and rare clinker. Cobbles and boulders are angular of brick.
					0.36	7.32		MADE GROUND: Dark grey gravelly ashy fine to coarse sand. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, shale and rare clinker fragments.
		0.50 - 0.70	ES					
					1.30	7.06		End of Borehole at 1.300m

1

2

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
0.60	0.60	Sides stable.	No shoring required.				

Remarks

1. Hand excavated inspection pit to expose foundations to 1.3m bgl.
2. No groundwater encountered.
3. Backfilled with arisings upon completion.

Trial Pit Log

Project Name: BRITON FERRY ROAD	Client: Lidl Great Britain Ltd	Date: 23/07/2020
Location: Neath	Contractor:	Co-ords: E274626.00 N196429.00
Project No. : 769.02	Crew Name:	Equipment: Hand digging tools.

Location Number	Location Type	Level	Logged By	Scale	Page Number
HDTP2	IP	7.42m AoD	PD	1:13	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
					0.05	7.42		MADE GROUND: Concrete paving slab.	
					0.08	7.37		MADE GROUND: Light brown medium sand.	
					0.13	7.34		MADE GROUND: Dark grey gravelly fine to medium sand. Gravel is angular to subangular fine to coarse of mixed lithologies including brick and coal fragments.	
		0.75 - 0.85	ES					MADE GROUND: Light brown slightly gravelly coarse sand with moderate cobble content. Gravel is angular to subangular fine to coarse predominantly of coarse-grained sandstone. Cobbles are angular of sandstone.	1
					1.20	7.29		End of Borehole at 1.200m	2

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
0.60	0.60	Sides stable.	No shoring required.				

Remarks

1. Hand excavated inspection pit to expose foundations to 1.2m bgl.
2. No groundwater encountered.
3. Backfilled with arisings upon completion.

Trial Pit Log

Project Name: BRITON FERRY ROAD	Client: Lidl Great Britain Ltd	Date: 23/07/2022
Location: Neath	Contractor:	Co-ords: E274641.00 N196436.00
Project No. : 769.02	Crew Name:	Equipment: Hand digging tools.

Location Number	Location Type	Level	Logged By	Scale	Page Number
HDTP3	IP	7.44m AoD	PD	1:13	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.05	7.44		MADE GROUND: Concrete paving slab.
					0.08	7.39		MADE GROUND: Light brown medium sand.
								MADE GROUND: Dark grey gravelly ashy medium to coarse sand. Gravel is angular to subangular fine to coarse of mixed lithologies including clinker, coal and brick.
					0.29	7.36		MADE GROUND: Light grey gravelly fine to medium sand. Gravel is angular to subangular medium of limestone and quartzite.
		0.40 - 0.80	B		0.37	7.15		MADE GROUND: Dark grey gravelly ashy medium to coarse sand. Gravel is angular to subangular fine to coarse of mixed lithologies including clinker, coal and brick fragments.
		0.60 - 0.70	ES					
					1.20	7.07		End of Borehole at 1.200m

1

2

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
0.60	0.60	Sides stable.	No shoring required.				

Remarks

1. Hand excavated inspection pit to expose foundations to 1.2m bgl.
2. No groundwater encountered.
3. Backfilled with arisings upon completion.

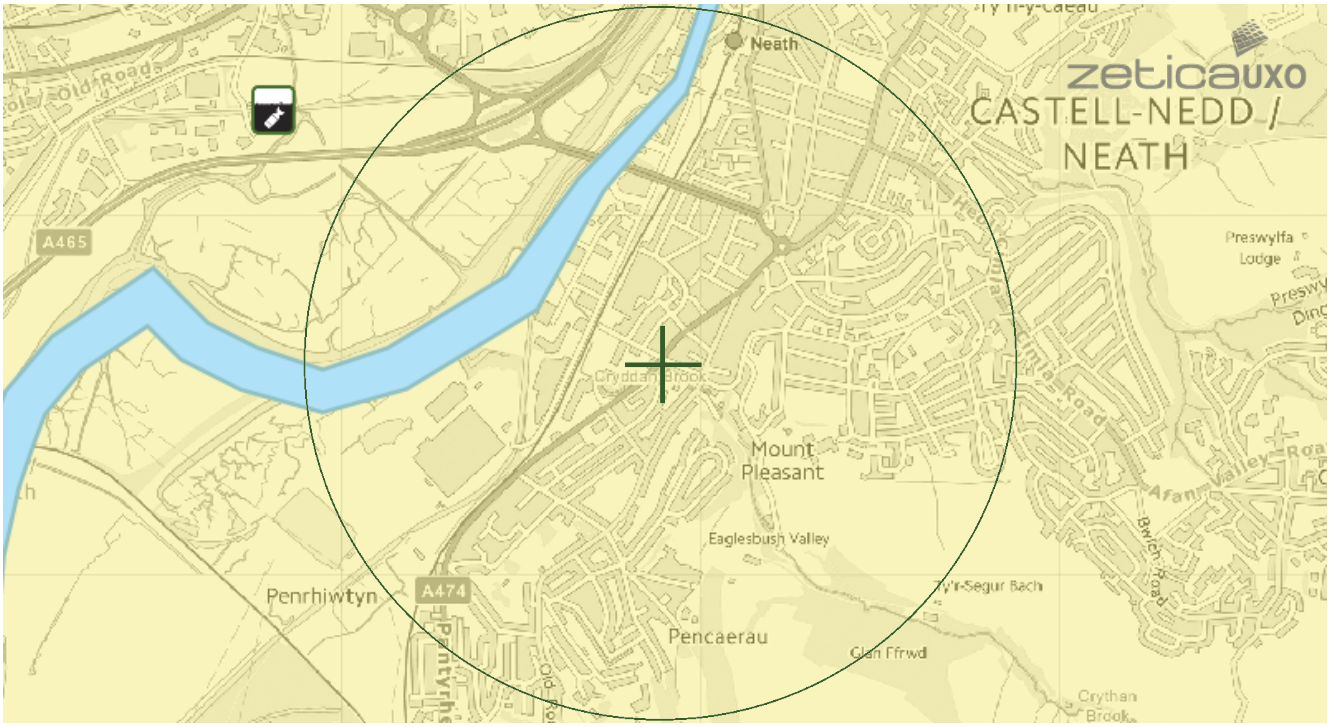
APPENDIX A
Zetica UXO Risk Mapping

UNEXPLODED BOMB RISK MAP

zeticauxo

SITE LOCATION

Location: SA11 1AS,
Map Centre: 274902,196587



LEGEND

- **High:** Areas indicated as having a bombing density of 50 bombs per 1000acre or higher.
- **Moderate:** Areas indicated as having a bombing density of 15 to 49 bombs per 1000acre.
- **Low:** Areas indicated as having 15 bombs per 1000acre or less.

miltary | **industry** | **UXO find**
transport | **dock** | **Luftwaffe targets**
utilities | **Bombing decoy** | **other**

How to use your Unexploded Bomb (UXB) risk map?

The map indicates the potential for Unexploded Bombs (UXB) to be present as a result of World War Two (WWII) bombing.

You can incorporate the map into your preliminary risk assessment* for potential Unexploded Ordnance (UXO) for a site. Using this map, you can make an informed decision as to whether more in-depth detailed risk assessment* is necessary.

What do I do if my site is in a moderate or high risk area?

Generally, we recommend that a detailed UXO desk study and risk assessment is undertaken for sites in a moderate or high UXB risk area.

Similarly, if your site is near to a designated Luftwaffe target or bombing decoy then additional detailed research is recommended.

More often than not, this further detailed research will conclude that the potential for a significant UXO hazard to be present on your site is actually low.

Never plan site work or undertake a risk assessment using these maps alone. More detail is required, particularly where there may be a source of UXO from other military operations which are not reflected on these maps.

If my site is in a low risk area, do I need to do anything?

If both the map and other research confirms that there is a low potential for UXO to be present on your site then, subject to your own comfort and risk tolerance, works can proceed with no special precautions.

A low risk really means that there is no greater probability of encountering UXO than anywhere else in the UK.

If you are unsure whether other sources of UXO may be present, you can ask for one of our **pre-desk study assessments (PDSA)**

If I have any questions, who do I contact?

tel: **+44 (0) 1993 886682**

email: **uxo@zetica.com**

web: **www.zeticauxo.com**

The information in this UXB risk map is derived from a number of sources and should be used in conjunction with the accompanying notes on our website: **(https://zeticauxo.com/downloads-and-resources/risk-maps/)**

Zetica cannot guarantee the accuracy or completeness of the information or data used and cannot accept any liability for any use of the maps. These maps can be used as part of a technical report or similar publication, subject to acknowledgment. The copyright remains with Zetica Ltd.

It is important to note that this map is not a UXO risk assessment and should not be reported as such when reproduced.

*Preliminary and detailed UXO risk assessments are advocated as good practice by industry guidance such as CIRIA C681 'Unexploded Ordnance (UXO), a guide for the construction industry'.

APPENDIX B
SPT Hammer Energy Test Report

James Fisher
Testing Services

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

James Fisher Testing Services
Ruby House
40a Hardwick Grange
Woolton
Warrington
WA1 4RF

SPT Hammer Ref:	R33
Test Date:	13/09/2019
Report Date:	16/09/2019
File Name:	R33.spt
Test Operator:	OT

Instrumented Rod Data

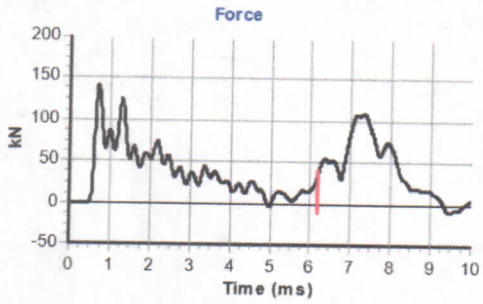
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.5
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	8965
Accelerometer No.2:	11949

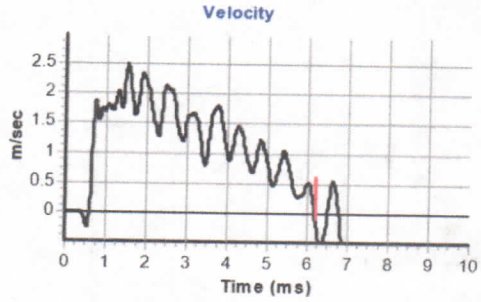
SPT Hammer Information

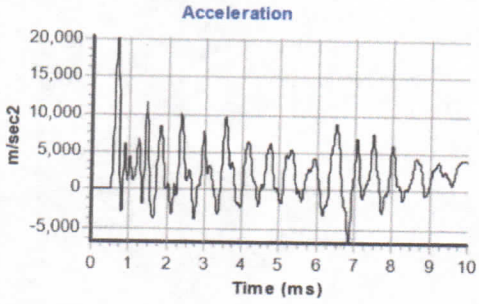
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	14.5

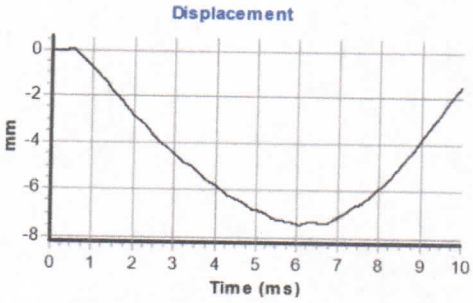
Comments / Location

Client: Vincent Camron Drilling
Location: JFTS Laboratory
Hammer Type: Trip Hammer









Calculations

Area of Rod A (mm2):	970
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	411

Energy Ratio E_r (%): 87

Signed: Oliver Turpin
Title: Team Leader

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APPENDIX C
Laboratory Chemical Analyses

Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	20-19735-1		
Initial Date of Issue:	04-Aug-2020		
Client	Remada Ltd		
Client Address:	Forward House 17 High Street Henley in Arden B95 5AA		
Contact(s):	Peter Dickinson Greg Jones		
Project	769.02 Briton Ferry Road, Neath		
Quotation No.:		**Date Received:**	29-Jul-2020
Order No.:	769.02	**Date Instructed:**	29-Jul-2020
No. of Samples:	4		
Turnaround (Wkdays):	5	**Results Due:**	04-Aug-2020
Date Approved:	04-Aug-2020		

Approved By:

Details: Glynn Harvey, Technical Manager

Results - Miscellaneous Solid

Project: 769.02 Briton Ferry Road, Neath

Client: Remada Ltd			**Chemtest Job No.:**		20-19735
Quotation No.:			**Chemtest Sample ID.:**		1040115
			Client Sample ID.:		4
			Sample Location:		BH1-B
			Sample Type:		MISCSOLID
			Top Depth (m):		0.00
			Bottom Depth (m):		0.10
			Date Sampled:		23-Jul-2020
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Naphthalene	N	2700	mg/kg	0.10	< 0.10
Acenaphthylene	N	2700	mg/kg	0.10	< 0.10
Acenaphthene	N	2700	mg/kg	0.10	< 0.10
Fluorene	N	2700	mg/kg	0.10	< 0.10
Phenanthrene	N	2700	mg/kg	0.10	< 0.10
Anthracene	N	2700	mg/kg	0.10	< 0.10
Fluoranthene	N	2700	mg/kg	0.10	< 0.10
Pyrene	N	2700	mg/kg	0.10	< 0.10
Benzo[a]anthracene	N	2700	mg/kg	0.10	< 0.10
Chrysene	N	2700	mg/kg	0.10	< 0.10
Benzo[b]fluoranthene	N	2700	mg/kg	0.10	< 0.10
Benzo[k]fluoranthene	N	2700	mg/kg	0.10	< 0.10
Benzo[a]pyrene	N	2700	mg/kg	0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	N	2700	mg/kg	0.10	< 0.10
Dibenz(a,h)Anthracene	N	2700	mg/kg	0.10	< 0.10
Benzo[g,h,i]perylene	N	2700	mg/kg	0.10	< 0.10
Coronene	N	2700	mg/kg	0.10	< 0.10
Total Of 17 PAH's	N	2700	mg/kg	2.0	< 2.0
Moisture	N		%	0.10	< 0.10

Results - Soil

Project: 769.02 Briton Ferry Road, Neath

Client: Remada Ltd				**Chemtest Job No.:**	20-19735	20-19735	20-19735
Quotation No.:				**Chemtest Sample ID.:**	1040112	1040113	1040114
				Client Sample ID.:	1	2	3
				Sample Location:	HDTP1	HDTP2	HDTP3
				Sample Type:	SOIL	SOIL	SOIL
				Top Depth (m):	0.50	0.75	0.60
				Bottom Depth (m):		0.85	0.70
				Date Sampled:	23-Jul-2020	23-Jul-2020	23-Jul-2020
				Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A	-	-	Cement, Fibres/Clumps
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	Chrysotile
ACM Detection Stage	U	2192		N/A	-	-	Stereo Microscopy
Asbestos by Gravimetry	U	2192	%	0.001			0.005
Total Asbestos	N	2192	%	0.001			0.005
Moisture	N	2030	%	0.020	9.0	7.6	8.9
Soil Colour	N	2040		N/A	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Sand	Sand	Sand
Chromatogram (TPH)	N			N/A	See Attached	See Attached	See Attached
pH	M	2010		4.0	9.8	9.7	9.4
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	0.83	1.2	0.66
Magnesium (Water Soluble)	N	2120	g/l	0.010	< 0.010	< 0.010	< 0.010
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.16	0.64	0.042
Total Sulphur	M	2175	%	0.010	0.28	0.10	0.11
Chloride (Water Soluble)	M	2220	g/l	0.010	0.020	0.011	0.023
Nitrate (Water Soluble)	N	2220	g/l	0.010	< 0.010	< 0.010	< 0.010
Ammonium (Water Soluble)	M	2120	g/l	0.01	< 0.01	< 0.01	< 0.01
Sulphate (Acid Soluble)	M	2430	%	0.010	0.15	0.28	0.092
Arsenic	M	2450	mg/kg	1.0	35	21	36
Beryllium	U	2450	mg/kg	1.0	2.0	< 1.0	< 1.0
Cadmium	M	2450	mg/kg	0.10	0.66	< 0.10	1.2
Copper	M	2450	mg/kg	0.50	99	7.7	130
Mercury	M	2450	mg/kg	0.10	0.72	< 0.10	12
Nickel	M	2450	mg/kg	0.50	30	9.8	41
Lead	M	2450	mg/kg	0.50	350	17	230
Selenium	M	2450	mg/kg	0.20	0.43	< 0.20	0.55
Vanadium	U	2450	mg/kg	5.0	160	28	58
Zinc	M	2450	mg/kg	0.50	350	30	690
Chromium (Trivalent)	N	2490	mg/kg	1.0	240	20	160
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Fraction of Organic Carbon	M	2625		0.0010	0.059	0.0030	0.050
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0

Results - Soil

Project: 769.02 Briton Ferry Road, Neath

Client: Remada Ltd			**Chemtest Job No.:**		20-19735	20-19735	20-19735
Quotation No.:			**Chemtest Sample ID.:**		1040112	1040113	1040114
			Client Sample ID.:		1	2	3
			Sample Location:		HDTP1	HDTP2	HDTP3
			Sample Type:		SOIL	SOIL	SOIL
			Top Depth (m):		0.50	0.75	0.60
			Bottom Depth (m):			0.85	0.70
			Date Sampled:		23-Jul-2020	23-Jul-2020	23-Jul-2020
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	7.2	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	7.2	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	8.4	16	8.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	430	150	120
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	440	170	120
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	450	170	120
Naphthalene	M	2700	mg/kg	0.10	0.77	0.30	0.58
Acenaphthylene	M	2700	mg/kg	0.10	1.1	0.14	0.25
Acenaphthene	M	2700	mg/kg	0.10	1.2	0.48	1.1
Fluorene	M	2700	mg/kg	0.10	1.2	0.49	1.2
Phenanthrene	M	2700	mg/kg	0.10	7.0	5.8	11
Anthracene	M	2700	mg/kg	0.10	2.5	2.0	2.9
Fluoranthene	M	2700	mg/kg	0.10	14	15	20
Pyrene	M	2700	mg/kg	0.10	14	16	21
Benzo[a]anthracene	M	2700	mg/kg	0.10	11	8.3	12
Chrysene	M	2700	mg/kg	0.10	12	8.2	11
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	20	9.4	15
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	6.6	3.5	5.4
Benzo[a]pyrene	M	2700	mg/kg	0.10	14	7.8	11
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	11	4.5	6.5
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	4.2	1.2	2.0
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	12	4.3	5.5
Total Of 16 PAH's	M	2700	mg/kg	2.0	130	87	130
Benzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Toluene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0

Results - Soil

Project: 769.02 Briton Ferry Road, Neath

Client: Remada Ltd			**Chemtest Job No.:**		20-19735	20-19735	20-19735
Quotation No.:			**Chemtest Sample ID.:**		1040112	1040113	1040114
			Client Sample ID.:		1	2	3
			Sample Location:		HDTP1	HDTP2	HDTP3
			Sample Type:		SOIL	SOIL	SOIL
			Top Depth (m):		0.50	0.75	0.60
			Bottom Depth (m):			0.85	0.70
			Date Sampled:		23-Jul-2020	23-Jul-2020	23-Jul-2020
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
m & p-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
o-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30

TPH Chromatogram on Soil Sample: 1040112

<Sample Information>

Sample Name : 1040112 20-19735
Data Filename : 31 July 2020_31072020_1040112 20-19735_058.gcd
Method Filename : TPH 12m Fast OSv2.gcm
Sample # : 104
Date Acquired : 31/07/2020 22:42:04
Date Processed : 31/07/2020

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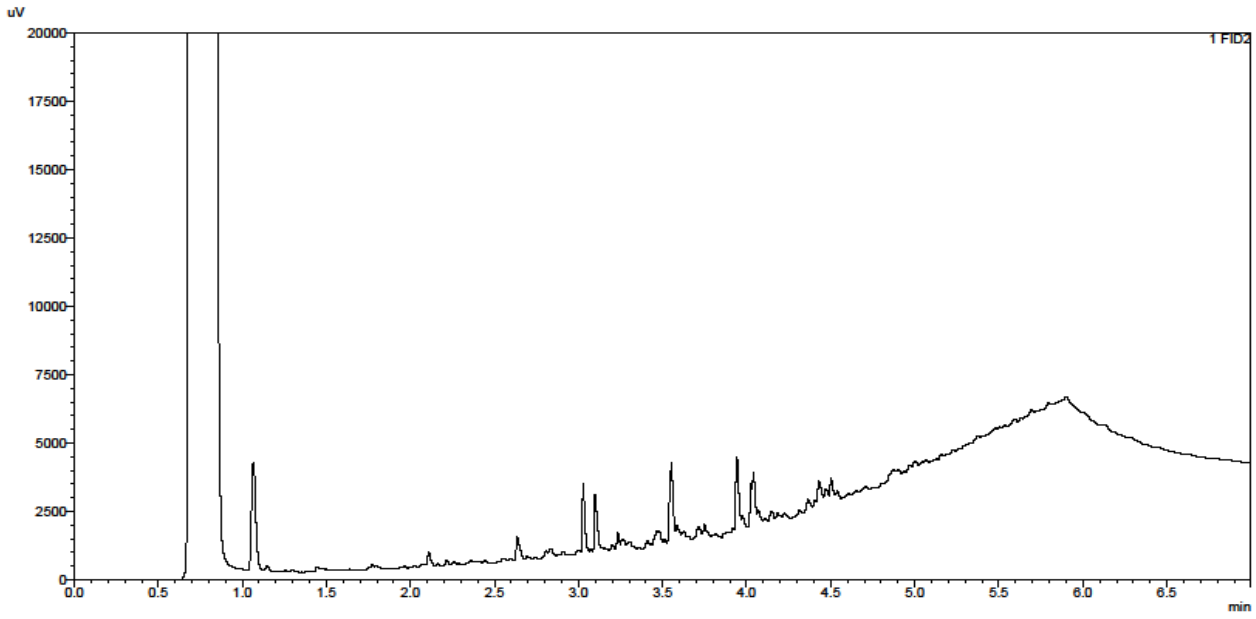

TPH Chromatogram on Soil Sample: 1040113

<Sample Information>

Sample Name : 1040113 20-19735
Data Filename : 31 July 2020_31072020_1040113 20-19735_060.gcd
Method Filename : TPH 12m Fast OSv2.gcm
Sample # : 105
Date Acquired : 31/07/2020 22:54:57
Date Processed : 31/07/2020

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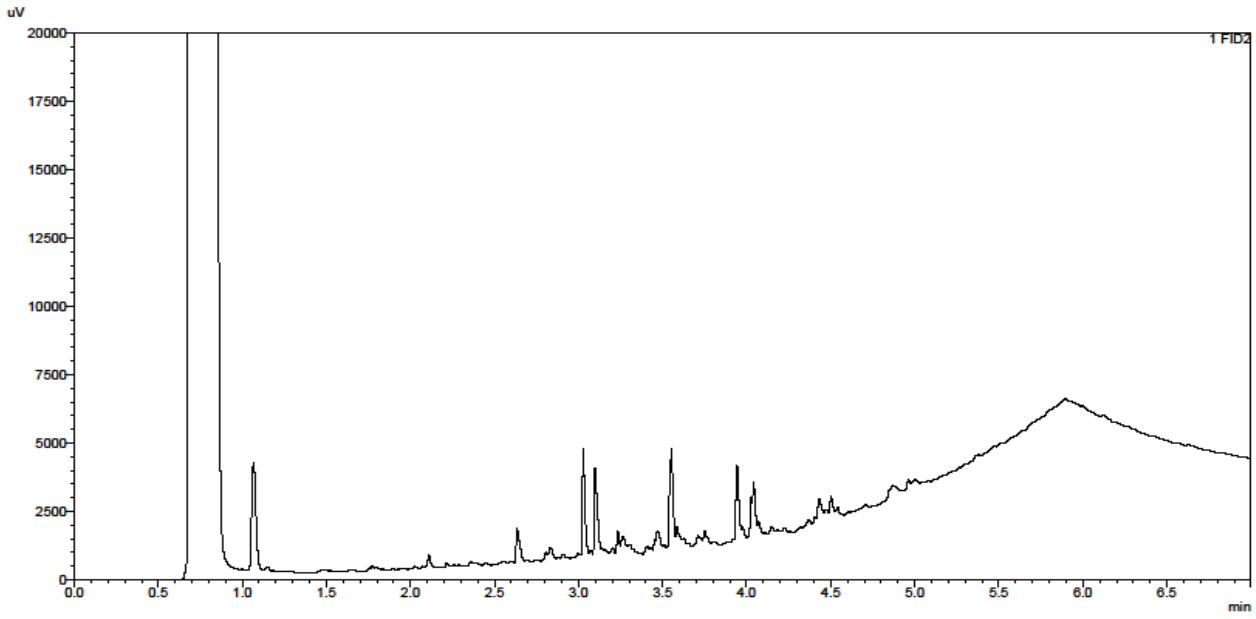

TPH Chromatogram on Soil Sample: 1040114

<Sample Information>

Sample Name : 1040114 20-19735
Data Filename : 31 July 2020_31072020_1040114 20-19735_062.gcd
Method Filename : TPH 12m Fast OSv2.gcm
Sample # : 106
Date Acquired : 31/07/2020 23:07:57
Date Processed : 31/07/2020

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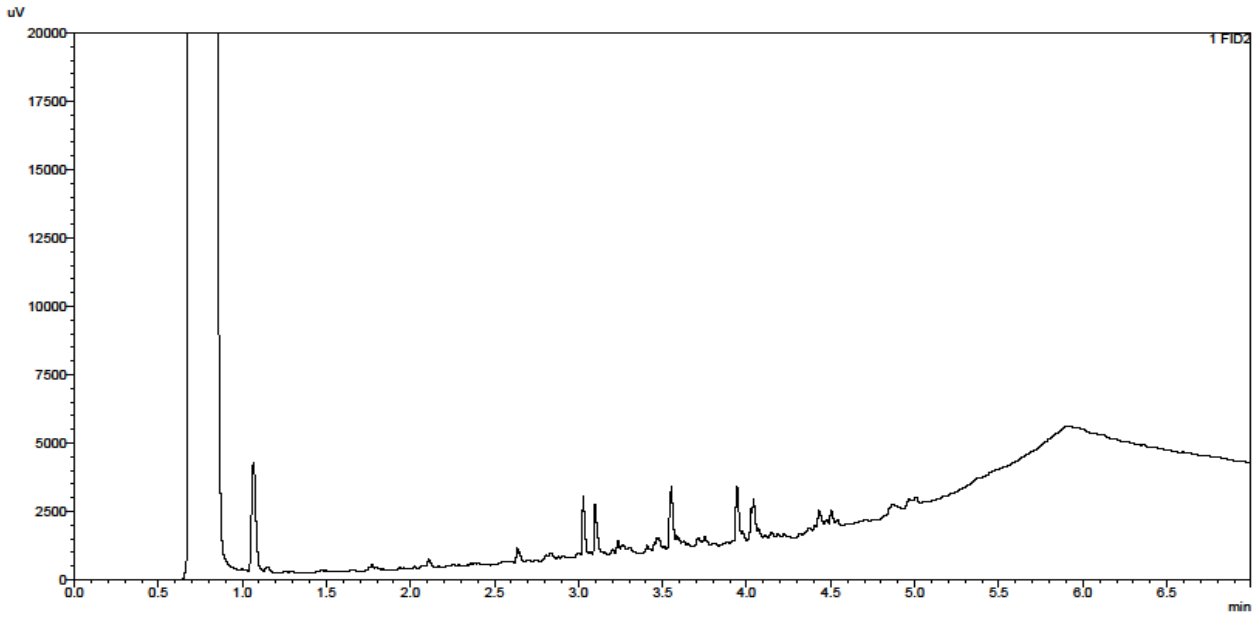

Test Methods

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 measuremernt 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; Dibenz[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

Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

2183

Final Report

Report No.:	22-11218-1		
Initial Date of Issue:	29-Mar-2022		
Client	Remada Ltd		
Client Address:	Forward House 17 High Street Henley in Arden B95 5AA		
Contact(s):	Dom Williams Greg Jones Peter Dickinson Callum Whitehead		
Project	769.02 Briton Ferry Road, Neath		
Quotation No.:		**Date Received:**	24-Mar-2022
Order No.:	769.02	**Date Instructed:**	24-Mar-2022
No. of Samples:	3		
Turnaround (Wkdays):	5	**Results Due:**	30-Mar-2022
Date Approved:	29-Mar-2022		
Approved By:			
Details:	Stuart Henderson, Technical Manager		

Results - Water

Project: 769.02 Briton Ferry Road, Neath

Client: Remada Ltd				**Chemtest Job No.:**	22-11218	22-11218	22-11218
Quotation No.:				**Chemtest Sample ID.:**	1398215	1398216	1398217
				Sample Location:	WS1B	WS2	WS4
				Sample Type:	WATER	WATER	WATER
				Date Sampled:	21-Mar-2022	21-Mar-2022	21-Mar-2022
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
pH	U	1010		N/A	7.6	7.7	7.7
Arsenic (Dissolved)	U	1455	µg/l	0.20	18	1.4	1.2
Boron (Dissolved)	U	1455	µg/l	10.0	150	150	79
Beryllium (Dissolved)	U	1455	µg/l	1.00	< 1.0	< 1.0	< 1.0
Cadmium (Dissolved)	U	1455	µg/l	0.11	< 0.11	< 0.11	< 0.11
Copper (Dissolved)	U	1455	µg/l	0.50	< 0.50	1.1	4.6
Mercury (Dissolved)	U	1455	µg/l	0.05	< 0.05	< 0.05	< 0.05
Nickel (Dissolved)	U	1455	µg/l	0.50	< 0.50	3.2	1.9
Lead (Dissolved)	U	1455	µg/l	0.50	< 0.50	< 0.50	< 0.50
Selenium (Dissolved)	U	1455	µg/l	0.50	< 0.50	0.61	< 0.50
Vanadium (Dissolved)	U	1455	µg/l	0.50	< 0.50	< 0.50	1.1
Zinc (Dissolved)	U	1455	µg/l	2.5	12	12	37
Chromium (Trivalent)	N	1490	µg/l	20	< 20	< 20	< 20
Chromium (Hexavalent)	U	1490	µg/l	20	< 20	< 20	< 20
Dissolved Organic Carbon	U	1610	mg/l	2.0	90	94	41
Aliphatic TPH >C5-C6	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C6-C8	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C8-C10	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C10-C12	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C12-C16	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C16-C21	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C21-C35	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C35-C44	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Total Aliphatic Hydrocarbons	N	1675	µg/l	5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C7-C8	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C8-C10	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C10-C12	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C12-C16	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C16-C21	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C21-C35	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C35-C44	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Total Aromatic Hydrocarbons	N	1675	µg/l	5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	1675	µg/l	10	< 10	< 10	< 10
Naphthalene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Fluorene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Anthracene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10

Results - Water

Project: 769.02 Briton Ferry Road, Neath

Client: Remada Ltd				**Chemtest Job No.:**	22-11218	22-11218	22-11218
Quotation No.:				**Chemtest Sample ID.:**	1398215	1398216	1398217
				Sample Location:	WS1B	WS2	WS4
				Sample Type:	WATER	WATER	WATER
				Date Sampled:	21-Mar-2022	21-Mar-2022	21-Mar-2022
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Pyrene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Chrysene	N	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	N	1700	µg/l	2.0	< 2.0	< 2.0	< 2.0
Phenol	U	1920	mg/l	0.0050	< 0.0050	< 0.0050	< 0.0050

Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1490	Hexavalent Chromium in Waters	Chromium [VI]	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1675	TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG)	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	Pentane extraction / GCxGC FID detection
1700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[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)
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) 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"
SOP	Standard operating procedure
LOD	Limit of detection

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 30 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 D
Laboratory Geotechnical Analyses

Laboratory Report

2788

GEO Site & Testing Services Ltd

Contract Number: 49475

Client Ref: **769.02**
Client PO: **769.02**

Report Date: **18-08-2020**

Client **Remada Limited**
Forward house, 17 high street, Henley in Arden
B95 5AA

Contract Title: **Briton Ferry Road, Neath**
For the attention of: **Peter Dickinson**

Date Received: **28-07-2020**
Date Completed: **18-08-2020**

Test Description	Qty
Moisture Content BS 1377:1990 - Part 2 : 3.2 - * UKAS	4
4 Point Liquid & Plastic Limit BS 1377:1990 - Part 2 : 4.3 & 5.3 - * UKAS	4
PSD Wet Sieve method BS 1377:1990 - Part 2 : 9.2 - * UKAS	3
BRE Reduced Suite **includes pH, water & acid soluble sulphate and total sulphur** BRE - BR279 - @ Non Accredited Test	3
Quick Undrained Triaxial Compression test - set of 3 - 38mm diameter specimens BS 1377:1990 - Part 7 : 8 - * UKAS	3
Disposal of samples for job	1

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
*** - denotes test included in laboratory scope of accreditation**
 # - denotes test carried out by approved contractor
@ - denotes non accredited tests

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 except in full, without the prior written approval of the laboratory.

Approved Signatories:
Emma Sharp (Office Manager) - Paul Evans (Quality/Technical Manager) - Richard John (Advanced Testing Manager)
Sean Penn (Administrative/Accounts Assistant) - Shaun Jones (Laboratory manager) - Wayne Honey (Administrative/Quality Assistant)

GEO Site & Testing Services Ltd
Unit 3-4, Heol Aur, Dafen Ind Estate, Dafen, Llanelli, Carmarthenshire SA14 8QN
Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk

GSTL	NATURAL MOISTURE, LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX (BS 1377 : Part 2 : 1990 Method 5)	
Contract Number	49475	
Site Name	Briton Ferry Road, Neath	
Date Tested	17/08/2020	
	DESCRIPTIONS	

Sample/Hole Reference	Sample Number	Sample Type	Depth (m)			Descriptions
BH1-B		U100	3.00	-	3.45	Brown fine gravelly sandy silty CLAY
BH3-B		U100	3.00	-	3.45	Brown silty CLAY
BH3-B		U100	5.00	-	5.45	Brown silty CLAY
BH2		B	3.00	-	3.45	Blackish grey fine to medium gravelly silty CLAY
				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		
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				-		
				-		
				-		

Operators	Checked	18/08/2020	Wayne Honey (Administrative/Quality Assistant)
** Please Select Operator **	Approved	18/08/2020	Paul Evans (Quality/Technical Manager)

UKAS TESTING 2788

GSTL	NATURAL MOISTURE, LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX (BS 1377 : Part 2 : 1990 Method 5)	
Contract Number	49475	
Project Location	Briton Ferry Road, Neath	
Date Tested	17/08/2020	

Sample/Hole Reference	Sample Number	Sample Type	Depth (m)			Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity index %	Passing 0.425mm %	Remarks
BH1-B		U100	3.00	-	3.45	20	55	18	37	81	CH High Plasticity
BH3-B		U100	3.00	-	3.45	47	62	23	39	100	CH High Plasticity
BH3-B		U100	5.00	-	5.45	34	65	30	35	100	CH High Plasticity
BH2		B	3.00	-	3.45	45	66	31	35	82	CH High Plasticity
				-							
				-							
				-							
				-							
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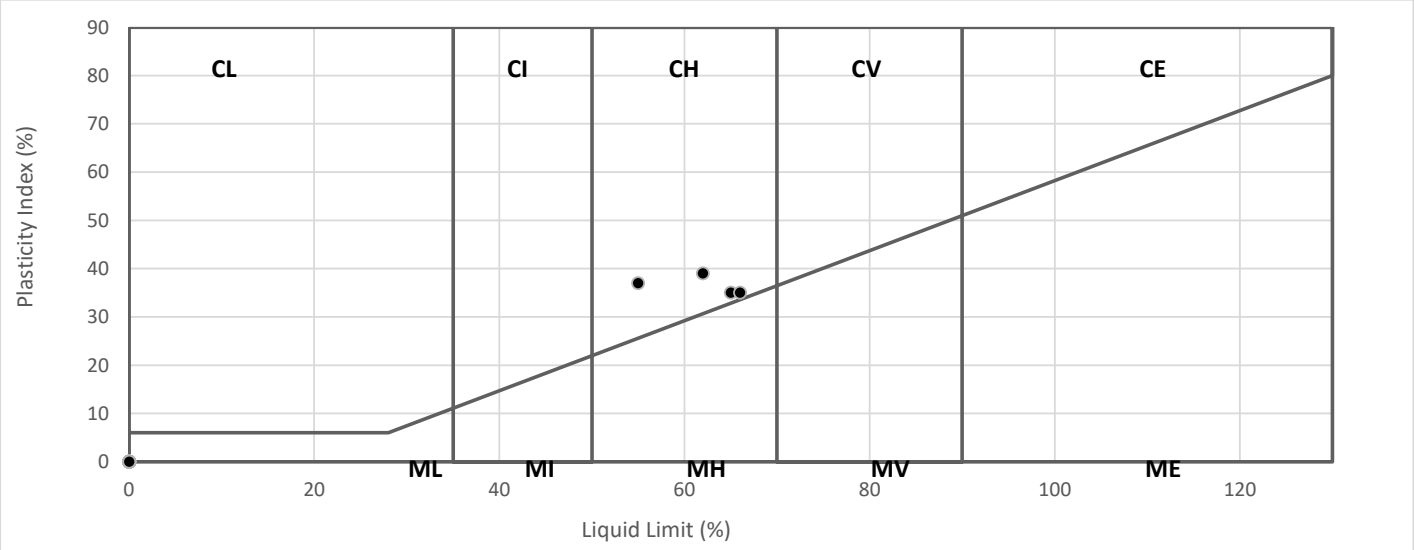
Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

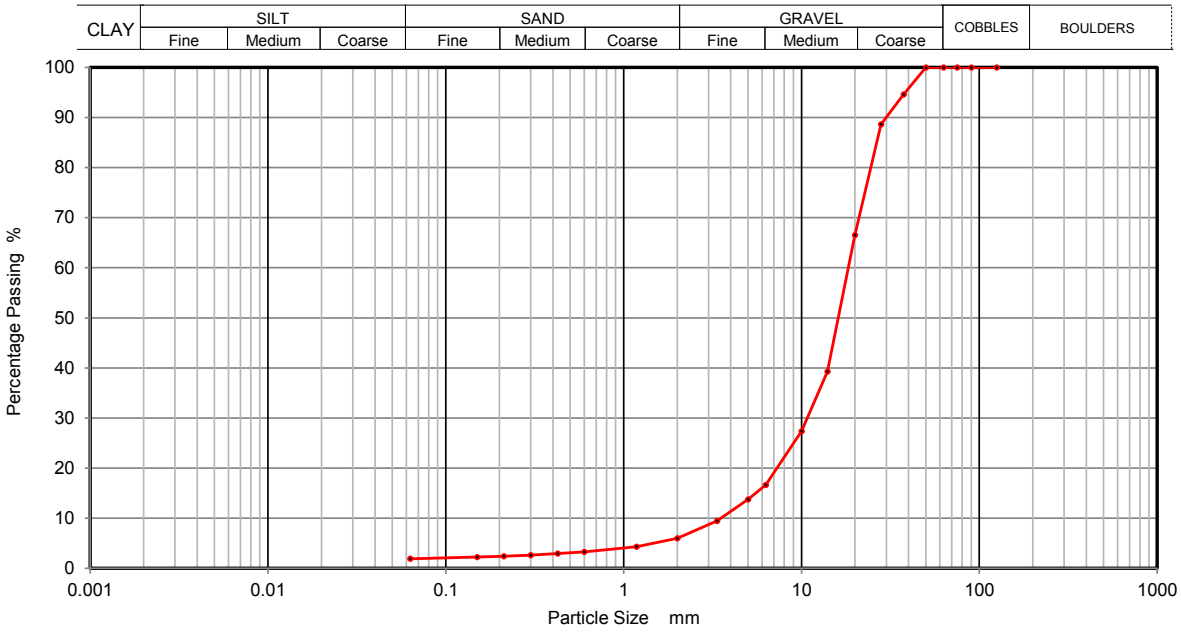
PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION
BS 5930:1999+A2:2010



Operators	Checked	18/08/2020	Wayne Honey (Administrative/Quality Assistant)
** Please Select Operator **	Approved	18/08/2020	Paul Evans (Quality/Technical Manager)

UKAS TESTING 2788

GSTL	PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve, Clause 9.2	Contract Number	49475
		Borehole/Pit No.	BHB-B
Site Name	Briton Ferry Road, Neath	Sample No.	
Soil Description	Grey slightly clayey/silty slightly fine to coarse sandy fine to coarse GRAVEL	Depth Top	0.10
		Depth Base	0.40
Date Tested	13/08/2020	Sample Type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	95		
28	89		
20	67		
14	39		
10	27		
6.3	17		
5	14		
3.35	9		
2	6		
1.18	4		
0.6	3		
0.425	3		
0.3	3		
0.212	2		
0.15	2		
0.063	2		

Sample Proportions	% dry mass
Cobbles	0
Gravel	94
Sand	4
Silt and Clay	2

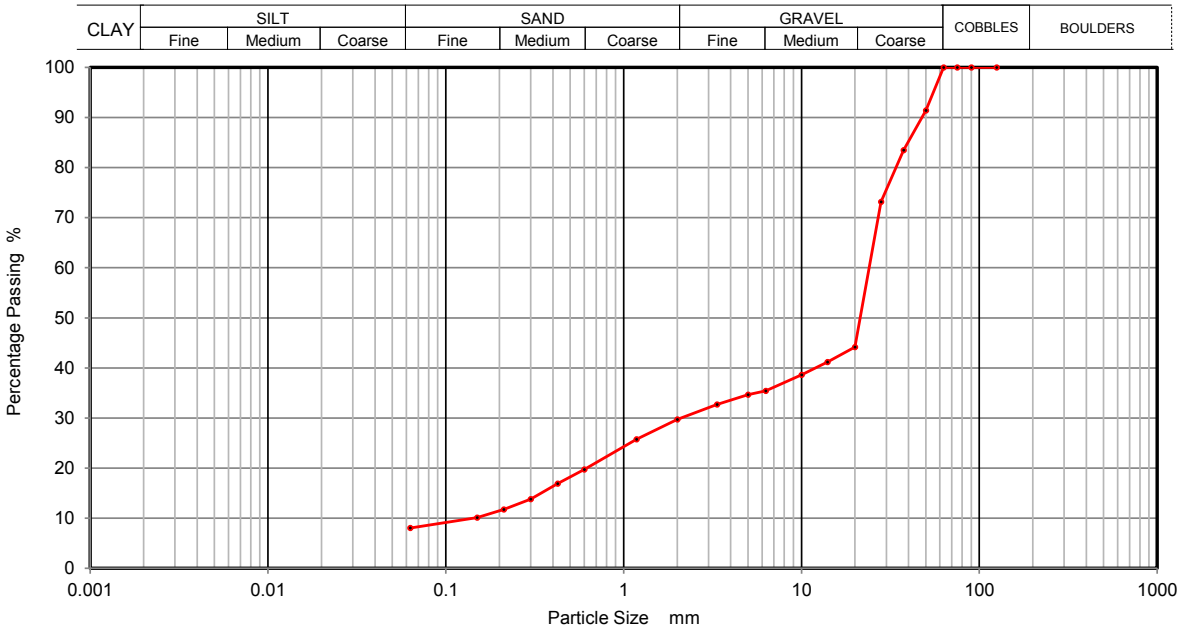
Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	17/08/2020	Wayne Honey	W. Honey
RO/MH	Approved	18/08/2020	Paul Evans	D P Evans

UKAS TESTING 2788

GSTL	PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve, Clause 9.2	Contract Number	49475
		Borehole/Pit No.	BH3-B
Site Name	Briton Ferry Road, Neath	Sample No.	
Soil Description	Grey slightly clayey/silty fine to coarse sandy fine to coarse GRAVEL	Depth Top	5.50
		Depth Base	5.80
Date Tested	13/08/2020	Sample Type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	91		
37.5	83		
28	73		
20	44		
14	41		
10	39		
6.3	35		
5	35		
3.35	33		
2	30		
1.18	26		
0.6	20		
0.425	17		
0.3	14		
0.212	12		
0.15	10		
0.063	8		

Sample Proportions	% dry mass
Cobbles	0
Gravel	70
Sand	22
Silt and Clay	8

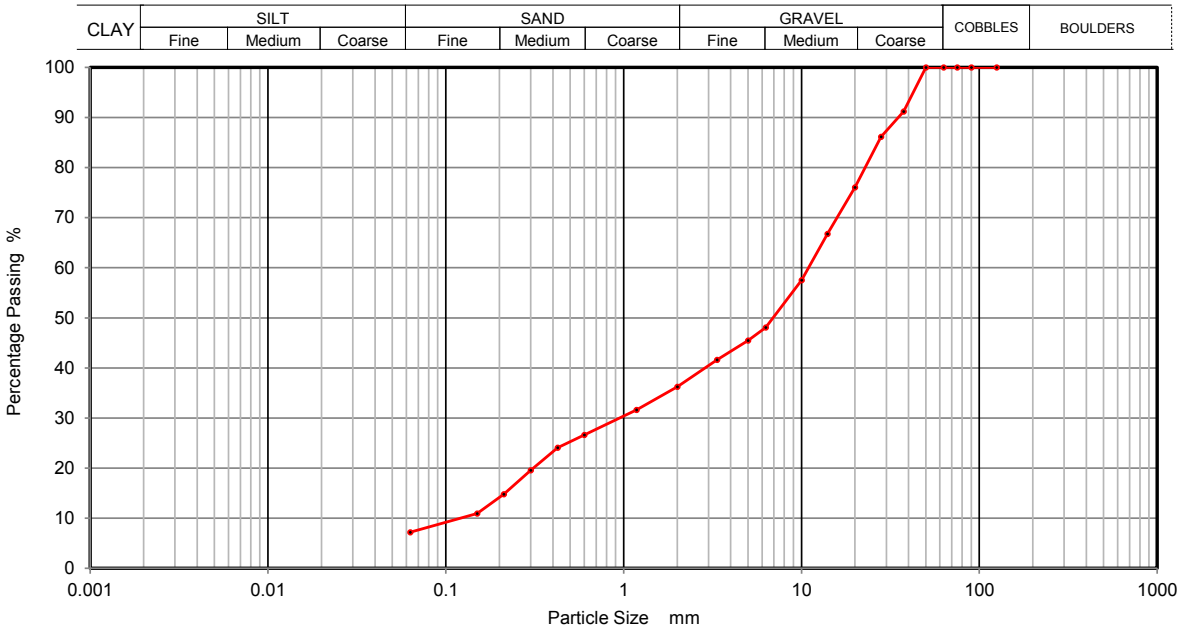
Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	17/08/2020	Wayne Honey	W. Honey
RO/MH	Approved	18/08/2020	Paul Evans	D P Evans

UKAS TESTING 2788

GSTL	PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve, Clause 9.2	Contract Number	49475
		Borehole/Pit No.	HDTP3
Site Name	Briton Ferry Road, Neath	Sample No.	
Soil Description	Dark brown slightly clayey/silty fine to coarse sandy fine to coarse GRAVEL	Depth Top	0.40
		Depth Base	0.80
Date Tested	13/08/2020	Sample Type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	91		
28	86		
20	76		
14	67		
10	58		
6.3	48		
5	45		
3.35	42		
2	36		
1.18	32		
0.6	27		
0.425	24		
0.3	20		
0.212	15		
0.15	11		
0.063	7		

Sample Proportions	% dry mass
Cobbles	0
Gravel	64
Sand	29
Silt and Clay	7

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	17/08/2020	Wayne Honey	W. Honey
RO/MH	Approved	18/08/2020	Paul Evans	D P Evans

UKAS TESTING 2788

GSTL	Certificate of Chemical Analysis (BRE BR 279)	Contract Number	49475
		Client Reference	769-02
Client	Remada	**Date Received**	
Site Name	Briton Ferry Road, Neath	**Date Started**	06/08/2020
		Date Completed	18/08/2020
		No. of Samples	3

Hole Number	Sample Number	Sample Type	Depth (m)			Acid Soluble Sulphate	Aqueous Extract Sulphate	Chloride Content	Ph Value	Total Sulphur	Magnesium	Nitrate
BH2		B	3.00	-	3.45	0.25	0.04		7.49	0.10		
BH3-B		B	5.50	-	5.80	0.27	0.04		7.86	0.11		
HDTP03		B	0.40	-	0.80	0.21	0.03		7.32	0.09		
				-								
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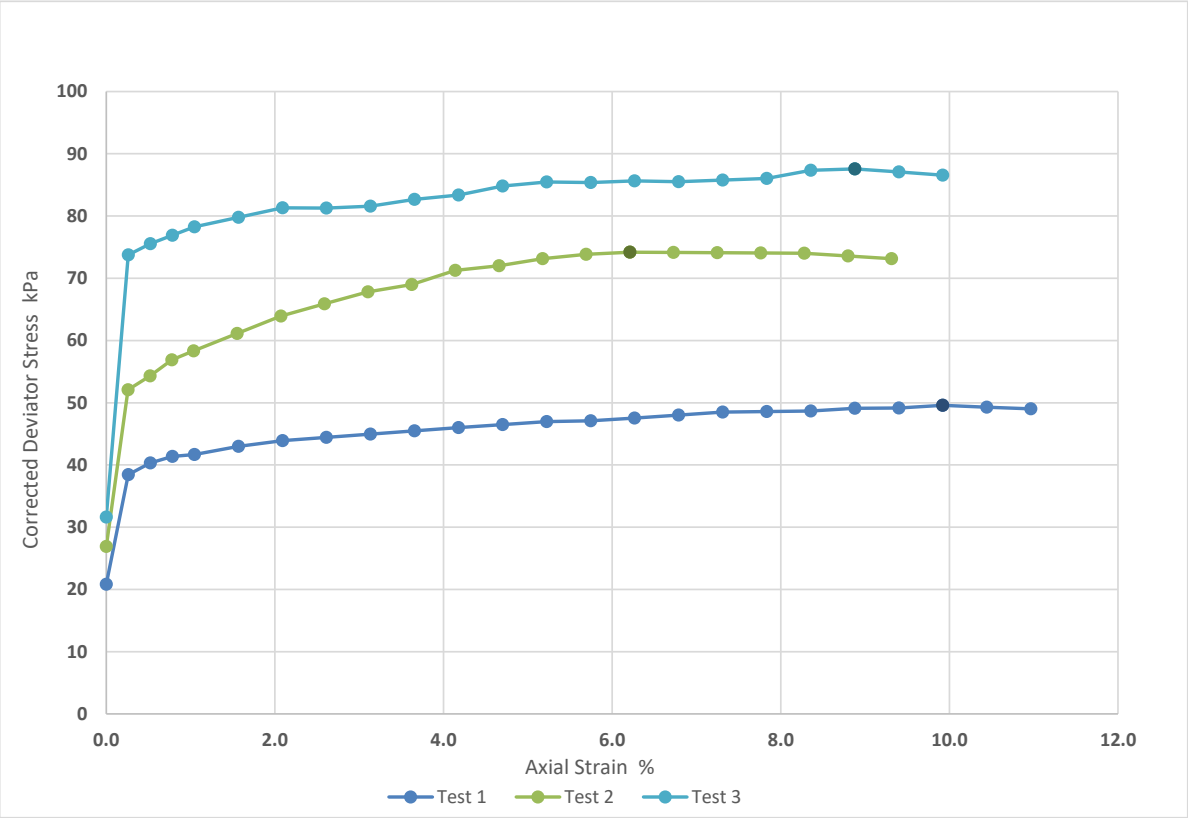
Key	Reported As
Acid Soluble Sulphate	% SO_4
Aqueous Extract Sulphate	g/l SO_4
Chloride Content (Semi)	mg Cl/l
PH Value	@ 25°
Total Sulphur	% S
Magnesium	g/l SO_4
Nitrate	NO_3 mg/l

Remarks

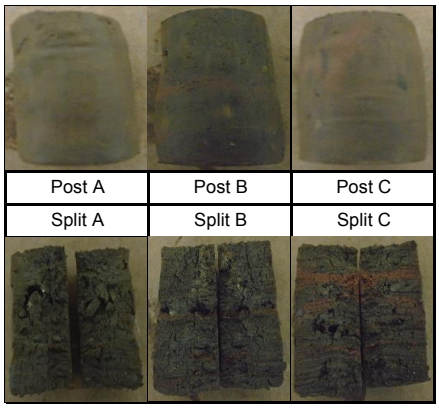
NCP = No Chloride Present

Test Operator	Checked and Authorised by		Paul Evans	D P Evans
Darren Bourne	Date	18/08/2020		

GSTL	Undrained Shear Strength in Triaxial Compression BS1377 : Part7 : Clause 8 : 1991 Set of Three 38 mm without the measurement of Pore Pressure	Contract Number	49475
		Borehole/Pit No.	BH1-B
Site Name	Briton Ferry Road, Neath	Sample No.	
Soil Description	Brown fine gravelly sandy silty CLAY	Depth Top	3.00
		Depth Base	3.45
Date Tested	12/08/2020	Sample Type	U100



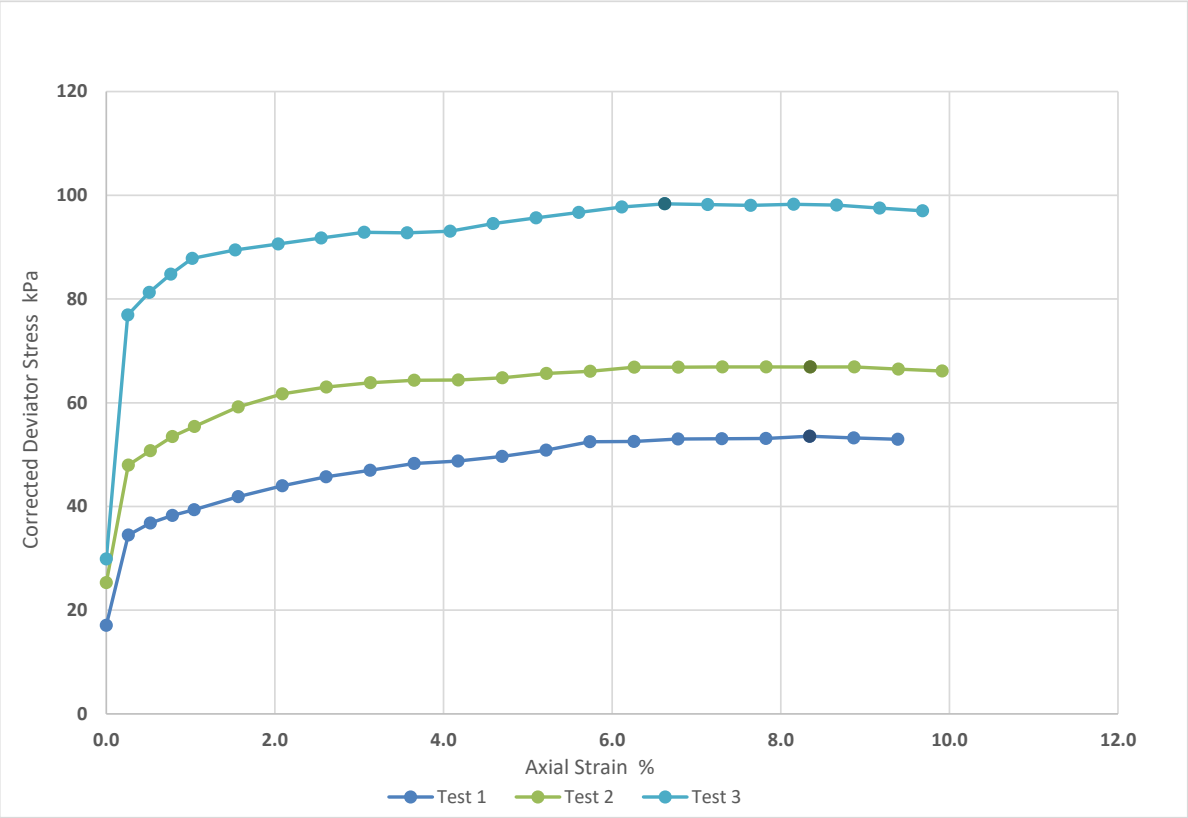
	Specimen 1	Specimen 2	Specimen 3
Moisture Content (%)	20	20	20
Bulk Density (Mg/m^3)	1.90	1.82	1.89
Dry Density (Mg/m^3)	1.58	1.52	1.58
Specimen Length (mm)	77	77	77
Specimen Diamteter (mm)	39	38	38
Cell Pressures (kPa)	60	120	240
Deviator Stress (kPa)	50	74	88
Undrained Shear Strength (kPa)	25	37	44
Failure Strain (%)	9.9	6.2	8.9
Mode Of Failure	Plastic	Plastic	Plastic
Membrane Used/Thickness	Rubber/0.3mm	Rubber/0.3mm	Rubber/0.3mm
Rate of Strain (%/min)	1.96	1.94	1.96



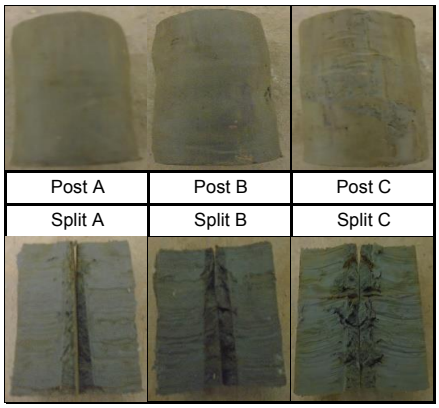
Checked	17/08/2020	Emma Sharp	
Approved	18/08/2020	Paul Evans	

UKAS TESTING 2788

GSTL	Undrained Shear Strength in Triaxial Compression BS1377 : Part7 : Clause 8 : 1991 Set of Three 38 mm without the measurement of Pore Pressure	Contract Number	49475
		Borehole/Pit No.	BH3-B
Site Name	Briton Ferry Road, Neath	Sample No.	
Soil Description	Brown silty CLAY	Depth Top	3.00
		Depth Base	3.45
Date Tested	12/08/2020	Sample Type	U100



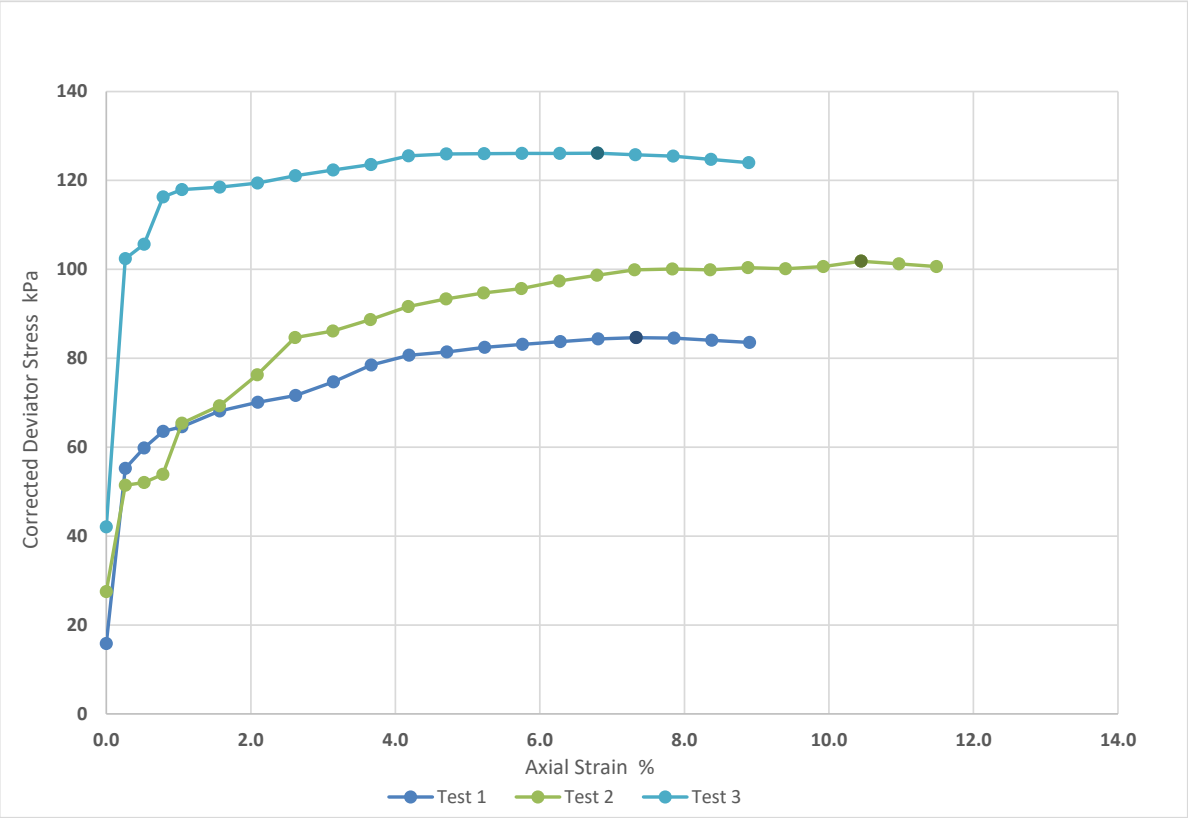
	Specimen 1	Specimen 2	Specimen 3
Moisture Content (%)	47	47	47
Bulk Density (Mg/m^3)	1.62	1.69	1.76
Dry Density (Mg/m^3)	1.10	1.15	1.20
Specimen Length (mm)	77	77	79
Specimen Diamteter (mm)	38	38	38
Cell Pressures (kPa)	60	120	240
Deviator Stress (kPa)	54	67	98
Undrained Shear Strength (kPa)	27	33	49
Failure Strain (%)	8.3	8.3	6.6
Mode Of Failure	Plastic	Plastic	Plastic
Membrane Used/Thickness	Rubber/0.3mm	Rubber/0.3mm	Rubber/0.3mm
Rate of Strain (%/min)	1.96	1.96	1.91



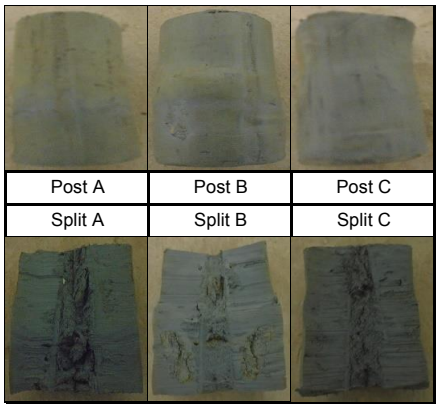
Checked	17/08/2020	Emma Sharp	
Approved	18/08/2020	Paul Evans	

UKAS TESTING 2788

GSTL	Undrained Shear Strength in Triaxial Compression BS1377 : Part7 : Clause 8 : 1991 Set of Three 38 mm without the measurement of Pore Pressure	Contract Number	49475
		Borehole/Pit No.	BH3-B
Site Name	Briton Ferry Road, Neath	Sample No.	
Soil Description	Brown silty CLAY	Depth Top	5.00
		Depth Base	5.45
Date Tested	12/08/2020	Sample Type	U100



	Specimen 1	Specimen 2	Specimen 3
Moisture Content (%)	33	33	33
Bulk Density (Mg/m^3)	1.79	1.81	1.85
Dry Density (Mg/m^3)	1.35	1.36	1.40
Specimen Length (mm)	76	77	77
Specimen Diamteter (mm)	38	39	39
Cell Pressures (kPa)	100	200	400
Deviator Stress (kPa)	85	102	126
Undrained Shear Strength (kPa)	42	51	63
Failure Strain (%)	7.3	10	6.8
Mode Of Failure	Plastic	Plastic	Plastic
Membrane Used/Thickness	Rubber/0.3mm	Rubber/0.3mm	Rubber/0.3mm
Rate of Strain (%/min)	1.96	1.96	1.96



Checked	17/08/2020	Emma Sharp	
Approved	18/08/2020	Paul Evans	

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