

Geo-Environmental Investigation & Assessment

For a site referred to as

Huyton Industrial Trade Park, Huyton

Undertaken on behalf of

Derwent Holdings Limited

Report Title:	Huyton Industrial Trade Park Geo-environmental Investigation and Assessment
Report Reference:	9333G-WML-XX-ZZ RP-G-0002B
Client:	Derwent Holdings Limited
Issue Date:	7th July 2022
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Revision Status / History

Rev	Date	Issue / Purpose / Comment	Prepared	Checked	Authorised
-	07/07/2022	First Issue	TJS	TPB	SCS
A	11/02/2022	Amended site plan	-	TPB	-
B	09/09/2022	Rev E Development Plan	-	-	SCS

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Executive Summary

Site Location	The site comprises land forming part of the broader Huyton Industrial Trade Park, situated adjacent to Wilson Road, Huyton, Merseyside. It is centred on approximate Ordnance Survey National Grid Reference 345347E, 390124N with an indicative postcode of L36 6JG.
Development Proposals	It is understood that the currently proposed development will comprise the demolition of existing structures (two industrial buildings) and the construction of two new steel framed industrial units and associated area of hard standing / car parking.
Ground Conditions	Ground conditions encountered during the intrusive investigations comprised made ground to depths of between 0.30m and 1.20mbgl. This was generally underlain by Glacial Till extending to depths of between 2.00m and 2.70mbgl below which strata of the Pennine Lower Coal Measures extended to a maximum proven depth of 3.45mbgl.
Site Preparation	Demolition of existing structures should not proceed until an appropriate Asbestos survey of the existing building has been undertaken and any Asbestos Containing Materials (ACM) removed by an appropriately licensed contractor. Historical/existing foundations, ground floor slabs and other buried concrete/brick obstructions associated with former structures will need to be broken out to suitable depths below formation levels where they are to impinge on the proposed buildings. Prior to construction, the status of all recorded services at the site will need to be established and it cannot be discounted that some may need to be diverted. Due to the age of the electricity substation, it is advised that discussions be held with the statutory service provider regarding the status of the facility and particularly whether any equipment potentially containing Polychlorinated Biphenyls (PCB's) has been appropriately de-commissioned.
Foundations and Floor Slabs	New structures could be supported by traditional spread foundations constructed on firm Glacial Till, at a depth of at least 1.00mbgl, although these should be designed on a net allowable bearing pressure not exceeding 75kN/m². Alternatively, foundations could be extended to the underlying Pennine Lower Coal Measures strata, locally encountered at depths as shallow as 0.30mbgl but more generally anticipated at depths of between 2.00m and 2.70mbgl, where a net allowable bearing pressure of 150kN/m² is anticipated. However, Unit A could instead be constructed on a fully reinforced raft foundation, balanced against a possible reduction in the extent and cost of any required ground treatment works as outlined within 15.2.2 of C758D: 2019 'Abandoned Mine Workings Manual'. Assessment as to the cohesive strata heave or shrinkage potential should then be undertaken in consideration of a low volume change potential for the clay with foundations designed to appropriate depths where such effects are envisaged. New floor slabs would need to be suspended unless and in the case of Unit A may need to be sufficiently reinforced to withstand potential horizontal forces, unless a fully reinforced raft foundation is adopted. Alternatively ground bearing floor slabs could be suitable for the new structures where underlain by competent natural strata or areas underlain by granular fill which has been compacted to an appropriate specification.
Pavement Design	New road pavement design should be based on a California Bearing Ratio (CBR) value of no more than 3% in made ground and natural cohesive deposits.
Groundwater and Excavations	Excavations at the site will be feasible using conventional hydraulic plant, although hydraulic breakers will be required for buried structures and where excavations extend into the underlying bedrock. Conventional 'sump and pump' dewatering measures are likely to be adequate to keep excavations dry.
Drainage	Soakaways are not considered to be a suitable drainage option for the site.
Concrete Classification	Assuming that the shallow coal will have been excavated and removed beneath the building footprint, typical design sulphate (DS) class and "Aggressive Chemical Environment for Concrete" (ACEC) class for the site are DS-1 and AC-1s respectively.

Further Coal Mining Investigations	Due to the anticipated position of the mine shaft referenced 345390-009, in the south-eastern section of the site, investigations to determine its location and extend of remediation will need to be undertaken. However, these can only be undertaken once the existing gas governor and electricity substation have been decommissioned and access from the southern section of Wilson Road, temporarily closed off, for the duration of the works. Based on the Coal Authority information, the potential for coal seams and/or abandoned mine workings to occur beneath the southern / south-eastern section of the site. Therefore, it is considered that rotary boreholes to depths of around 30.00m to 40.00mbgl will need to be undertaken beneath the proposed footprint of Unit A, once the existing structure located across the proposed footprint area, has been demolished. The above investigations would need to be undertaken under the relevant Coal Authority licence.
Ground Gas	As such it is considered that Unit B would classify as CS1 – ‘Very Low Risk’ with no specific gas protection measures required. However in accordance with BS8485:2015 Unit B would classify as Characteristic Situation (CS) 2 – ‘Low Gas Risk’, on the basis of the presence of consistently elevated concentrations of methane (above 1% v/v) and carbon dioxide (above 5% v/v). It is anticipated that these would include installation of gas protection measures sufficient to provide a Gas Protection Score of 3.5 as defined in BS8485:2015.
Ground Contamination	The long-term exposure risk to human health, based on the samples analysed, is therefore confirmed to be low with no specific remediation requirements. Notwithstanding the above, it would be prudent to undertake verification of soils beneath any removed UST's in the northern section of the development area and the electricity substation in the south-east once these features have been decommissioned and removed by a specialist contractor. The risk to controlled waters from the site is considered to be low, with no environmental remediation considered necessary.
Waste Soils	For guidance and based on the current information, it is likely that the majority of made ground would be classified as Non-Hazardous with natural deposits, classified as Inert for landfill disposal. It will be the responsibility of the waste producer to undertake testing and classification of any waste soils for disposal to an appropriately licenced landfill in accordance with current guidelines.

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1.0 INTRODUCTION

Appointment

- 1.1 WML Consulting has been commissioned by Derwent Holdings Limited to undertake a Geo-environmental Investigation and Assessment of the Huyton Industrial Trade Park site located off Wilson Road, Huyton, Merseyside.

Proposed Development

- 1.2 It is understood that the currently proposed development will comprise the construction of two single storey commercial / industrial structures, split into several smaller units, together with associated areas of car parking, roadway and pathways.
- 1.3 A drawing indicating the proposed layout is presented in Appendix 01.

Objective

- 1.4 The objective of the ground investigation and assessment was to provide geotechnical recommendations for construction design purposes together with a geo-environmental risk assessment in terms of possible ground contamination.
- 1.5 To achieve the objective, the following tasks were undertaken:
- From existing data, establish the geological, hydrogeological and environmental setting of the site to identify any potential ground constraints and to develop an initial site specific conceptual model.
 - Design a ground investigation so as to develop the conceptual ground model further.
 - Characterise the ground conditions in terms of geology, soil geotechnical parameters and ground contamination from information provided by the ground investigation.
 - Provide recommendations regarding suitable foundations, floor slabs and new pavement construction, together with any other geotechnical considerations that could affect possible future development.
 - Determine a ground conceptual model for the site so as to undertake a ground contamination Generic Quantitative Risk Assessment (GQRA).

Background

- 1.6 In support of the proposed redevelopment of the site, RoC Consulting Limited (RoC) have undertaken the following reports on behalf of Derwent Holdings Limited:
- RoC Consulting Limited, Phase 2 Site Investigation Report, September 2009, referenced AS/ROC/p2 2014E;
 - RoC Consulting Limited, Phase 2 Site Investigation Letter Report, November 2009, referenced AS/bl/201109.
- 1.7 Subsequently, a Phase 1 Desk Study for the site area has been undertaken by WML and is presented in the following report:
- Phase 1 Desk Study and Preliminary Geoenvironmental Assessment Report, Reference 9333G-WML-00-XX-RP-G-0001, dated 12th April 2022.
- 1.8 From a review of the above reports, it was concluded that further investigation was required to provide supplementary information on the ground conditions beneath the proposed development site.

Scope

- 1.9 This report presents the findings of the supplementary ground investigation designed on conclusions and recommendations within the Phase 1 Desk Study. For ease of reference, the findings of the Phase 1 Desk Study and previous RoC Phase 2 report are also summarised within this report although the three reports should be read in conjunction.
- 1.10 The ground investigation comprised the formation of window sample probeholes undertaken with reference to BS5930:2015 + A1:2020 Code of Practice for Ground Investigation and BS10175:2011 together with A1:2013, "Investigation of Potentially Contaminated Sites - Code of Practice" except where superseded by EN ISO 22475-1 "Geotechnical Investigation and Assessment – Sampling by Drilling and Excavation and Groundwater Measurements".
- 1.11 Geotechnical soil testing has been undertaken in general accordance with guidelines provided in BS1377:1990 – Parts 1-9, "Method of Test for Soils for Civil Engineering Purposes". Samples for chemical analysis were obtained and handled generally in accordance with the current guidelines, BS10175: 2011 and A2:2017.
- 1.12 The ground investigation has also been undertaken with consideration of BS8576:2013, Guidance on Investigations for Ground Gas – Permanent Gases and Volatile Organic Compounds (VOCs).

2.0 SITE LOCATION AND DESCRIPTION

Site Location

- 2.1 The site comprises land forming part of the broader Huyton Industrial Trade Park, situated adjacent to Wilson Road, Huyton, Merseyside. It is centred on approximate Ordnance Survey National Grid Reference 345347E, 390124N with an indicative postcode of L36 6JG.
- 2.2 The proposed development site is bounded to the north-east by a car parking area and Wilson Road beyond, to the south-west by residential properties bounding Kipling Avenue, to the south-east by additional industrial properties within the wider Huyton Industrial Trade Park, and to the north-west by additional industrial / commercial units.

Site Description

- 2.3 At the time of the intrusive investigation on 20th May 2022 the site formed the central section of the existing Trade Park and comprised two existing low rise steel-framed, commercial units surrounded by areas of asphalt and concrete for access and parking.
- 2.4 The structures are divided into several smaller retail units, referenced Units 1 to 9, which historically included a paint decoration and plumbing, hire shop, catering and food storage, car repair / MOT garages (pre 2005), furniture outlet, general couriers, clothing manufacturer.
- 2.5 A rectangle of maintained grass is located within the northern section of the site.
- 2.6 An electricity substation is located close to Wilson Road on the north-eastern site boundary. A second smaller substation is located to the south-east section adjacent to a gas governor. These are to be retained as part of the proposed development modifications.
- 2.7 The north-eastern and south-western boundaries of the site are landscaped and comprise a mix of grass and semi-mature / mature trees.
- 2.8 Access into the site is via several junctions from Wilson Road, two of which are located within the proposed development area.

3.0 SUMMARY OF ENVIRONMENTAL AND HISTORICAL SETTING

- 3.1 The following paragraphs summarise the most relevant findings of the Phase 1 desk study report and refer to the subject site, unless otherwise stated.

Geology

- 3.2 The BGS plans indicate no artificial ground recorded within the site. BGS mapping shows the site to be underlain by Devensian Glacial Till, comprising mainly clay but with possible interbedded sand and gravel horizons.
- 3.3 The superficial deposits are underlain by the solid strata of the Pennine Lower Coal Measures (PLCM) of Carboniferous age. These are inferred to comprise sandstone, mudstone and siltstone with subordinate seams of coal.
- 3.4 The nearest coal seam is inferred to sub-outcrop around 24m east of the development area, namely the Rushy Park Mine. The coal seam is indicated to strike generally north-west to south-east with a dip of around 50 degrees to the south west, suggesting that the Rushy Park Mine seam underlies the southern area of the proposed development footprint at an unknown depth.

Radon

- 3.5 The property is in an area as defined by the UK Health Security Agency where less than 1% of properties are above the radon action level of exposure. Therefore, no radon protection measures are necessary for new structures as described in publication BR211 by the Building Research Establishment.

Mining and Subsidence

- 3.6 A Coal Authority (CA) report and Coal Authority Mine Entry Interpretative Report were obtained and reviewed as part of the Phase 1 Desk Study. The report indicated that the property lies in an area where no past mining is recorded, although the extreme eastern and southern section of the site were underlain by probable unrecorded shallow mine workings.
- 3.7 The CA states that there are two mine entries within the development site, namely:-

Entry Type	Reference	Grid Reference	Treatment Description
Shaft	345390-009	345443E, 390101N	None Recorded
	345390-010	345444E, 390064N	

- 3.8 However, the Coal Authority Interactive web viewer indicates that there is only one shaft within the area referenced 345390-012 with an assumed shaft diameter of 2.5m, although this was not verified.
- 3.9 Therefore, to clarify the information a Coal Authority Mine Entry Interpretative Report was also obtained as part of the Phase 1 report. This indicated that shaft 345390-09 is inferred to be located within the area of current car parking and the gas governor / smaller electricity substation in the south-eastern corner of the development area. The Mine Entry report indicates that Unit A would be within influencing distance of ground movement associated with this shaft, although risks were noted to be very small.
- 3.10 Shaft 345390-010 appears to be at or close to the existing larger factory structure in the southern section of the site when plotted on web based mapping systems. Therefore, based on the current coordinates, plots beneath the adjacent structure and outside the development boundary. Therefore, the Mine Entry report indicates, that in this position the mine shaft would not pose a risk to the proposed development of the block of Unit A.

- 3.11 The Desk Study concluded that the risks to development from subsidence relating to shallow, unrecorded abandoned mine workings and mine shafts were very low for Units B1 to B9 within the northern part of the site, but the risk to Unit A within the southern part of the site would be low to moderate, requiring clarification via intrusive investigations under a licence from the Coal Authority.

Environmental Setting

- 3.12 The superficial deposits underlying the site are classified as a 'Secondary Undifferentiated' Aquifer, and the bedrock underlying the site is classified as a 'Secondary (A) Aquifer'. The site does not lie within an Environment Agency Source Protection Zone (SPZ). No groundwater abstractions have been identified within 1km of the site.
- 3.13 There are no surface watercourses situated within 250m of the site, and no surface water abstractions within 1km.
- 3.14 There are no active landfills recorded within 1km of the site. The closest historical landfill is located within 91m north-east and was operated by Tushingham Metallic Brickworks to infill the former clay pits and quarry.

Site History

- 3.15 The earliest complete map dated 1850 indicates the site to have been undeveloped and in rural / agricultural use, with two coal pits located within 20m of the eastern site boundary. A colliery with associated shafts and adits was also located close to the north-western site boundary, which was then noted as disused by 1907.
- 3.16 By 1956 the southern section of the site had been developed as part of a larger Biscuit Factory development, which included an electricity substation and cooling tanks located at the north-eastern extent of the structure. By 1968 the factory had been extended to the north and the cooling tanks appeared to have been removed. The site remained relatively unchanged until sometime prior to 1980 when a series of tanks (of unknown use) were located to the north of the factory between the two access roads into the site. An additional electricity substation had been constructed in its current position close to Wilson Road on the site's northern extent.
- 3.17 The structures in their current configuration were evident by 1993, which comprised partial demolition of the former biscuit factory and construction of two low rise retail units. By this time the smaller electricity substation and the gas governor were depicted in the south-eastern section of the site adjacent to Wilson Road.
- 3.18 The former tanks appear to be located in the area of the grass landscaping within the northern section of the site. It is not known if these were above or below ground and if below ground it is not known if these have been decommissioned or removed.

Historical Site Investigation

- 3.19 Historical site investigation at the site by RoC Consulting Limited has cumulated in the following reports:
- RoC Consulting Limited, Phase 2 Site Investigation Report, September 2009, reference AS/ROC/p2 2014E;
 - RoC Consulting Limited, Phase 2 Site Investigation Letter Report, November 2009, reference AS/bl/201109.
- 3.20 Relevant excerpts of the reports are reproduced in Appendix 02 and summarised below.
- 3.21 RoC undertook intrusive investigations in 2009 primarily to determine risks associated with ground contamination and ground gas. The intrusive investigation comprised the formation of 1no cable percussive borehole and 5no window sample probe-holes.

- 3.22 The exploratory holes encountered either topsoil or hardstanding overlying made ground to depths of between 0.20m and 1.20mbgl comprising mixed cohesive and loose sandy gravel of brick, concrete, sandstone and asphalt. Locally the made ground was underlain by firm clay to depths of around 2.60mbgl. The made ground and glacial clay, where encountered were underlain by mudstone of the PLCM at depths of between 0.30m to 2.60mbgl.
- 3.23 The report also noted steel reinforced concrete flooring and historical floor slabs within WS2 and WS4 (situated in the north-western and central northern areas of the site) from ground level to depths of around 0.50mbgl, where the concrete could not be broken out further using the available investigation equipment.
- 3.24 No groundwater was encountered during the investigations. However, perched groundwater was encountered at depths of between 0.84m and 1.35mbgl during subsequent monitoring visits.
- 3.25 Chemical analysis was undertaken on 9no samples of shallow soil for metals, inorganics and petroleum hydrocarbons. When compared to the current LQM/S4UL reference values for a 'Commercial' end use, no elevated concentrations of Contaminants of Concern (CoC's) were recorded. However, the chemical analyses did not include asbestos screening. Therefore, it could not be determined on the basis of the available data whether the shallow made ground contains asbestos from historical demolition.
- 3.26 The monitoring comprised a total of five gas monitoring visits between August and November 2009, with methane concentrations of less than 0.1% by volume in air (v/v) and carbon dioxide concentrations of up to 0.7% v/v recorded. Positive flow rates of between 0.3 and 0.90l/hr were also detected.

Preliminary Contamination Risk Assessment

- 3.27 The Phase 1 report concluded that under the proposed development scenario, potential pollution linkages have been, on the whole, considered unlikely with associated preliminary risks assessed as low.
- 3.28 However, previous chemical analysis had been undertaken over a slightly different development boundary, with further analysis of made ground for contaminants of concern including the presence of ACM and/or asbestos fibres required.
- 3.29 Based on the previous monitoring results, the potential for ground gas to impact on the proposed development from on-site sources and migration from surrounding areas was considered low, however due to the change of development area could not be fully discounted.
- 3.30 Further ground investigations were considered necessary to validate the conceptual model, investigate areas outside the former investigation boundary and to provide a Generic Quantitative Risk Assessment (GQRA) under current assessment criteria.

4.0 SITE INVESTIGATION

Rationale

- 4.1 Intrusive investigations were undertaken to provide geotechnical parameters for structural design purposes and verify the preliminary site conceptual model and confirm the anticipated low environmental risk.
- 4.2 Due to the anticipated depths to shallow rockhead and the requirement to install monitoring standpipes, window sample probeholes were undertaken to provide information on near surface deposits and to obtain samples for chemical analysis. Due to the small diameter of the probing equipment, the depth of penetration achieved is dependent on favourable ground conditions. As such, ground penetration may be restricted in circumstances where the ground is particularly strong or contains relatively large obstructions such as cobbles and/or boulders.
- 4.3 A general coverage of the proposed development area was considered appropriate. However, the investigation locations were limited at the time of the investigation due to the existing structures, services and the active access road and car park.
- 4.4 Monitoring standpipes were installed in selected probeholes for the measurement of ground gas and groundwater levels.
- 4.5 Chemical analysis of a general suite of contaminants was undertaken on selected samples of soil. This was to confirm the anticipated low contamination.

Intrusive Works

- 4.6 Ground investigation work was undertaken by Dynamic Sampling Limited on 20th May 2022. This comprised the formation of eleven windowless sample probeholes to a maximum depth of 3.00 metres below ground level (mbgl).
- 4.7 The exploratory hole locations are shown on drawing SK01 in Appendix 01 and the exploratory hole records in Appendix 03. Site investigation photographs are presented within Appendix 04.

Monitoring Standpipes

- 4.8 Monitoring wells for groundwater and ground gas measurements were installed in 4 No. probeholes, namely WS103, WS105, WS106 and WS110 as indicated on the logs presented in Appendix 03.

Geotechnical and Chemical Testing

- 4.9 In-situ geotechnical testing was undertaken at regular intervals during the formation of the probeholes in the form of Standard Penetration Tests (SPTs). The results for this testing are presented on the descriptive logs in Appendix 03.
- 4.10 Geotechnical soils testing was undertaken on selected samples for the following:
- Natural Moisture Content.
 - Liquid and Plastic Limit.
- 4.11 The results of the geotechnical testing are presented in Appendix 05.
- 4.12 Chemical analysis was undertaken on selected soil samples for the following contaminants of concern:
- Total arsenic, boron, cadmium, chromium vi, copper, lead, mercury, nickel, selenium, vanadium, zinc;
 - Total cyanide, phenols, sulphur, sulphate;

- Speciated USEPA Polyaromatic Hydrocarbons (PAH);
- Asbestos screen and identification; and
- 2:1 water/soil sulphate extract, pH.

4.13 Leachability testing was undertaken on selected soil samples, for the following contaminants of concern:

- Arsenic, boron, cadmium, chromium, copper, lead, mercury, nickel, selenium, vanadium and zinc;
- Speciated USEPA PAHs;
- Sulphate and pH;
- Cyanide; and
- Total sulphur.

4.14 The results of the chemical analysis are presented in Appendix 06.

Groundwater and Ground Gas Monitoring

4.15 Monitoring of standpipes for groundwater and ground gas has been undertaken on six occasions between 27th May and 19th August 2022, the results for which are presented in Appendix 07.

5.0 GROUND CONDITIONS

Stratigraphy

- 5.1 The current investigation data set is supplemented by information from the previous RoC report where this is considered relevant, so as to provide a detailed profile of the ground conditions beneath the site. Information is from the 2022 stage of investigation unless otherwise stated.
- 5.2 Ground conditions encountered during the intrusive investigations comprised made ground to depths of between 0.30m and 1.20mbgl. This was generally underlain by Glacial Till extending to depths of between 2.00m and 2.70mbgl. This was in turn underlain by Pennine Lower Coal Measures strata to a maximum proven depth of 3.45mbgl (RoC).

Made Ground

- 5.3 Made ground was encountered within all of exploratory holes (RoC and WML), from ground level to depths of between 0.30m and 1.20mbgl.
- 5.4 WS101 was initially positioned on a concrete slab, which could not be broken out with the handheld equipment available. Therefore the hole was abandoned as no suitable location to reposition the borehole was available due to services and the site being in use. No log is provided for WS101.
- 5.5 WS102 had to be abandoned due to the presence of an unmarked orange plastic utility duct at 0.70mbgl on an approximate north-west to south-east trend.
- 5.6 Holes BH2, WS3 (RoC) and WS104, WS107, WS108, WS109, WS110, WS111 and WS112 (WML) comprised dark grey asphalt to depths of between 0.11m and 0.15mbgl.
- 5.7 Within WS107, WS109, WS111 and WS112 the asphalt was underlain directly by a reinforced concrete slab which could not be broken out with the breaker, resulting in the termination of the holes at depths of between 0.11m and 0.13mbgl.
- 5.8 Within WS2 and WS4 (RoC) a reinforced concrete slab at ground level was also reinforced and could not be broken out.
- 5.9 BH1, WS1 (RoC) and WS102, WS103, WS105 and WS106 (WML) comprised turf overlying mid/dark brown topsoil.
- 5.10 Where the concrete was absent, or could be broken through, the made ground typically comprised mid to dark brown, slightly silty, gravelly sand with a low to moderate cobble content. Gravel generally comprised brick and concrete.
- 5.11 A relict brick wall was also encountered between 0.55m and 0.76mbgl in WS108, overlying a further concrete obstruction.
- 5.12 WS104 was terminated at 0.50mbgl due to the presence of significant standing water in the base of the service inspection pit, preventing visibility of the ground conditions at the base of the pit.
- 5.13 No SPTs were undertaken in the made ground due to the requirement to excavate service inspection pits to 1.20mbgl or into hard natural ground.

Glacial Till

- 5.14 Strata considered to represent Glacial Till was encountered within the majority of the exploratory holes penetrating the made ground at depths ranging between 0.30m and 0.90mbgl, extending to depths of between 2.00m and 2.70mbgl.

- 5.15 The Glacial Till typically comprised mid reddish brown, soft to firm, slightly silty, slightly sandy to sandy, slightly gravelly clay. It was noted to frequently include fine gravel sized fragments of coal, shale and sandstone.
- 5.16 SPT 'N' values within the glacial till deposits ranged between 4 and 10, but locally up to 12 (RoC). This indicates an initially locally soft but generally firm consistency but becoming stiff with depth towards the top of the PLCM strata.
- 5.17 Natural moisture contents of between 8.5% and 16% were recorded within the Glacial Till with liquid limits between 27% and 32%, together with corresponding plasticity indices between 14% and 16% (modified to between 14% and 16%) indicating clay of low plasticity and low volume change potential.

Pennine Lower Coal Measures Deposits

- 5.18 The Pennine Lower Coal Measures (PLCM) deposits were encountered underlying the Glacial Till at depths generally between 2.10m and 2.70mbgl. However, within BH2 (RoC) the PLCM was indicated to directly underlie the made ground at a depth of 0.30mbgl. However, this may represent a cobble or boulder at shallow depth, rather than rock head.
- 5.19 The PLCM strata comprised highly weathered dark grey, thinly laminated mudstone, locally recovered as silty fine to coarse angular gravel of mudstone.
- 5.20 A natural moisture contents of 11% was recorded within the mudstone.
- 5.21 SPT N values recorded within the upper weathered mudstone are generally between 40 and in excess of 50, with a single value of 10 recorded in WS1 (RoC) at the Glacial Till/ PLCM interface. This indicates the strata to be variably weathered and very weak to weak.

Visual/Olfactory Evidence of Contamination

- 5.22 No visual and/or olfactory evidence of significant ground contamination was identified within the exploratory holes during the investigation.
- 5.23 This broadly concurs with the findings of the RoC report.

Groundwater

- 5.24 Perched groundwater was encountered in WS104 at 0.14mbgl as a moderate strike within the made ground. Groundwater was also encountered during the formation of WS103, WS106 and WS110 at depths of between 2.00m and 3.00mbgl. However, the RoC holes were noted to be dry during formation.
- 5.25 Longer term groundwater monitoring in 2022 recorded standing water ranging between 1.34m and 1.77mbgl with the previous RoC report recording groundwater standing at depths of between 0.84m and 1.35mbgl on the first three visits.
- 5.26 It should be appreciated that the groundwater observations described above have been undertaken during a very short period of time. Significant variations in the long-term groundwater regime may occur at other times, particularly with prolonged, extreme weather conditions, and that no account can be taken of such in this report.

General

- 5.27 It should also be appreciated that ground conditions may vary between and away from the exploratory hole positions, and that no account can be taken in this report of such variations.

6.0 FURTHER INVESTIGATIONS FOR MINE WORKINGS AND SHAFTS

Mine Shafts

- 6.1 The Coal Authority reports procured as part of the Phase 1 Desk Study, identified the presence of two mine shafts in the south-eastern section of the site, referenced 345390-009 and 345390-010, which could potentially locally affect development. These included:-
- Shaft 345390-009 is apparently located within a current area of hard standing close to an existing gas governor / small electricity substation. The current redevelopment proposals include the construction of a new building (Unit A5) close to this feature and potential widening of the access splay at this point.
 - Shaft 345390-010 appears to be at or close to the existing larger factory structure in the southern section of the site and when plotted on web based mapping systems, based on the current coordinates, plots outside the development boundary beneath the former factory to the south. Therefore, the Mine Entry report indicates, that in this position the mine shaft would not pose a risk to the proposed development.
- 6.2 It is concluded that the risks to development from subsidence relating to mine shafts were very low for Units B1 to B10 within the northern part of the site, but the risk to Unit A within the southern part of the site would be moderate, requiring clarification via intrusive investigations under licence by the Coal Authority.
- 6.3 However, due to the anticipated position of shaft 345390-009, close to the existing services infrastructure which include an active access road to the wider site these can only be undertaken once the existing gas governor and electricity substation have been decommissioned and access from the southern section of Wilson Road, temporarily closed off, for the duration of the works.
- 6.4 These investigations would either comprise a series of trial trenches or probeholes at a close grid across the area identified as the potential location of Shaft 345390-09 by the Coal Authority. These investigations would need to be undertaken under an appropriate license from the Coal Authority.
- 6.5 Subsequently, any encountered concrete caps should be exposed so as to undertake a structural engineering assessment of their condition and to determine if any damage has been sustained to the cap. Existing caps may also need to be re-built to an appropriate specification to meet current Coal Authority standards. Furthermore, on completion of the inspections and/or reinstatement, the caps should be suitably marked on the surface with a permanent marker such as a fixed plate so that the shaft position may be readily located and identified in the future.
- 6.6 If/ where an untreated shaft is encountered such as through encountering voids, marked changes in ground conditions, buried structures or any other signs which could signify the presence of a mine shaft, such would need to be suitably treated in line with current Coal Authority Guidance.
- 6.7 Although not anticipated to affect Shaft 345390-09, it is also worth noting that should the location of the shaft be encountered closer to the proposed structure, it may result in an amendment to the position of Unit A.
- 6.8 Current guidance indicates that new structures should be located around the site in order to maintain a safety zone around each shaft. The safety zone should ensure a clearance subtended by an angle of 45° to the surface from the sides of the shaft where it intersects rockhead.

Mine Workings

- 6.9 Units B1 to B10 are considered to be outside the zone of influence from potential unrecorded shallow workings. However, based on the Coal Authority information, the potential for coal seams and/or

abandoned mine workings to occur beneath the southern / south-eastern section of the site, namely Unit A, cannot be wholly discounted at this stage.

- 6.10 Therefore, it is considered that 4no rotary boreholes to depths of around 30.00m to 40.00mbgl will need to be undertaken beneath the proposed footprint of Unit A, once the existing structure located across the proposed footprint area, has been demolished.
- 6.11 These investigations would also need to be undertaken under license from the Coal Authority.
- 6.12 As such it cannot be discounted that ground stabilisation will be required prior to construction of structural foundations at the site. Such stabilisation works where required would involve a programme of drilling and grouting with boreholes being drilled on a primary close grid. Subsequently, a cement stabilised fly-ash or similar grout will need to be injected into the boreholes under pressure with secondary or even tertiary infill holes being grouted where necessary.

7.0 GEOTECHNICAL APPRAISAL

Site Preparation

- 7.1 Site development will include the demolition of existing structures which should not proceed until an appropriate Asbestos survey of the existing building has been undertaken and any Asbestos Containing Materials (ACM) removed by an appropriately licensed contractor. Similarly, any demolition materials present on site and considered for re-use should be inspected with any ACM removed accordingly prior to crushing.
- 7.2 Construction near any retained trees and importantly within any RPA's should be undertaken with due regard to guidance provided in BS5837:2012 'Trees in relation to design, demolition and construction – recommendations'.
- 7.3 On the basis of observations during the ground investigation historical/existing foundations, ground floor slabs and other buried concrete/brick obstructions associated with former structures will be encountered. Where encountered, these will need to be broken out to suitable depths below formation levels where they are to impinge on the proposed buildings.
- 7.4 Any asphalt/concrete hardstanding and below ground foundations removed as part of the clearance work, subject to appropriate screening and crushing, will be suitable for re-use as bulk fill beneath hard cover areas.
- 7.5 Prior to construction, the status of all recorded services at the site will need to be established and it cannot be discounted that some may need to be diverted. It has also been indicated that the gas governor will be decommissioned and a replacement electricity substation constructed adjacent to Wilson road.
- 7.6 Due to the age of the electricity substation, it is advised that discussions be held with the statutory service provider regarding the status of the facility and particularly whether any equipment potentially containing Polychlorinated Biphenyls (PCB's) has been appropriately de-commissioned.
- 7.7 The potential for buried hydrocarbon storage tanks has been inferred in the northern section of the site within a rectangular grassed areas. Although not encountered to date, if / where such buried tanks are encountered during redevelopment the tanks and all associated pipework and pumps should be appropriately decommissioned and removed by a specialist contractor.
- 7.8 No significant earthworks are anticipated to facilitate redevelopment of the site with the exception of localised re-grading.

Foundations

- 7.9 Any made ground and soft natural clay should be considered unsuitable for the direct support of structural loads as their generally incompetent nature could result in unacceptable total and differential settlements.
- 7.10 New structures could be supported by traditional spread foundations constructed on firm Glacial Till, at a depth of at least 1.00mbgl, although these should be designed on a net allowable bearing pressure not exceeding 75kN/m². This is provided that all formations are carefully inspected to confirm the anticipated soil strength with any soft/loose or otherwise incompetent soils so encountered being excavated and replaced with foundation concrete. At these depths formation excavations would potentially encounter variable soil conditions comprising both firm cohesive Glacial deposits and mudstone bedrock. As such, foundations spanning over such variable ground conditions would need to be suitably reinforced to reduce differential settlements to tolerable limits.

- 7.11 Alternatively, foundations could be extended to the underlying Pennine Lower Coal Measures strata, locally encountered at depths as shallow as 0.30mbgl but more generally anticipated at depths of between 2.00 and 2.70mbgl, where a net allowable bearing pressure of 150kN/m² is anticipated.
- 7.12 However, the above recommendations would be subject to confirmation of shallow mine workings beneath the proposed footprint of Unit A1 to A10, and possible programme of grouting if/where required. However, the lightly loaded structure could instead be constructed on a fully reinforced raft foundation, balanced against a possible reduction in the extent and cost of ground treatment works as outlined within 15.2.2 of C758D: 2019 '*Abandoned Mine Workings Manual*'.
- 7.13 Notwithstanding the above, due to the limitations across the southern and eastern sections of the site, it is recommended that further ground investigations are undertaken to confirm the ground conditions beneath the existing floor slabs once the existing structures have been cleared.
- 7.14 Where foundations are to be constructed on clay soils in close proximity to existing and/or removed trees, identification of the tree species will determine its water demand as provided in Appendix 4.2-A of NHBC Standards 2010, Foundations, Chapter 4.2, Building Near Trees. Assessment as to the cohesive strata heave or shrinkage potential should then be undertaken in consideration of a low volume change potential for the clay with foundations designed to appropriate depths where such effects are envisaged.
- 7.15 Alternatively, if the additional investigations encounter deep made ground of incompetent natural soils beneath the existing floor slabs, or higher loads are required, it may be prudent to consider a piled foundation solution. Pile type, selection and design should to be undertaken in conjunction with a reputable, specialist piling contractor, ideally with experience of the local ground conditions.
- 7.16 Foundation construction will need to take account of any remaining services and, where they are in close proximity, may need to be taken down to beneath the lowest level of the service trench so that their structural integrity is maintained.

Floor Slabs

- 7.17 In consideration of the variation in made ground thickness and current risks from shallow mine workings (Unit A), floor slabs for the new structures should be suspended and in the case of Unit A may need to be sufficiently reinforced to withstand potential horizontal forces, unless a fully reinforced raft foundation is adopted.
- 7.18 Alternatively ground bearing floor slabs could be suitable for the new structures where underlain by competent natural strata or areas underlain by granular fill which has been compacted to an appropriate specification. This also assumes that no shallow mine workings are encountered during the additional investigations.

Excavations and Groundwater

- 7.19 Excavations at the site will be feasible using conventional hydraulic plant, although hydraulic breakers will be required to break out buried structures and may be required where excavations extend into the less weathered PLCM bedrock beneath the proposed building footprint.
- 7.20 All excavations at the site and specifically requiring man-entry, will need adequate lateral support, or will need to be battering back to a safe angle to ensure their stability.
- 7.21 Conventional 'sump and pump' dewatering measures are likely to be adequate to keep excavations dry. Excavations for foundations should be protected from the ingress of surface water run-off during times of heavy and/or prolonged rainfall to reduce the potential for softening of formation levels.

Pavement Design

- 7.22 In consideration of the ground conditions, it is recommended that new road pavement design should be based on a California Bearing Ratio (CBR) value of no more than 3% in made ground and natural cohesive deposits.
- 7.23 The CBR will need to be reviewed and confirmed by site inspection and possibly by suitable in-situ testing at formation levels following any earthwork operations and prior to pavement construction.
- 7.24 In any event, all formations should be proof-rolled with any soft, loose or otherwise unsuitable material being removed and replaced with compacted granular fill.

Concrete Design

- 7.25 Design/mix of buried concrete should be undertaken in accordance with the "Aggressive Chemical Environment for Concrete" (ACEC) classification, of BRE Special Digest 1:2005 (Concrete in Aggressive Ground). With reference to the site history, it is deemed appropriate to classify the site as "Brownfield", with respect to BRE Special Digest.
- 7.26 The values of 2:1 water/soil extract for sulphate range from less than 10 to 90mg/l. Values of pH at foundation depth range from 7.7 to 8.48 indicating neutral to slightly alkaline conditions.
- 7.27 On the basis of the test results, the typical design sulphate (DS) class and "Aggressive Chemical Environment for Concrete" (ACEC) class for the site are DS-1 and AC-1s respectively.

Drainage and Soakaways

- 7.28 In consideration of the site being underlain by cohesive Glacial Till, soakaways are unlikely to be a suitable drainage option for the site.

8.0 GENERIC QUANTITATIVE RISK ASSESSMENT (GQRA)

General

- 8.1 A review of the desk study information and previous investigation by RoC, had concluded that the potential for a significant pollution linkage to be present at the site is low with corresponding low risk to human health and the environment.
- 8.2 No visual or olfactory evidence of significant ground contamination has been recorded from the intrusive investigations, although the presence of made ground including demolition materials was observed in the majority of exploratory holes on the site.
- 8.3 Therefore, it has been considered prudent to adopt a precautionary principal and undertake chemical analysis of the sub-surface soils to confirm the low human health risk status of the site.

Human Health

- 8.4 Selected samples have been analysed for a general suite of contaminants of concern and compared against Screening Levels (SL's) for human health to determine the significance of the measured concentrations in relation to the site conceptual model. Thus, a Generic Quantitative Risk Assessment has been undertaken in line with guidelines provided in the Environment Agencies Model Procedures for the Land Contamination Risk Assessment (LCRM), October 2020.
- 8.5 The criteria for a limited number of contaminants have been derived by DEFRA in their document entitled SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination, April 2014.
- 8.6 Within the document, Category 4 Screening Levels (C4SL's) are described as being more pragmatic than previous screening criteria and represent concentrations in soil that present an 'acceptable' level of risk within the context of Part 2A.
- 8.7 The National Planning Policy Framework states that 'after development, as a minimum, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990'. Therefore, by inference, the C4SL's are appropriate for use in the planning context.
- 8.8 Although the SP1010 document states that C4SL only apply for a 'sandy loam soil with 6% soil organic matter', it is generally accepted that assessment criteria for metals are not sensitive to changes in soil organic content (SOM). The C4SL's have therefore been adopted as assessment criteria in this report for the listed metals within the SP1010.
- 8.9 Subsequent to SP1010, LQM/CIEH have published a document entitled 'The LQM/CIEH S4ULs for Human Health Risk Assessment' 2015. In brief, the document provides updated assessment criteria which have been derived in accordance with UK legislation, national as well as EA policy and using a modified version of the CLEA software and available guidance. The new screening criteria, or Suitable 4 Use Levels (S4ULs), are intended to provide a complete and updated replacement to the previous LQM/CIEH GAC of 2009. As such they are considered appropriate for use in this assessment for other contaminants not covered by C4SL's and/or for organic contaminants assuming a worst-case Soil Organic Matter (SOM) of 1% as an initial conservative assessment.
- 8.10 For each contaminant, S4UL's and C4SL's have been calculated for six land use scenarios, namely:
- Residential with homegrown produce.
 - Residential without homegrown produce.
 - Allotments.
 - Commercial.
 - Public Open Space, near residential housing.
 - Public Parks, remote from residential housing.

8.11 In light of the proposed development, the SLs for a “Commercial” end-use are considered appropriate for the development, based on its continued use as part of a larger industrial estate.

8.12 A table of relevant SL's are provided in Appendix 08.

Controlled Waters

8.13 Generic criteria for the assessment of potential groundwater contamination have been derived from very conservative guidelines protective of drinking water and environmental quality, namely:

- UK Drinking Water Standards (DWS) as defined by The Water Supply (Water Quality) Regulations, 2016;
- UK Environmental Quality Standards (EQS) for Freshwater, leachates are based on a Hardness of Moderately soft 51-100 as CaCO₃ mg/l, as determined from United Utilities web-based information.

8.14 A table of relevant SL's are provided in Appendix 08.

Soil Test Results

8.15 In total 17 No. soil samples (9no RoC & 8no WML) were analysed for a suite of typical Brownfield Contaminants of Concern (CoC). RoC submitted 9no samples for Total Petroleum Hydrocarbon (TPH) testing. In 2022 a further 8no samples of made ground were also submitted for asbestos screening (WML). Soil analytical results from the WML investigation are presented in Appendix 06 with results from the RoC investigation included within Appendix 02.

8.16 The results indicate that all of the concentrations (RoC & WML) of standard CoC's were measured below the SL's for “Commercial” end-use with no exceptions.

8.17 The results of the TPH testing (RoC) ranged from below the laboratory limit of detection (1 mg/kg) to a maximum concentration of 7500mg/kg, corresponding to a sample of made ground from 0.4mbgl in BH1. There are no available SLs for concentrations of total TPH, however, when the value is assessed against the individual aliphatic /aromatic ranges, the lowest SL for speciated TPH for a commercial end use is 3,200 mg/kg, in the aliphatic range of C5-C6. However, based on the observations recorded in the log for BH1, it is considered most likely that the elevated total TPH concentration resulted from fragmentation of the relic asphalt horizon immediately overlying the depth at which the sample was obtained.

8.18 No asbestos fibres or asbestos containing material (ACM) were identified in the samples scheduled for testing.

Leachability Test Results

8.19 3 No. soil samples of made ground were selected for leachability testing during the 2022 WML investigations.

8.20 The majority of the concentrations were measured below the respective SL's with the following exceptions.

Contaminant	Number of Samples Exceeding SL	SL (ug/l)	Recorded Concentrations (ug/l)	Sample (mbgl)
Arsenic	1	10 (UK DWS)	11	WS110 0.2
Copper	2	3 (EQS/WFD)	6 - 13	WS110 0.2 WS104 0.2

Discussion and Conclusions

Human Health

- 8.21 In consideration of the chemical test results, it is concluded that the site does not contain any significant and / or widespread contamination sources. The localised elevated concentration of TPH at 0.4 mbgl in BH1 (RoC) is considered due to the presence of asphalt fragments within the made ground matrix and is therefore not considered to be significantly hazardous to health.
- 8.22 The long-term exposure risk to human health, based on the samples analysed, is therefore confirmed to be low with no specific remediation requirements.
- 8.23 Notwithstanding the above, it would be prudent to undertake verification of soils beneath any removed UST's in the northern section of the development area and the electricity substation in the south-east once these features have been decommissioned and removed by a specialist contractor.
- 8.24 Although not anticipated to be significant, any suspected area of contamination encountered beneath the existing floor slabs should also be managed as part of a watching brief to ensure that any suspected / encountered contamination is suitably remediated as part of site redevelopment.

Controlled Waters

- 8.25 In terms of sensitivity, the superficial deposits underlying the site are classified as a Secondary (Undifferentiated) Aquifer, with the bedrock classified as a 'Secondary (A) Aquifer'. Both units are considered to be of limited resource value and utilisation.
- 8.26 The site is not within an Environment Agency Source Protection Zone (SPZ) and there are no active groundwater abstraction licences within 1km. There are no surface watercourses within 250m of the site.
- 8.27 The presence of limited leachable contaminants at concentrations above their respective SLs have been detected in chemical analysis. However, due to the typically marginal nature of these exceedances (all are within an order of magnitude of their respective SL), the conservative nature of leachability testing data and the low sensitivity of Controlled Waters receptors at the site (both groundwater and surface waters) the likelihood that the site will impact controlled waters is considered to be very low.
- 8.28 Therefore, the risk to controlled waters from the site is considered to be low, with no environmental remediation considered necessary.

9.0 GROUND GAS RISK ASSESSMENT

Methodology

- 9.1 Current guidance for the assessment of risk associated with the presence of hazardous ground gases (principally methane and carbon dioxide) is provided in two key documents, namely:
- Code of practice for the Characterisation and remediation from Ground Gas in Affected Developments. British Standard Institution (BS 8485: 2015 & A1:2019); and
 - Assessing Risks posed by Hazardous Ground Gases to Buildings CIRIA (C665, 2007).
- 9.2 The assessment presented herein is primarily based on the BS8485 document.
- 9.3 Hazardous ground gas qualitative risk assessment is based on a conceptual model similar to that used for soil and groundwater contamination sources (i.e., source-pathway-receptor pollutant linkages). A semi-quantitative estimate of risk can be assessed based on knowledge of the conceptual model and a measure of hazardous gas concentration and gas flow at the site within monitoring standpipes.
- 9.4 Based on the measured flow rates and hazardous gas concentrations, individual “hazardous gas flow rates” (Q_{hg}) can be derived for each monitoring point, from which the “site characteristic hazardous gas flow rate” (Q_{hgs}), and then the “Characteristic Situation” (CS) can be determined.
- 9.5 BS8485 provides guidance on the level of gas protection requirements based upon the characteristic situation and the proposed development based on building type as outlined in Table 3.

Table 3 - Building Types

	Type A	Type B	Type C	Type D
Ownership	Private	Private or commercial/ Public, possible multiple	Commercial / Public	Commercial / Industrial
Control (Change of use)	None	Some but not all	Full	Full
Room Sizes	Small	Small/ medium	Small to Large	Large Industrial/ Retail Park

- 9.6 The proposed development therefore is indicated to comprise the construction of Type B buildings which include commercial/public structures with central building management and small to large room sizes, but with multiple occupancy.

Ground Gas Conceptual Model

- 9.7 The property is not in a Radon Affected Area as defined by the UK Health Security Agency, as less than 1% of properties are above the Action Level of exposure. Therefore, no radon protection measures are necessary for new structures as described in publication BR211 by the Building Research Establishment.
- 9.8 Ground investigations have confirmed that no areas of deep made ground with the potential to generate hazardous concentrations and volumes of ground gas occur beneath the site. Where made ground was encountered, this was not observed to include significant quantities of potentially putrescible materials.
- 9.9 There are no recorded landfills within influencing distance of the site.
- 9.10 However, the presence of ground gas resulting from shallow unrecorded mine workings cannot be discounted at this stage.

- 9.11 Previous ground gas monitoring, completed by RoC, comprised a total of five monitoring visits between August and November 2009. These recorded methane concentrations of less than 0.1% by volume in air (v/v) and carbon dioxide concentrations up to 0.7% v/v. Positive flow rates of between 0.3 and 0.90l/hr were also detected.
- 9.12 In consideration of the above, a preliminary low risk to the proposed development from ground gas has been determined.
- 9.13 However, due to the changes in proposed development area, it has been considered prudent to undertake additional ground gas monitoring, primarily for methane and carbon dioxide, with associated flow rates on six occasions between 27th April 2022 and 10 August 2022.
- 9.14 The results of preliminary monitoring are presented within Appendix 07.

Results

- 9.15 The results indicate the concentrations of peak and steady state methane to be below instrument detection limits of 0.1% by volume in air (v/v) in monitoring wells WS103, WS105 and WS106 on all six monitoring rounds. However, methane concentrations of up to 3.4% v/v (peak) and 3.1% v/v (steady state) were recorded in WS110.
- 9.16 Peak carbon dioxide concentrations ranged from 0.9 to 2.1% in monitoring wells WS103, WS105 and WS106. However, within WS110 more localised concentrations of carbon dioxide were recorded, with the highest peak concentration of 11.3% and steady state of 10.2% on the final visit.
- 9.17 Depleted oxygen concentrations of between 0.0% and 7.4% were also recorded within WS110 after 10th June 2022.
- 9.18 A maximum detectable positive steady ground gas flow of 1.2 l/hr within WS103, on 13th July 2022 recorded during the monitoring visits. No positive gas flow was detected at monitoring location WS110 on any of the visits. The results of the monitoring visits have been used to derive a Characteristic Gas Situation which provides a maximum Q_{hg} of 0.0102 l/hr, on the basis of monitoring data from WS110. No calculated Q_{hg} values exceed 0.07 l/hr, which suggests that the likelihood of gas migration into built structures is relatively low.

Recommendations

- 9.19 As such it is considered that Unit B would classify as CS1 – 'Very Low Risk' with no specific gas protection measures required.
- 9.20 However in accordance with BS8485:2015 Unit B would classify as Characteristic Situation (CS) 2 – 'Low Gas Risk', on the basis of the presence of consistently elevated concentrations of methane (above 1% v/v) and carbon dioxide (above 5% v/v). It is anticipated that these would include installation of gas protection measures sufficient to provide a Gas Protection Score of 3.5 as defined in BS8485:2015.
- 9.21 Depending on final floor type this would include one of the two options below:-

Suspended Floor Option:-

- Passive sub-floor dispersal (minimum 150mm clear void) with cross ventilation to internal sleeper walls of very good performance which meets all criteria as set out in Appendix B of BS 8485:2015. To achieve 'very good performance' the minimum area of side ventilation should be 1500 mm²/m run of wall on at least two opposite sides, assuming a structure of <15m average width. Sleeper walls should include cross vents totalling at least double the area of the side ventilation.

- Lapped and taped gas resistant membrane suitable for use in a CS2 situation, in the floor slab construction, installed in accordance with the manufacturer's instructions and to reasonable levels of workmanship in line with current good practice.

Ground Bearing Floor Option:-

- Cast-in-situ monolithic reinforced ground bearing raft or reinforced cast in situ suspended floor slab, with minimal service penetrations, which should be well reinforced to control cracking and have minimal penetrations cast in.
- Lapped and taped gas resistant membrane suitable for use in a CS2 situation, in the floor slab construction, installed in accordance with the manufacturer's instructions and to reasonable levels of workmanship in line with current good practice.

10.0 OTHER POTENTIAL DEVELOPMENT CONSIDERATIONS

Excavated Soils

- 10.1 Groundworks undertaken during the development will produce excavated soil which will require appropriate site management. Principally, and in line with the sustainable development agenda, any soils arising from site excavations should firstly be considered for re-use where possible by incorporation into the development.
- 10.2 However, in view of current development levels, it is anticipated that all site won soils would be surplus to requirements and will need to be removed from site under appropriate duty of care.
- 10.3 For guidance and based on the current information, it is likely that the majority of made ground would be classified as Non-Hazardous with natural deposits, classified as Inert for landfill disposal. Excavated coal, where present, may classify as Hazardous waste for disposal due to its potentially high calorific value. This would need to be confirmed at an early stage with the landfill operator.
- 10.4 Also, where excavated made ground, following inspection, is found to include significant ACM and/or fibres that cannot be segregated, it may classify as Hazardous, subject to further quantification testing.
- 10.5 It should be noted that the chemical analysis results for disposal classification are assessed against different assessment criteria to those relating to contamination risk assessment. Soils that are deemed suitable for use in terms of risk to human health and the environment may not necessary be uncontaminated and could be classified as Non-Hazardous or even Hazardous for disposal purposes.
- 10.6 It will be the responsibility of the waste producer to undertake testing and classification of any waste soils for disposal to an appropriately licenced landfill in accordance with current guidelines.

Imported Fill

- 10.7 Imported fill will be subject to specific quality requirements and should be accompanied by appropriate certification to confirm its suitability. Allowance should also be made for testing imported fill materials prior to placement to ensure suitability.

Water Supply Pipes

- 10.8 The relevant water supply provider will need to be consulted with regards the selection of suitable water supply pipe materials for the development. In light of the ground conditions encountered, the requirement for specific materials and measures to protect the water supply from ground contamination are not anticipated.

APPENDIX 01

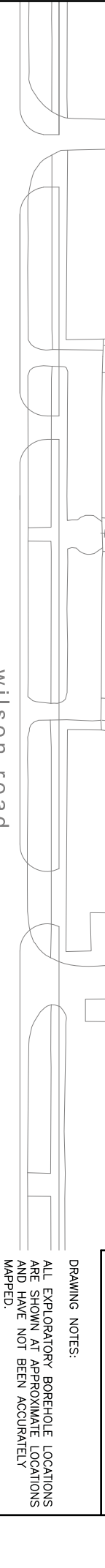
Drawings

Project Huyton Trade Industrial Park		WML CONSULTING Civil, Structural & Geotechnical Engineers		No.8 Oak Green Earl Road Stanley Green Business Park Cheadle Hulme Cheshire SK8 6QL Tel 0161 482 0600 Fax 0161 486 9210 e-mail info@wmlconsulting.com www.wmlconsulting.com	
Title Exploratory Hole Location Plan					
Job No. 9333G	Drawing No SK01	Drawn T SHEEN	Checked S SEDDON	Date 23/05/2022	Scale DO NOT SCALE



APPENDIX 02

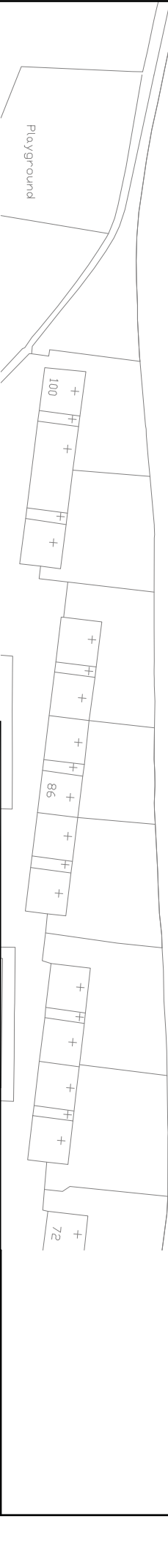
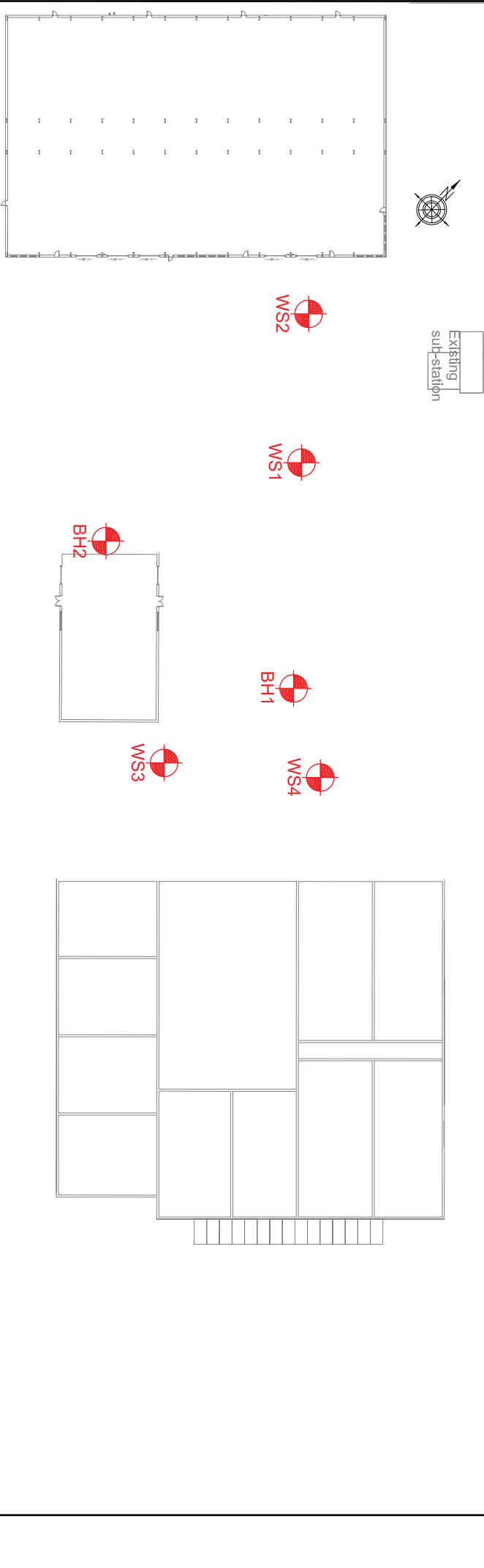
RoC Report Excerpts



DRAWING NOTES:

ALL EXPLORATORY BOREHOLE LOCATIONS ARE SHOWN AT APPROXIMATE LOCATIONS AND HAVE NOT BEEN ACCURATELY MAPPED.

 **BH1**
ROC BOREHOLE / WINDOW
SAMPLER LOCATION



PROJECT TITLE				CLIENT				 Gill & Stuart Engineering 81 Canal Street, Suite 103, 3rd Fl. Tel: 0161 883 3724 Fax: 0161 819 3070			
INTERCHANGE MOTORWAY ESTATE HUYTON				DERWENT HOLDINGS LTD							
DRAWING TITLE				PROJECT No.				DRAWING No.			
BOREHOLE LOCATION PLAN CURRENT SITE				2796				S101			
REV. DATE				AUTOCAD DRAWING FILE NAME:				PLOT DATE:			
DETAILS				2796/ROC/ES				12.2012			
DRAWING STATUS				DRN. CHK.				APPROD.			
SCHEME				R2C0 Consulting				DATE			
								THE ABOVE SCALES APPLY WHEN PLOTTED AT A3 SIZE			
								EMAIL FOR DRAWINGS drawings@r2c0consulting.com			



CABLE PERCUSSION BOREHOLE LOGSHEET

Project Interchange Motorway Estate, Huyton				BOREHOLE No BH1	
Job No 2014E	Date 06-08-09 06-08-09	Ground Level (m)	Co-Ordinates ()		
Contractor HB Boring & Co Ltd				Sheet 1 of 1	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
0.10	D1					0.10		
0.40	D2					0.40		
1.00	D4					(0.80)		
1.20-1.65	U1001	19				1.20		
1.20	D3					(1.40)		
2.00-2.45	SPT1	N12				2.60		
2.50	D5					(0.60)		
2.60	D6					3.20		
3.00	D7							
3.00-3.10	SPT2	N50/ 150mm						
3.20-3.20	SPT3	N50/ 75mm						

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Water Strikes Depth	Standing	Final	From	To	Hours	From	To	
All dimensions in metres Scale 1:50						Client KFM Ltd		Method/ Plant Used Dando Mrk 2000		Logged By AS	

CONATMINATED LAND TOOL.GLB Log AGS3 UK BH G:\COMMONJOBS\2014 HUYTON RETAIL DEVELOPMENT\EARTH SCIENCES\PHASE 2 SI AUG 2009\BH LOGS\2014 BH LOGS.GPJ AGS 3_1.GDT <<DrawingFileSpec>> 09/09/2009 13:54:54



WINDOW SAMPLER BOREHOLE LOG

Project Interchange Motorway Estate, Huyton				BOREHOLE No BH2	
Job No 2014E	Date 06-08-09 06-08-09	Ground Level (m)	Co-Ordinates ()		
Contractor HB Boring & Co Ltd				Sheet 1 of 1	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
0.10	D1					0.20		
0.20	D2					0.30		
1.00	D3					(1.15)		
1.00	D4					1.45		
1.20-1.38	SPT1	N50						
Borehole terminated at 1.45mbgl due to bedrock obstruction.								

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Depth	Water Strikes Standing	Final	From	To	Hours	From	To	
											No visual or olfactory evidence of potential soil / groundwater contamination noted. No groundwater strikes / ingresses reported.
All dimensions in metres Scale 1:50		Client KFM Ltd		Method/ Plant Used Competitor Window Sampler		Logged By AS					

CONATMINATED LAND TOOL.GLB Log AGS3 UK WS G:\COMMONJOBS\2014 HUYTON RETAIL DEVELOPMENT\EARTH SCIENCES\PHASE 2\SI AUG 2009\BH LOGS\2014 BH LOGS.GPJ AGS 3_1.GDT <<DrawingFileSpec>> 03/09/2009 13:52:44

WINDOW SAMPLER BOREHOLE LOG

Project Interchange Motorway Estate, Huyton				BOREHOLE No WS1	
Job No 2014E	Date 06-08-09 06-08-09	Ground Level (m)	Co-Ordinates ()		
Contractor HB Boring & Co Ltd				Sheet 1 of 1	

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)		
0.20	D1	N7			0.20	Grass overlying loose dark brown organic rich SAND with frequent root inclusions. (TOPSOIL)		
0.50	D2				(1.90)	Firm reddish brown mottled grey sandy CLAY with rare fine to medium gravel inclusions of mixed lithology including Sandstone, Shale and Coal. (GLACIAL CLAY)		
1.00	D3							
1.20	D4							
1.20-2.45	SPT1							
2.00	D5	N10			2.10	Dark grey thinly laminated weathered MUDSTONE.		
2.00-2.45	SPT2							
2.10	D6							

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Depth	Water Strikes Standing	Final	From	To	Hours	From	To	
											No visual or olfactory evidence of potential soil / groundwater contamination noted. No groundwater strikes / ingresses reported.
All dimensions in metres Scale 1:50			Client KFM Ltd			Method/ Plant Used Competitor Window Sampler			Logged By AS		

CON/ATMATED LAND TOOL.GLB Log AGS3 UK WS G:\COMMON\JOBS\2014 HUYTON RETAIL DEVELOPMENT\EARTH SCIENCES\PHASE 2\SI AUG 2009\BH LOGS\2014 BH LOGS.GPJ AGS 3_1.GDT <<DrawingFileSpec>> 03/09/2009 13:52:47

WINDOW SAMPLER BOREHOLE LOG

Project Interchange Motorway Estate, Huyton				BOREHOLE No WS2
Job No 2014E	Date 06-08-09 06-08-09	Ground Level (m)	Co-Ordinates ()	
Contractor HB Boring & Co Ltd				Sheet 1 of 1

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
						0.20	Steel reinforced Concrete. (MADE GROUND)		
						0.30	Refusal on unknown obstruction, possible Concrete floor slab. (MADE GROUND)		
Borehole terminated at 0.3mbgl due to possible concrete obstruction.									

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Depth	Water Strikes Standing	Final	From	To	Hours	From	To	
											No visual or olfactory evidence of potential soil / groundwater contamination noted. No groundwater strikes / ingresses reported.
All dimensions in metres Scale 1:50		Client KFM Ltd				Method/ Plant Used Competitor Window Sampler					Logged By AS

CONATMINATED LAND TOOL, GLB Log AGS3 UK WS G:\COMMON\JOBS\2014 HUYTON RETAIL DEVELOPMENT\EARTH SCIENCES\PHASE 2 SI AUG 2009\BH LOGS\GPJ AGS 3_1.GDT <-DrawingFilesSpec> 03/09/2009 13:52:50



WINDOW SAMPLER BOREHOLE LOG

Project Interchange Motorway Estate, Huyton				BOREHOLE No WS3	
Job No 2014E	Date 06-08-09 06-08-09	Ground Level (m)	Co-Ordinates ()		
Contractor HB Boring & Co Ltd				Sheet 1 of 1	

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.20	D1					0.30	Tarmac hardstanding. (MADE GROUND)		
						0.50	Concrete slab. (MADE GROUND)		
0.60	D2					(1.50)	Firm brown mottled grey sandy CLAY with rare fine to medium gravel inclusions of mixed lithology including Sandstone, Shale and Coal. (GLACIAL CLAY)		
1.60	D3					2.00			
2.00	D4					(0.60)	Soft orange and brown very silty plastic CLAY. (GLACIAL CLAY)		
						2.60			
						2.65	Dark grey thinly laminated weathered MUDSTONE. Borehole terminated at 2.65mbgl due to bedrock obstruction.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Depth	Water Strikes Standing	Final	From	To	Hours	From	To	
											No visual or olfactory evidence of potential soil / groundwater contamination noted. No groundwater strikes / ingresses reported.
All dimensions in metres Scale 1:50			Client KFM Ltd			Method/ Plant Used Competitor Window Sampler			Logged By AS		

CON/ATMATED LAND TOOL.GLB Log AGS3 UK WS G:\COMMON\JOBS\2014 HUYTON RETAIL DEVELOPMENT\EARTH SCIENCES\PHASE 2\SI AUG 2009\BH LOGS\2014 BH LOGS.GPJ AGS 3_1.GDT <<DrawingFileSpec>> 03/09/2009 13:52:52



WINDOW SAMPLER BOREHOLE LOG

Project Interchange Motorway Estate, Huyton				BOREHOLE No WS4	
Job No 2014E	Date 06-08-09 06-08-09	Ground Level (m)	Co-Ordinates ()		
Contractor HB Boring & Co Ltd				Sheet 1 of 1	

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
1.00	SPT1	N50/ 50mm				0.20	Steel reinforced Concrete. (MADE GROUND)		
						0.30	Refusal on unknown obstruction, possible Concrete floor slab. (MADE GROUND)		
			Borehole terminated at 0.3mbgl due to possible concrete obstruction.						

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Depth	Water Strikes Standing	Final	From	To	Hours	From	To	
											No visual or olfactory evidence of potential soil / groundwater contamination noted. No groundwater strikes / ingresses reported.
All dimensions in metres Scale 1:50			Client KFM Ltd			Method/ Plant Used Competitor Window Sampler			Logged By AS		

CONATMINATED LAND TOOL.GLB Log AGS3 UK WS G:\COMMON\JOBS\2014 HUYTON RETAIL DEVELOPMENT\EARTH SCIENCES\PHASE 2\SI AUG 2009\BH LOGS\2014 BH LOGS.GPJ AGS 3_1.GDT <<DrawingFileSpec>> 03/09/2009 13:52:55



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Hadfield House, Hadfield Street, Manchester M16 9FE

Scientific Analysis Laboratories

Certificate of Analysis

Hadfield House
Hadfield Street
Cornbrook
Manchester
M16 9FE
Tel : 0161 874 2400
Fax : 0161 874 2468

Report Number: 173510-2

Date of Report: 02-Sep-2009

Customer: RoC Consulting
Studio B
Commercial Wharf
6 Commercial Street
Castlefield
Manchester
M15 4PZ

Customer Contact: Mr Alex Smiles

Customer Job Reference: 2014

Customer Site Reference: Huyton

Date Job Recieved at SAL: 10-Aug-2009

Date Analysis Started: 27-Aug-2009

Date Analysis Completed: 02-Sep-2009

The results reported relate to samples received in the laboratory
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation
This report should not be reproduced except in full without the written approval of the laboratory
Tests covered by this certificate were conducted in accordance with SAL SOPs



Report checked
and authorised by :
Miss Carrie Hughes
Senior Project Manager

Issued by :

Index to symbols used in 173510-2

Value	Description
M40	Analysis conducted on sample assisted dried at no more than 40C. Results are reported on a dry weight basis.
M105	Analysis conducted on an "as received" aliquot. Results are reported on a dry weight basis where moisture content was determined by assisted drying of sample at 105C
AR	As Received
9	LOD raised due to dilution of sample
U	Analysis is UKAS accredited
M	Analysis is MCERTS accredited
N	Analysis is not accredited

Method Index

Value	Description
T6	ICP/OES
T2	Grav
T277	Grav (1 Dec) (40 C)
T8	GC/FID
T7	Probe
T207	GC/MS(MCERTS)
T162	Grav (1 Dec) (105 C)
T4	Colorimetry

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
Moisture	T277	AR	0.1	%	N	001-002,008-010,013-014,016-017
Moisture @ 105 C	T162	AR	0.1	%	N	001-002,008-010,013-014,016-017
Boron (water-soluble)	T6	AR	1	mg/kg	N	001-002,008-010,013-014,016-017
Chromium VI	T6	AR	1	mg/kg	N	001-002,008-010,013-014,016-017
Cyanide(Total)	T4	AR	1	mg/kg	U	001-002,008-010,013-014,016-017
Cyanide(free)	T4	AR	1	mg/kg	U	001-002,008-010,013-014,016-017
pH	T7	AR			M	001-002,008-010,013-014,016-017
Phenols(Mono)	T4	AR	1	mg/kg	U	001-002,008-010,013-014,016-017
SO4(Total)	T6	M40	0.01	%	N	001-002,008-010,013-014,016-017
Sulphide	T4	AR	10	mg/kg	N	001-002,008-010,013-014,016-017
Sulphur(Free)	T2	M40	500	mg/kg	N	001-002,008-010,013-014,016-017
Thiocyanate	T4	AR	10	mg/kg	N	001-002,008-010,013-014,016-017
Arsenic	T6	M40	2	mg/kg	M	001-002,008-010,013-014,016-017
Cadmium	T6	M40	1	mg/kg	M	001-002,008-010,013-014,016-017
Chromium	T6	M40	1	mg/kg	M	001-002,008-010,013-014,016-017
Copper	T6	M40	1	mg/kg	M	001-002,008-010,013-014,016-017
Lead	T6	M40	1	mg/kg	M	001-002,008-010,013-014,016-017
Mercury	T6	M40	1	mg/kg	M	001-002,008-010,013-014,016-017
Nickel	T6	M40	1	mg/kg	M	001-002,008-010,013-014,016-017
Selenium	T6	M40	3	mg/kg	M	001-002,008-010,013-014,016-017
Zinc	T6	M40	1	mg/kg	M	001-002,008-010,013-014,016-017
Naphthalene	T207	M105	0.1	mg/kg	M	001-002,008-010,013-014,016-017
Acenaphthylene	T207	M105	0.1	mg/kg	U	001-002,008-010,013-014,016-017
Acenaphthene	T207	M105	0.1	mg/kg	M	001-002,008-010,013-014,016-017
Fluorene	T207	M105	0.1	mg/kg	M	001-002,008-010,013-014,016-017
Phenanthrene	T207	M105	0.1	mg/kg	M	001-002,008-010,013-014,016-017
Anthracene	T207	M105	0.1	mg/kg	U	001-002,008-010,013-014,016-017
Fluoranthene	T207	M105	0.1	mg/kg	M	001-002,008-010,013-014,016-017
Pyrene	T207	M105	0.1	mg/kg	M	001-002,008-010,013-014,016-017
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	M	001-002,008-010,013-014,016-017
Chrysene	T207	M105	0.1	mg/kg	M	001-002,008-010,013-014,016-017
Benzo(b/k)Fluoranthene	T207	M105	0.1	mg/kg	M	001-002,008-010,013-014,016-017
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	M	001-002,008-010,013-014,016-017
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	M	001-002,008-010,013-014,016-017
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	M	001-002,008-010,013-014,016-017
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	M	001-002,008-010,013-014,016-017
PAH(total)	T207	M105	0.1	mg/kg	U	001-002,008-010,013-014,016-017
Total Petroleum Hydrocarbons	T8	AR	1	mg/kg	U	001-002,008-010,013-014,016-017

Soil	Analysed as Soil
MCERTS Preparation	

SAL Reference					173510 001	173510 002	173510 008	173510 009	173510 010	173510 013	173510 014	173510 016	173510 017
Customer Sample Reference					WS1 D1 0.0	WS1 D2 0.2	BH1 D1 0.1	BH1 D2 0.4	BH1 D3 1.2	BH2 J2 0.2	BH2 J3 1.0	WS3 T1 0.2	WS3 T2 0.6
Depth					0.0	0.2	0.1	0.4	1.2	0.2	1.0	0.2	0.6
Type					Topsoil	Clay	Topsoil	Sand	Clay	Clay	Sand	Sand	Clay
Determinand	Method	Test Sample	LOD	Units									
Moisture	T277	AR	0.1	%	14	10	15	4.2	9.1	8.7	7.9	12	9.3
Moisture @ 105 C	T162	AR	0.1	%	17	8.4	13	3.5	9.1	11	6.2	12	5.7

Soil	Analysed as Soil
Heavy Metals(9)	

SAL Reference					173510 001	173510 002	173510 008	173510 009	173510 010	173510 013	173510 014	173510 016	173510 017
Customer Sample Reference					WS1 D1 0.0	WS1 D2 0.2	BH1 D1 0.1	BH1 D2 0.4	BH1 D3 1.2	BH2 J2 0.2	BH2 J3 1.0	WS3 T1 0.2	WS3 T2 0.6
Depth					0.0	0.2	0.1	0.4	1.2	0.2	1.0	0.2	0.6
Type					Topsoil	Clay	Topsoil	Sand	Clay	Clay	Sand	Sand	Clay
Determinand	Method	Test Sample	LOD	Units									
Arsenic	T6	M40	2	mg/kg	9	9	12	3	6	6	6	84	9
Cadmium	T6	M40	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	2	<1
Chromium	T6	M40	1	mg/kg	21	38	17	6	24	19	26	24	21
Copper	T6	M40	1	mg/kg	37	24	54	63	76	41	33	120	23
Lead	T6	M40	1	mg/kg	120	12	180	44	36	26	8	200	31
Mercury	T6	M40	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1
Nickel	T6	M40	1	mg/kg	23	41	15	5	21	28	38	48	35
Selenium	T6	M40	3	mg/kg	<3	<3	<3	<3	<3	<3	<3	<3	<3
Zinc	T6	M40	1	mg/kg	120	46	150	150	300	81	160	100	32

Soil	Analysed as Soil
RoC Maxi Suite 1	

[illegible]

Soil	Analysed as Soil
Miscellaneous	

SAL Reference					173510 001	173510 002	173510 008	173510 009	173510 010	173510 013	173510 014	173510 016	173510 017
Customer Sample Reference					WS1 D1 0.0	WS1 D2 0.2	BH1 D1 0.1	BH1 D2 0.4	BH1 D3 1.2	BH2 J2 0.2	BH2 J3 1.0	WS3 T1 0.2	WS3 T2 0.6
Depth					0.0	0.2	0.1	0.4	1.2	0.2	1.0	0.2	0.6
Type					Topsoil	Clay	Topsoil	Sand	Clay	Clay	Sand	Sand	Clay
Determinand	Method	Test Sample	LOD	Units									
Total Petroleum Hydrocarbons	T8	AR	1	ma/ka	120	<1	270	7500	1600	500	<1	(9) <10	28

Soil	Analysed as Soil
Total and Speciated USEPA16 PAH	

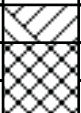
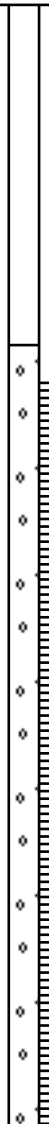
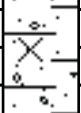
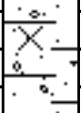
SAL Reference					173510 001	173510 002	173510 008	173510 009	173510 010	173510 013	173510 014	173510 016	173510 017
Customer Sample Reference					WS1 D1 0.0	WS1 D2 0.2	BH1 D1 0.1	BH1 D2 0.4	BH1 D3 1.2	BH2 J2 0.2	BH2 J3 1.0	WS3 T1 0.2	WS3 T2 0.6
Depth					0.0	0.2	0.1	0.4	1.2	0.2	1.0	0.2	0.6
Type					Topsoil	Clay	Topsoil	Sand	Clay	Clay	Sand	Sand	Clay
Determinand	Method	Test Sample	LOD	Units									
Naphthalene	T207	M105	0.1	mg/kg	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	T207	M105	0.1	mg/kg	0.3	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	T207	M105	0.1	mg/kg	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	T207	M105	0.1	mg/kg	1.9	<0.1	1.4	0.1	<0.1	0.2	<0.1	<0.1	<0.1
Anthracene	T207	M105	0.1	mg/kg	0.5	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	T207	M105	0.1	mg/kg	3.6	<0.1	4.1	0.3	<0.1	0.3	<0.1	<0.1	0.2
Pyrene	T207	M105	0.1	mg/kg	3.3	<0.1	4.2	0.6	0.2	0.3	<0.1	<0.1	0.2
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	1.4	<0.1	1.7	1.0	0.3	0.2	<0.1	<0.1	<0.1
Chrysene	T207	M105	0.1	mg/kg	1.4	<0.1	1.7	0.6	0.2	0.2	<0.1	<0.1	<0.1
Benzo(b/k)Fluoranthene	T207	M105	0.1	mg/kg	1.7	<0.1	2.4	0.6	0.3	0.3	<0.1	<0.1	<0.1
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	1.2	<0.1	1.6	0.5	0.2	0.2	<0.1	<0.1	<0.1
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	0.5	<0.1	0.7	0.2	0.2	0.1	<0.1	<0.1	<0.1
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	0.2	<0.1	0.2	0.2	<0.1	0.1	<0.1	<0.1	<0.1
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	0.6	<0.1	0.8	0.4	0.2	0.1	<0.1	<0.1	<0.1
PAH(total)	T207	M105	0.1	mg/kg	17	<0.1	19	4.5	1.6	2.0	<0.1	<0.1	0.4

APPENDIX 03

Exploratory Hole Records

			Project Title: Huyton Trade Industrial Park				WS102																															
			Project Number: 9333G		Client: Derwent Holdings Ltd					Sheet 1 Of 1																												
			GL (mAOD):		N Coord: 0		E Coord: 0																															
Date: 20/05/2022			Method: Hand Dug		Driller: Dynamic Sampling		Logged By: TJS																															
Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe																														
0.30 - 0.50	ES				0.10	Mid/dark brown slightly silty slightly gravelly sand with high rootlet content. (TOPSOIL)																																
					0.60	Mid brown slightly silty slightly gravelly fine to medium grained sand. Reworked natural ground. (MADE GROUND)																																
					0.70	Pale grey angular medium grained gravel of subangular to angular limestone. (MADE GROUND)																																
						End Of Borehole At 0.70 m																																
					1.00																																	
					2.00																																	
					3.00																																	
KEY D - Disturbed Sample B - Bulk Sample U - Undisturbed W - Water Sample S - Standard Penetration Test C - Cone Penetration Test N - Penetration Test 'N' Value V - Hand Shear Vane kPa  - Groundwater Strike  - Groundwater Level			REMARKS No Groundwater Encountered Ridged plastic ducting/drainage channel encountered at 0.70mbgl (could not determine diameter as not exposed fully), trending approximately SE-NW.			Water Strikes <table border="1"> <thead> <tr> <th>Date</th> <th>Strike</th> <th>Level</th> <th>Minutes</th> <th>Casing</th> <th>Sealed</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>			Date	Strike	Level	Minutes	Casing	Sealed																								
Date	Strike	Level	Minutes	Casing	Sealed																																	
			Scale: 1:20			Daily Log Of Depths Chiselling <table border="1"> <thead> <tr> <th>Date</th> <th>Casing</th> <th>Water</th> <th>From</th> <th>To</th> <th>Hours</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>			Date	Casing	Water	From	To	Hours																								
Date	Casing	Water	From	To	Hours																																	

		Project Title: Huyton Trade Industrial Park				WS103	
		Project Number: 9333G		Client: Derwent Holdings Ltd			
		GL (mAOD):		N Coord: 0		E Coord: 0	
Date: 20/05/2022		Method: Window Sample		Driller: Dynamic Sampling		Logged By: TJS	

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.15 - 0.30	ES				0.10	Cropped grass overlying mid/dark brown slightly silty slightly gravelly sandy clay with rootlets. (TOPSOIL)		
				0.35	Mid / dark brown slightly silty gravelly fine to medium grained sand with low to moderate cobble content. Gravel and cobbles are of mixed lithology including red brick fragments. Low content of metal and plastic. (MADE GROUND)			
0.70 - 0.80	ES			1.00		Mid reddish brown silty slightly gravelly sandy CLAY. Low content of black and pale grey mottling. Low content of coally inclusions. (GLACIAL TILL)		
1.20 - 1.65	SPT	N=9						
1.30 - 1.40	D							
1.40 - 1.50	ES							
2.00 - 2.45	SPT	N=10			2.00			
2.70 - 3.00	D				2.70	Dark grey/black MUDSTONE recovered as silty slightly sandy angular fine to coarse gravel. (MUDSTONE)		
3.00 - 3.34	SPT	pp 50/190mm		3.00	End Of Borehole At 3.00 m			

KEY D - Disturbed Sample B - Bulk Sample U - Undisturbed W - Water Sample S - Standard Penetration Test C - Cone Penetration Test N - Penetration Test 'N' Value V - Hand Shear Vane kPa  - Groundwater Strike  - Groundwater Level		REMARKS 	Water Strikes <table border="1"> <thead> <tr> <th>Date</th> <th>Strike</th> <th>Level</th> <th>Minutes</th> <th>Casing</th> <th>Sealed</th> </tr> </thead> <tbody> <tr> <td>20/05/2022</td> <td>3</td> <td></td> <td></td> <td></td> <td>Moderate</td> </tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>	Date	Strike	Level	Minutes	Casing	Sealed	20/05/2022	3				Moderate																							
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Scale: 1:20

			Project Title: Huyton Trade Industrial Park				WS104		
			Project Number: 9333G		Client: Derwent Holdings Ltd				
			GL (mAOD):		N Coord: 0		E Coord: 0		
Date: 20/05/2022			Method: Hand Dug		Driller: Dynamic Sampling		Logged By: TJS		

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.20 - 0.30	ES				0.12	Dark grey tarmacadam. (TARMACADAM)	▼	
				0.32	Mid reddish brown sand and gravel. Sand is mixed lithology including red brick fragments. Gravel is mixed lithology including red brick, concrete and wood. Low content of plastic.			
				0.50	(MADE GROUND)			
				1.00	Pale brown very wet silty sand and gravel. Gravel is mixed lithology including red brick and plastic sheeting. (MADE GROUND)			
					2.00			
					3.00			

KEY

D - Disturbed Sample
 B - Bulk Sample
 U - Undisturbed
 W - Water Sample
 S - Standard Penetration Test
 C - Cone Penetration Test
 N - Penetration Test 'N' Value
 V - Hand Shear Vane kPa
 ▼ - Groundwater Strike
 ▼ - Groundwater Level

REMARKS

Scale: 1:20

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
20/05/2022	0.14				Moderate

Daily Log Of Depths

Date	Casing	Water	From	To	Hours

		Project Title: Huyton Trade Industrial Park				WS105	
		Project Number: 9333G		Client: Derwent Holdings Ltd		Sheet 1 Of 1	
		GL (mAOD):		N Coord: 0		E Coord: 0	
Date: 20/05/2022		Method: Hand Dug		Driller: Dynamic Sampling		Logged By: TJS	

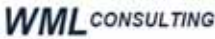
Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.20 - 0.40	ES				0.15	Cropped grass overlying mid/dark brown slightly silty slightly gravelly sandy clay with rootlets. (TOPSOIL) Mid/dark brown slightly silty gravelly fine to coarse sand with low to moderate cobble content. (MADE GROUND)		
1.00 - 1.20	ES				0.90 1.00 1.20	Pale brown sand and gravel. Gravel is medium to coarse of limestone and red brick. Low content of earthenware pipework. (MADE GROUND) End Of Borehole At 1.20 m		
					2.00 3.00			

KEY D - Disturbed Sample B - Bulk Sample U - Undisturbed W - Water Sample S - Standard Penetration Test C - Cone Penetration Test N - Penetration Test 'N' Value V - Hand Shear Vane kPa - Groundwater Strike - Groundwater Level	REMARKS No Groundwater Encountered Dense mid grey concrete encountered at 1.20mbgl, unable to break through. Scale: 1:20	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="6">Water Strikes</th> </tr> <tr> <th>Date</th> <th>Strike</th> <th>Level</th> <th>Minutes</th> <th>Casing</th> <th>Sealed</th> </tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="3">Daily Log Of Depths</th> <th colspan="3">Chiselling</th> </tr> <tr> <th>Date</th> <th>Casing</th> <th>Water</th> <th>From</th> <th>To</th> <th>Hours</th> </tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table>	Water Strikes						Date	Strike	Level	Minutes	Casing	Sealed																									Daily Log Of Depths			Chiselling			Date	Casing	Water	From	To	Hours																		
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		Project Title: Huyton Trade Industrial Park				WS106	
		Project Number: 9333G		Client: Derwent Holdings Ltd		Sheet 1 Of 1	
		GL (mAOD):		N Coord: 0		E Coord: 0	
Date: 20/05/2022		Method: Window Sample		Driller: Dynamic Sampling		Logged By: TJS	

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.20 - 0.40	ES				0.10	Close cropped grass overlying mid / dark brown slightly clayey slightly gravelly sand. (TOPSOIL)		
					0.25			
0.60 - 0.70	ES					0.50	Mid grey/brown gravelly fine to coarse sand. Gravel is mixed lithology including concrete fragments. (MADE GROUND)	
1.20 - 1.65	SPT	N=4			1.00	Mid reddish brown firm sandy slightly gravelly CLAY. Low content of pale grey and black mottling, low content of coally fragments. (GLACIAL TILL)		
1.40 - 1.50	ES				1.20			
2.00 - 2.42	SPT	pp 50/275mm			2.00	Soft to firm slightly sandy slightly gravelly CLAY. Low content of pale grey and black mottling, low content of coally fragments. (GLACIAL TILL)		
						End Of Borehole At 2.00 m	▼	
					3.00			

KEY D - Disturbed Sample B - Bulk Sample U - Undisturbed W - Water Sample S - Standard Penetration Test C - Cone Penetration Test N - Penetration Test 'N' Value V - Hand Shear Vane kPa - Groundwater Strike - Groundwater Level 	REMARKS Scale: 1:20	Water Strikes <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <th>Date</th> <th>Strike</th> <th>Level</th> <th>Minutes</th> <th>Casing</th> <th>Sealed</th> </tr> <tr> <td>20/05/2022</td> <td>2</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table> Daily Log Of Depths <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <th colspan="3">Chiselling</th> <th colspan="3"></th> </tr> <tr> <th>Date</th> <th>Casing</th> <th>Water</th> <th>From</th> <th>To</th> <th>Hours</th> </tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table>	Date	Strike	Level	Minutes	Casing	Sealed	20/05/2022	2																	Chiselling						Date	Casing	Water	From	To	Hours												
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			Project Title: Huyton Trade Industrial Park				WS107																																																	
			Project Number: 9333G		Client: Derwent Holdings Ltd					Sheet 1 Of 1																																														
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Date: 20/05/2022			Method:		Driller: Dynamic Sampling		Logged By: TJS																																																	
Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe																																																
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			Project Title: Huyton Trade Industrial Park				WS108		
			Project Number: 9333G		Client: Derwent Holdings Ltd				
			GL (mAOD):		N Coord: 0		E Coord: 0		
Date: 20/05/2022			Method:		Driller: Dynamic Sampling		Logged By: TJS		

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.30 - 0.50	ES				0.15	Dark grey tarmacadam hardstanding - tarmac running surface and underlying densely packed sub base. (TARMACADAM) Dark/mid reddish brown sand and gravel. Gravel is fine to coarse of red brick. (MADE GROUND) Mid/buff brown cobbly sand and gravel. Gravel and cobbles are of subangular limestone. (MADE GROUND) Mid reddish brown sand and gravel. Gravel and cobbles are of mixed lithology including red brick. (MADE GROUND) 0.55 - 0.76 Relict red brick wall. End Of Borehole At 0.76 m		
					0.30			
					0.55			
					0.76			
					1.00			
					2.00			
					3.00			

KEY D - Disturbed Sample B - Bulk Sample U - Undisturbed W - Water Sample S - Standard Penetration Test C - Cone Penetration Test N - Penetration Test 'N' Value V - Hand Shear Vane kPa - Groundwater Strike - Groundwater Level	REMARKS No Groundwater Encountered Mid buff brown concrete slab encountered at 0.76mbgl, unable to break out.. 	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="6">Water Strikes</th> </tr> <tr> <th>Date</th> <th>Strike</th> <th>Level</th> <th>Minutes</th> <th>Casing</th> <th>Sealed</th> </tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="3">Daily Log Of Depths</th> <th colspan="3">Chiselling</th> </tr> <tr> <th>Date</th> <th>Casing</th> <th>Water</th> <th>From</th> <th>To</th> <th>Hours</th> </tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table>	Water Strikes						Date	Strike	Level	Minutes	Casing	Sealed																									Daily Log Of Depths			Chiselling			Date	Casing	Water	From	To	Hours																		
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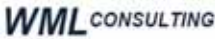
			Project Title: Huyton Trade Industrial Park				WS109																																																	
			Project Number: 9333G		Client: Derwent Holdings Ltd					Sheet 1 Of 1																																														
			GL (mAOD):		N Coord: 0		E Coord: 0																																																	
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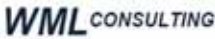
		Project Title: Huyton Trade Industrial Park				WS110	
		Project Number: 9333G		Client: Derwent Holdings Ltd			
		GL (mAOD):		N Coord: 0		E Coord: 0	
Date: 20/05/2022		Method: Window Sample		Driller: Dynamic Sampling		Logged By: TJS	

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.20 - 0.40	ES				0.09	Dark grey tarmacadam. (TARMACADAM)		
					0.20	Densely packed medium grained angular gravel of limestone (SUB-BASE) (MADE GROUND)		
0.50 - 0.70	ES				0.40	Dark brown/red sand and gravel. Gravel is mixed lithology including red brick fragments. (MADE GROUND)		
					0.90	Soft very sandy very gravelly clay. Gravel is mixed lithology including red brick, concrete. Mottled dark grey/black in places. (MADE GROUND)		
1.20 - 1.65	SPT	N=8			1.00	Mid reddish brown sandy slightly gravelly CLAY. Low content of grey mottling. Clay is firm. (GLACIAL TILL)		
1.40 - 1.50	D				1.20	Firm to stiff reddish brown slightly sandy slightly gravelly CLAY with thin sandy pockets. (GLACIAL TILL)		
2.00 - 2.42	SPT	pp 51/275mm			2.00	1.70 - 1.80 Softer and higher sand content		
						End Of Borehole At 2.00 m		
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								

KEY D - Disturbed Sample B - Bulk Sample U - Undisturbed W - Water Sample S - Standard Penetration Test C - Cone Penetration Test N - Penetration Test 'N' Value V - Hand Shear Vane kPa  - Groundwater Strike  - Groundwater Level		REMARKS 	Water Strikes <table border="1"> <thead> <tr> <th>Date</th> <th>Strike</th> <th>Level</th> <th>Minutes</th> <th>Casing</th> <th>Sealed</th> </tr> </thead> <tbody> <tr> <td>20/05/2022</td> <td>2</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table> Daily Log Of Depths <table border="1"> <thead> <tr> <th>Date</th> <th>Casing</th> <th>Water</th> <th>From</th> <th>To</th> <th>Hours</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>	Date	Strike	Level	Minutes	Casing	Sealed	20/05/2022	2																	Date	Casing	Water	From	To	Hours												
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			Project Number: 9333G		Client: Derwent Holdings Ltd					Sheet 1 Of 1																																														
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			Scale: 1:20																																																					

			Project Title: Huyton Trade Industrial Park				WS112																																																	
			Project Number: 9333G		Client: Derwent Holdings Ltd					Sheet 1 Of 1																																														
			GL (mAOD):		N Coord: 0		E Coord: 0																																																	
Date: 20/05/2022			Method: Hand Dug		Driller: Dynamic Sampling		Logged By: TJS																																																	
Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe																																																
					0.07 0.11	Dark grey tarmacadam. (TARMACADAM) Dark grey tarmacadam. (TARMACADAM) End Of Borehole At 0.11 m																																																		
					1.00																																																			
					2.00																																																			
					3.00																																																			
KEY D - Disturbed Sample B - Bulk Sample U - Undisturbed W - Water Sample S - Standard Penetration Test C - Cone Penetration Test N - Penetration Test 'N' Value V - Hand Shear Vane kPa  - Groundwater Strike  - Groundwater Level			REMARKS No Groundwater Encountered Dense mid grey concrete at 0.11mbgl. Too dense to be broken out.			Water Strikes <table border="1"> <thead> <tr> <th>Date</th> <th>Strike</th> <th>Level</th> <th>Minutes</th> <th>Casing</th> <th>Sealed</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table> <table border="1"> <thead> <tr> <th colspan="3">Daily Log Of Depths</th> <th colspan="3">Chiselling</th> </tr> <tr> <th>Date</th> <th>Casing</th> <th>Water</th> <th>From</th> <th>To</th> <th>Hours</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>			Date	Strike	Level	Minutes	Casing	Sealed																			Daily Log Of Depths			Chiselling			Date	Casing	Water	From	To	Hours												
Date	Strike	Level	Minutes	Casing	Sealed																																																			
Daily Log Of Depths			Chiselling																																																					
Date	Casing	Water	From	To	Hours																																																			
			Scale: 1:20																																																					

APPENDIX 04

Site Investigation Photographs



Photograph 1
WS102 inspection pit



Photograph 2
WS102 inspection pit showing plastic utility at base of pit



Photograph 3
WS102 following reinstatement



Photograph 4
WS103 inspection pit



Photograph 5
WS103 deep arisings (mudstone arisings to right side of image)



Photograph 6
WS103 following installation



Photograph 7
WS104 shallow arisings



Photograph 8
WS105 inspection pit (concrete obstruction visible in base)



Photograph 9
WS105 following installation



Photograph 10
WS106 inspection pit



Photograph 11
WS106 shallow arisings



Photograph 12
WS106 deep arisings



Photograph 13
WS106 following installation



Photograph 14
WS107 obstruction below tarmacadam hardstanding



Photograph 15
WS108 inspection pit



Photograph 16
WS108 following reinstatement



Photograph 17
WS109 showing obstruction below tarmacadam hardstanding



Photograph 18
WS109 following reinstatement



Photograph 19
WS110 inspection pit



Photograph 20
WS110 shallow arisings



Photograph 21
WS110 deep arisings



Photograph 22
WS110 following installation



Photograph 23
WS111 obstruction beneath tarmacadam hardstanding



Photograph 24
WS111 following reinstatement



Photograph 25
WS112 obstruction beneath tarmacadam hardstanding



Photograph 26
WS112 following reinstatement

APPENDIX 05

Geotechnical Testing Results



LABORATORY REPORT



4043

Contract Number: PSL22/3768

Report Date: 13 June 2022

Client's Reference: 9333G

Client Name: WML Consultants
No 8 Oak Green Earl Road
Stanley Green Business Park
Cheadle Hulme
Cheshire
SK8 6QL

For the attention of: Sam Seddon

Contract Title: Huyton Industrial Estate

Date Received: 27/5/2022

Date Commenced: 27/5/2022

Date Completed: 13/6/2022

Notes: Opinions and Interpretations are outside the UKAS Accreditation

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

Checked and Approved Signatories:

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)

L Knight
(Assistant Laboratory Manager)

S Eyre
(Senior Technician)

T Watkins
(Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
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e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

	Contract No:	
	PSL22/3768	
	Client Ref:	
	9333G	

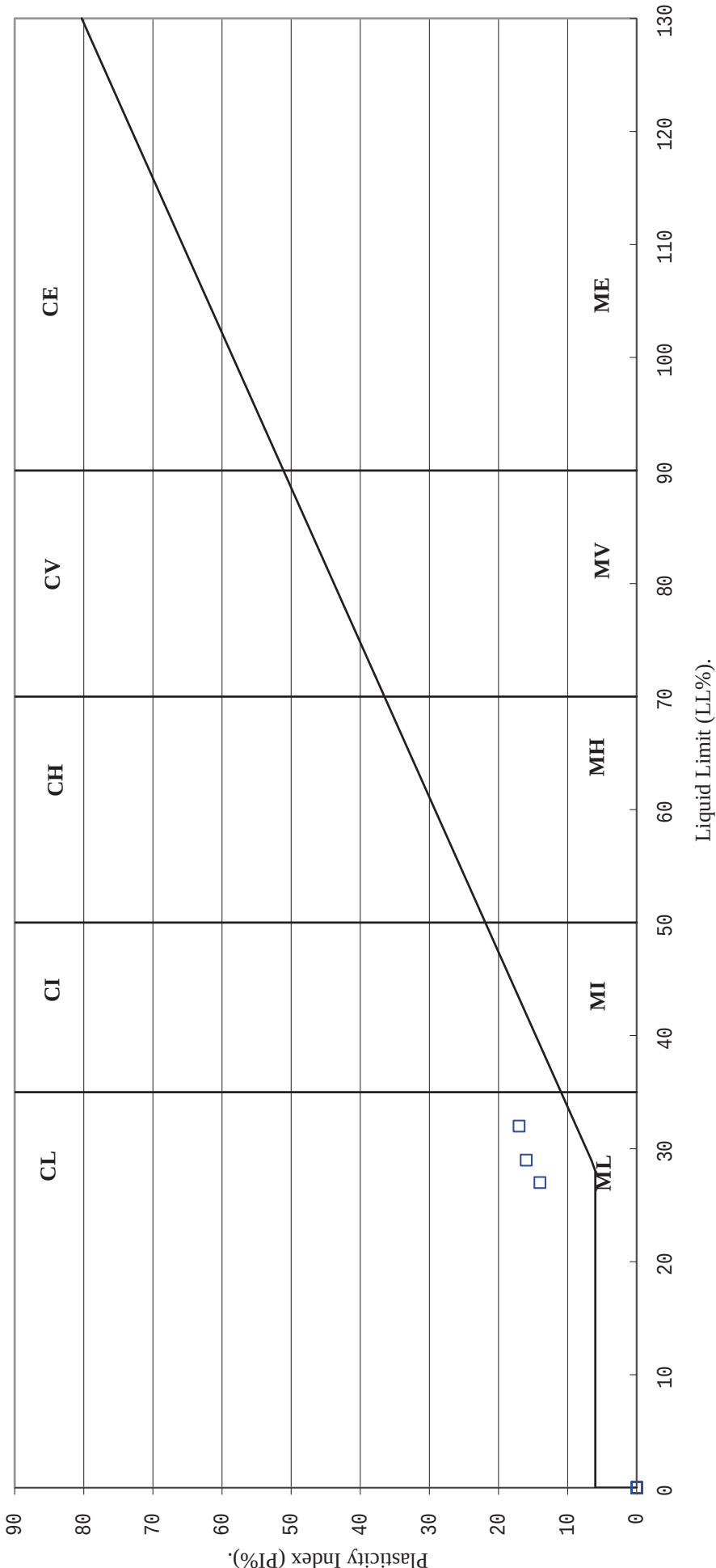
(BS1377 : PART 2 : 1990)

SYMBOLS: NP : Non Plastic

* : Liquid Limit and Plastic Limit Wet Sieved.

Contract No:
PSL22/3768
Client Ref:
9333G

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



4043

PSL
Professional Soils Laboratory

Huyton Industrial Estate

Contract No:

PSL22/3768

Client Ref:

9333G



ANALYTICAL TEST REPORT

Contract no: 110108

Contract name: Huyton Industrial Estate

Client reference: PSL22/3768

Clients name: Professional Soils Laboratory

Clients address: 5/7 Hexthorpe Road
Doncaster
DN4 0AR

Samples received: 08 June 2022

Analysis started: 08 June 2022

Analysis completed: 15 June 2022

Report issued: 15 June 2022

Key

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

Approved by:

Rachael Burton

Reporting Team Lead

Chemtech Environmental Limited

SOILS

Lab number			110108-1	110108-2
Sample id			WS106	WS110
Depth (m)			1.20	1.20
Sample Type			D	D
Date sampled			-	-
Test	Method	Units		
pH	CE004 ^U	units	7.7	7.7
Sulphate (2:1 water soluble)	CE061 ^U	mg/l SO ₄	38	28

Chemtech Environmental Limited

METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE004	pH	Based on BS 1377, pH Meter	As received	U	-	units
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	U	10	mg/l SO ₄

Chemtech Environmental Limited

DEVIATING SAMPLE INFORMATION

Comments

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

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

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

Key

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

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
110108-1	WS106	1.20	Y	All (NSD)
110108-2	WS110	1.20	Y	All (NSD)

Chemtech Environmental Limited

ADDITIONAL INFORMATION

Notes

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

Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.

All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing.

Methods, procedures and performance data are available on request.

Results reported herein relate only to the material supplied to the laboratory.

This report shall not be reproduced except in full, without prior written approval.

Samples will be disposed of 4 weeks from initial receipt unless otherwise instructed.

For soils and solids, all results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.

Analytical results are inclusive of stones, where applicable.

APPENDIX 06

Chemical Analytical Results

FINAL ANALYTICAL TEST REPORT

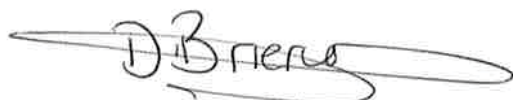
Envirolab Job Number: 22/05028
Issue Number: 1

Date: 01 June, 2022

Client: WML Construction
No 8 Oak Green
Earl Road
Stanley Green Business Park
Cheadle Hulme
Cheshire
SK8 6QL

Project Manager: Thomas Sheen
Project Name: Huyton
Project Ref: 9333G
Order No: 9333G
Date Samples Received: 23/05/22
Date Instructions Received: 24/05/22
Date Analysis Completed: 01/06/22

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 22/05028

Client Project Name: Huyton

Client Project Ref: 9333G

Lab Sample ID	22/05028/1	22/05028/2	22/05028/4	22/05028/5	22/05028/6	22/05028/7	22/05028/9	Units	Limit of Detection	Method ref
Client Sample No	1	2	1	2	3	1	4			
Client Sample ID	WS105	WS105	WS106	WS106	WS106	WS110	WS103			
Depth to Top	0.20	1.00	0.20	0.60	1.40	0.20	1.40			
Depth To Bottom	0.40	1.20	0.40	0.70	1.60	0.40	1.50			
Date Sampled	20-May-22	20-May-22	20-May-22	20-May-22	20-May-22	20-May-22	20-May-22			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5AE	5A	4AE	6AE	6A	4A	6A			
% Stones >10mm _A	<0.1	14.9	<0.1	<0.1	<0.1	31.4	<0.1	% w/w	0.1	A-T-044
pH _D ^{M#}	8.10	7.84	7.98	7.34	7.70	9.52	8.48	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	<0.01	0.09	<0.01	0.03	<0.01	0.25	<0.01	g/l	0.01	A-T-026s
Sulphate (acid soluble) _D ^{M#}	370	-	610	<200	-	2100	-	mg/kg	200	A-T-028s
Sulphur (total) _D	279	-	456	77	-	1390	-	mg/kg	50	A-T-024s
Cyanide (total) _A ^{M#}	<1	-	<1	<1	-	<1	-	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	-	<0.2	<0.2	-	<0.2	-	mg/kg	0.2	A-T-050s
Organic Matter _D ^{M#}	5.5	-	5.7	1.6	-	4.7	-	% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	7	-	10	1	-	3	-	mg/kg	1	A-T-024s
Boron (water soluble) _D	<1.0	-	<1.0	<1.0	-	1.4	-	mg/kg	1	A-T-027s
Cadmium _D ^{M#}	<0.5	-	0.7	<0.5	-	<0.5	-	mg/kg	0.5	A-T-024s
Copper _D ^{M#}	38	-	53	15	-	19	-	mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	-	<1	<1	-	<1	-	mg/kg	1	A-T-040s
Lead _D ^{M#}	118	-	268	9	-	40	-	mg/kg	1	A-T-024s
Mercury _D	<0.17	-	0.46	<0.17	-	0.90	-	mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	23	-	18	53	-	15	-	mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	-	<1	<1	-	<1	-	mg/kg	1	A-T-024s
Vanadium _D ^{M#}	23	-	25	27	-	31	-	mg/kg	1	A-T-024s
Zinc _D ^{M#}	96	-	170	36	-	71	-	mg/kg	5	A-T-024s
Leachate Prep NRA (10:1) _A	-	-	-	-	-	*	-			A-T-001
pH (leachable) _A [#]	-	-	-	-	-	9.90	-	pH	0.01	A-T-031w
Sulphate (leachable) _A [#]	-	-	-	-	-	48.93	-	mg/l	1	A-T-026w
Cyanide (total) (leachable) _A [#]	-	-	-	-	-	<0.005	-	mg/l	0.005	A-T-042wTCN
Phenols (total by HPLC) (leachable) _A	-	-	-	-	-	<0.01	-	mg/l	0.01	A-T-050w
Arsenic (leachable) _A [#]	-	-	-	-	-	11	-	µg/l	1	A-T-025w
Boron (leachable) _A [#]	-	-	-	-	-	67	-	µg/l	10	A-T-025w
Cadmium (leachable) _A [#]	-	-	-	-	-	<1	-	µg/l	1	A-T-025w
Copper (leachable) _A [#]	-	-	-	-	-	13	-	µg/l	1	A-T-025w
Chromium (hexavalent) (leachable) _A	-	-	-	-	-	0.05	-	mg/l	0.05	A-T-040w
Lead (leachable) _A [#]	-	-	-	-	-	3	-	µg/l	1	A-T-025w
Mercury (leachable) _A [#]	-	-	-	-	-	<0.1	-	µg/l	0.1	A-T-025w
Nickel (leachable) _A [#]	-	-	-	-	-	2	-	µg/l	1	A-T-025w
Selenium (leachable) _A [#]	-	-	-	-	-	1	-	µg/l	1	A-T-025w

Envirolab Job Number: 22/05028

Client Project Name: Huyton

Client Project Ref: 9333G

Lab Sample ID	22/05028/1	22/05028/2	22/05028/4	22/05028/5	22/05028/6	22/05028/7	22/05028/9	Units	Limit of Detection	Method ref
Client Sample No	1	2	1	2	3	1	4			
Client Sample ID	WS105	WS105	WS106	WS106	WS106	WS110	WS103			
Depth to Top	0.20	1.00	0.20	0.60	1.40	0.20	1.40			
Depth To Bottom	0.40	1.20	0.40	0.70	1.60	0.40	1.50			
Date Sampled	20-May-22	20-May-22	20-May-22	20-May-22	20-May-22	20-May-22	20-May-22			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5AE	5A	4AE	6AE	6A	4A	6A			
Sulphur, Total (leachable) _D	-	-	-	-	-	11	-	mg/l	1	A-T-024s
Vanadium (leachable) _A [#]	-	-	-	-	-	93	-	µg/l	1	A-T-025w
Zinc (leachable) _A [#]	-	-	-	-	-	3	-	µg/l	1	A-T-025w

Envirolab Job Number: 22/05028

Client Project Name: Huyton

Client Project Ref: 9333G

Lab Sample ID	22/05028/1	22/05028/2	22/05028/4	22/05028/5	22/05028/6	22/05028/7	22/05028/9	Units	Limit of Detection	Method ref
Client Sample No	1	2	1	2	3	1	4			
Client Sample ID	WS105	WS105	WS106	WS106	WS106	WS110	WS103			
Depth to Top	0.20	1.00	0.20	0.60	1.40	0.20	1.40			
Depth To Bottom	0.40	1.20	0.40	0.70	1.60	0.40	1.50			
Date Sampled	20-May-22	20-May-22	20-May-22	20-May-22	20-May-22	20-May-22	20-May-22			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5AE	5A	4AE	6AE	6A	4A	6A			
Asbestos in Soil (inc. matrix)										
Asbestos in soil _D [#]	NAD	-	NAD	NAD	-	NAD	-			A-T-045
Asbestos Matrix (visual) _D	-	-	-	-	-	-	-			A-T-045
Asbestos Matrix (microscope) _D	-	-	-	-	-	-	-			A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	-	N/A	N/A	-	N/A	-			A-T-045

Envirolab Job Number: 22/05028

Client Project Name: Huyton

Client Project Ref: 9333G

Lab Sample ID	22/05028/1	22/05028/2	22/05028/4	22/05028/5	22/05028/6	22/05028/7	22/05028/9	Units	Limit of Detection	Method ref
Client Sample No	1	2	1	2	3	1	4			
Client Sample ID	WS105	WS105	WS106	WS106	WS106	WS110	WS103			
Depth to Top	0.20	1.00	0.20	0.60	1.40	0.20	1.40			
Depth To Bottom	0.40	1.20	0.40	0.70	1.60	0.40	1.50			
Date Sampled	20-May-22	20-May-22	20-May-22	20-May-22	20-May-22	20-May-22	20-May-22			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5AE	5A	4AE	6AE	6A	4A	6A			
PAH-16MS										
Acenaphthene _A ^{M#}	0.01	-	0.69	<0.01	-	0.14	-	mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	<0.01	-	0.03	<0.01	-	<0.10	-	mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	0.03	-	1.11	<0.02	-	0.31	-	mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	0.15	-	2.16	<0.04	-	0.88	-	mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	0.15	-	1.69	<0.04	-	1.13	-	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	0.21	-	1.89	<0.05	-	1.35	-	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	0.09	-	0.80	<0.05	-	0.77	-	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	<0.07	-	0.72	<0.07	-	<0.70	-	mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	0.18	-	2.09	<0.06	-	1.30	-	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	<0.04	-	0.18	<0.04	-	<0.40	-	mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	0.26	-	5.17	<0.08	-	2.07	-	mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	<0.01	-	0.56	<0.01	-	<0.10	-	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	0.09	-	0.94	<0.03	-	0.74	-	mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	-	0.05	<0.03	-	<0.30	-	mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	0.13	-	3.73	<0.03	-	0.71	-	mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	0.25	-	4.69	<0.07	-	2.00	-	mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	1.55	-	26.5	<0.08	-	11.4	-	mg/kg	0.01	A-T-019s

Envirolab Job Number: 22/05028

Client Project Name: Huyton

Client Project Ref: 9333G

Lab Sample ID	22/05028/1	22/05028/2	22/05028/4	22/05028/5	22/05028/6	22/05028/7	22/05028/9	Units	Limit of Detection	Method ref
Client Sample No	1	2	1	2	3	1	4			
Client Sample ID	WS105	WS105	WS106	WS106	WS106	WS110	WS103			
Depth to Top	0.20	1.00	0.20	0.60	1.40	0.20	1.40			
Depth To Bottom	0.40	1.20	0.40	0.70	1.60	0.40	1.50			
Date Sampled	20-May-22	20-May-22	20-May-22	20-May-22	20-May-22	20-May-22	20-May-22			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5AE	5A	4AE	6AE	6A	4A	6A			
PAH 16MS (leachable)										
Acenaphthene (leachable) _A	-	-	-	-	-	0.06	-	µg/l	0.02	A-T-019w
Acenaphthylene (leachable) _A	-	-	-	-	-	<0.02	-	µg/l	0.02	A-T-019w
Anthracene (leachable) _A	-	-	-	-	-	0.03	-	µg/l	0.02	A-T-019w
Benzo(a)anthracene (leachable) _A	-	-	-	-	-	0.05	-	µg/l	0.02	A-T-019w
Benzo(a)pyrene (leachable) _A	-	-	-	-	-	0.03	-	µg/l	0.02	A-T-019w
Benzo(b)fluoranthene (leachable) _A	-	-	-	-	-	0.04	-	µg/l	0.02	A-T-019w
Benzo(ghi)perylene (leachable) _A	-	-	-	-	-	0.03	-	µg/l	0.02	A-T-019w
Benzo(k)fluoranthene (leachable) _A	-	-	-	-	-	<0.02	-	µg/l	0.02	A-T-019w
Chrysene (leachable) _A	-	-	-	-	-	0.06	-	µg/l	0.02	A-T-019w
Dibenzo(ah)anthracene (leachable) _A	-	-	-	-	-	<0.02	-	µg/l	0.02	A-T-019w
Fluoranthene (leachable) _A	-	-	-	-	-	0.15	-	µg/l	0.02	A-T-019w
Fluorene (leachable) _A	-	-	-	-	-	<0.02	-	µg/l	0.02	A-T-019w
Indeno(123-cd)pyrene (leachable) _A	-	-	-	-	-	0.03	-	µg/l	0.02	A-T-019w
Naphthalene (leachable) _A	-	-	-	-	-	0.07	-	µg/l	0.02	A-T-019w
Phenanthrene (leachable) _A	-	-	-	-	-	0.09	-	µg/l	0.02	A-T-019w
Pyrene (leachable) _A	-	-	-	-	-	0.14	-	µg/l	0.02	A-T-019w
Total PAH 16MS (leachable) _A	-	-	-	-	-	0.78	-	µg/l	0.02	A-T-019w

REPORT NOTES

General

This report shall not be reproduced, except in full, without written approval from Envirolab.

The results reported herein relate only to the material supplied to the laboratory.

The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.

Analytical results reflect the quality of the sample at the time of analysis only.

Opinions and interpretations expressed are outside the scope of our accreditation.

If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

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N/A indicates Not Applicable.

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Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

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EPH CWG results have humics mathematically subtracted through instrument calculation

TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921
email. ask@envirolab.co.uk

Client:	WML Construction , No 8 Oak Green, Earl Road, Stanley Green Business Park, Cheadle Hulme, Cheshire, SK8 6QL	Project No:	22/05028
Project:	Huyton	Date Received:	24/05/2022 (am)
Clients Project No:	9333G	Cool Box Temperatures (°C):	12.3

NO DEVIATIONS IDENTIFIED

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

Envirolab Analysis Dates

Lab Sample ID	22/05028/1	22/05028/2	22/05028/4	22/05028/5	22/05028/6	22/05028/7	22/05028/9
Client Sample No	1	2	1	2	3	1	4
Client Sample ID/Depth	WS105 0.20-0.40m	WS105 1.00-1.20m	WS106 0.20-0.40m	WS106 0.60-0.70m	WS106 1.40-1.60m	WS110 0.20-0.40m	WS103 1.40-1.50m
Date Sampled	20/05/22	20/05/22	20/05/22	20/05/22	20/05/22	20/05/22	20/05/22
A-T-019s	26/05/2022		26/05/2022	26/05/2022		26/05/2022	
A-T-019w						31/05/2022	
A-T-024s	30/05/2022		30/05/2022	30/05/2022		01/06/2022	
A-T-025w						31/05/2022	
A-T-026s	27/05/2022	27/05/2022	27/05/2022	27/05/2022	27/05/2022	27/05/2022	27/05/2022
A-T-026w						31/05/2022	
A-T-027s	27/05/2022		27/05/2022	27/05/2022		27/05/2022	
A-T-028s	30/05/2022		30/05/2022	30/05/2022		30/05/2022	
A-T-031s	27/05/2022	27/05/2022	27/05/2022	27/05/2022	27/05/2022	27/05/2022	27/05/2022
A-T-031w						31/05/2022	
A-T-032 OM	27/05/2022		27/05/2022	27/05/2022		27/05/2022	
A-T-040s	27/05/2022		27/05/2022	27/05/2022		27/05/2022	
A-T-040w						31/05/2022	
A-T-042sTCN	26/05/2022		26/05/2022	26/05/2022		26/05/2022	
A-T-042wTCN						31/05/2022	
A-T-044	30/05/2022	30/05/2022	30/05/2022	30/05/2022	30/05/2022	30/05/2022	30/05/2022
A-T-045	25/05/2022		25/05/2022	25/05/2022		25/05/2022	
A-T-050s	28/05/2022		28/05/2022	28/05/2022		28/05/2022	
A-T-050w						31/05/2022	

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

End of Report

FINAL ANALYTICAL TEST REPORT

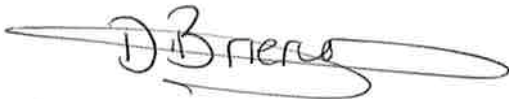
Envirolab Job Number: 22/05029
Issue Number: 1

Date: 06 June, 2022

Client: WML Construction
No 8 Oak Green
Earl Road
Stanley Green Business Park
Cheadle Hulme
Cheshire
SK8 6QL

Project Manager: Thomas Sheen
Project Name: Huyton
Project Ref: 9333G
Order No: 9333G
Date Samples Received: 23/05/22
Date Instructions Received: 24/05/22
Date Analysis Completed: 01/06/22

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 22/05029

Client Project Name: Huyton

Client Project Ref: 9333G

Lab Sample ID	22/05029/1	22/05029/2	22/05029/3	22/05029/4				Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1						
Client Sample ID	WS102	WS103	WS104	WS108						
Depth to Top	0.30	0.15	0.20	0.30						
Depth To Bottom	0.50	0.30	0.30	0.50						
Date Sampled	20-May-22	20-May-22	20-May-22	20-May-22						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4AE	5AE	4A	4A						
% Stones >10mm _A	13.1	<0.1	32.4	36.1				% w/w	0.1	A-T-044
pH _D ^{M#}	8.20	8.11	10.05	8.84				pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	<0.01	<0.01	0.22	1.04				g/l	0.01	A-T-026s
Sulphate (acid soluble) _D ^{M#}	<200	400	2100	5500				mg/kg	200	A-T-028s
Sulphur (total) _D	103	283	823	2330				mg/kg	50	A-T-024s
Cyanide (total) _A ^{M#}	<1	<1	<1	<1				mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2	<0.2	<0.2				mg/kg	0.2	A-T-050s
Organic Matter _D ^{M#}	2.5	3.6	2.6	2.0				% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	3	7	4	3				mg/kg	1	A-T-024s
Boron (water soluble) _D	<1.0	<1.0	1.0	1.1				mg/kg	1	A-T-027s
Cadmium _D ^{M#}	<0.5	0.6	<0.5	0.6				mg/kg	0.5	A-T-024s
Copper _D ^{M#}	22	49	20	11				mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1	<1				mg/kg	1	A-T-040s
Lead _D ^{M#}	18	179	137	52				mg/kg	1	A-T-024s
Mercury _D	<0.17	<0.17	1.03	0.91				mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	27	20	11	10				mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1	<1	<1				mg/kg	1	A-T-024s
Vanadium _D ^{M#}	18	22	17	18				mg/kg	1	A-T-024s
Zinc _D ^{M#}	50	120	70	104				mg/kg	5	A-T-024s
Leachate Prep NRA (10:1) _A	-	-	*	*						A-T-001
pH (leachable) _A [#]	-	-	10.57	8.75				pH	0.01	A-T-031w
Sulphate (leachable) _A [#]	-	-	36.91	509				mg/l	1	A-T-026w
Cyanide (total) (leachable) _A [#]	-	-	<0.005	<0.005				mg/l	0.005	A-T-042wTCN
Phenols (total by HPLC) (leachable) _A	-	-	<0.01	<0.01				mg/l	0.01	A-T-050w
Arsenic (leachable) _A [#]	-	-	4	3				µg/l	1	A-T-025w
Boron (leachable) _A [#]	-	-	54	85				µg/l	10	A-T-025w
Cadmium (leachable) _A [#]	-	-	<1	<1				µg/l	1	A-T-025w
Copper (leachable) _A [#]	-	-	6	1				µg/l	1	A-T-025w
Chromium (hexavalent) (leachable) _A	-	-	<0.05	<0.05				mg/l	0.05	A-T-040w
Lead (leachable) _A [#]	-	-	3	<1				µg/l	1	A-T-025w
Mercury (leachable) _A [#]	-	-	<0.1	<0.1				µg/l	0.1	A-T-025w
Nickel (leachable) _A [#]	-	-	<1	<1				µg/l	1	A-T-025w
Selenium (leachable) _A [#]	-	-	<1	<1				µg/l	1	A-T-025w

Envirolab Job Number: 22/05029

Client Project Name: Huyton

Client Project Ref: 9333G

Lab Sample ID	22/05029/1	22/05029/2	22/05029/3	22/05029/4				Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1						
Client Sample ID	WS102	WS103	WS104	WS108						
Depth to Top	0.30	0.15	0.20	0.30						
Depth To Bottom	0.50	0.30	0.30	0.50						
Date Sampled	20-May-22	20-May-22	20-May-22	20-May-22						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4AE	5AE	4A	4A						
Sulphur, Total (leachable) _D	-	-	7	96				mg/l	1	A-T-024s
Vanadium (leachable) _A [#]	-	-	29	9				µg/l	1	A-T-025w
Zinc (leachable) _A [#]	-	-	2	2				µg/l	1	A-T-025w

Envirolab Job Number: 22/05029

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Date Sampled	20-May-22	20-May-22	20-May-22	20-May-22						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4AE	5AE	4A	4A						
Asbestos in Soil (inc. matrix)										
Asbestos in soil _D [#]	NAD	NAD	NAD	NAD						A-T-045
Asbestos Matrix (visual) _D	-	-	-	-						A-T-045
Asbestos Matrix (microscope) _D	-	-	-	-						A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A	N/A	N/A						A-T-045

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Date Sampled	20-May-22	20-May-22	20-May-22	20-May-22						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4AE	5AE	4A	4A						
PAH-16MS										
Acenaphthene _A ^{M#}	<0.01	0.09	0.07	0.08				mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	<0.01	0.02	<0.01	0.13				mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	<0.02	0.14	0.08	0.22				mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	0.05	0.45	0.32	1.01				mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	0.06	0.50	0.31	1.31				mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	0.08	0.59	0.39	1.44				mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	<0.05	0.30	0.21	0.87				mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	<0.07	0.20	0.13	0.51				mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	<0.06	0.53	0.41	1.02				mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	<0.04	0.06	0.04	0.17				mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	0.09	1.04	0.63	1.90				mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	<0.01	0.06	0.04	0.06				mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	0.04	0.32	0.21	0.99				mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	<0.03	<0.03	<0.03				mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	0.07	0.52	0.40	0.64				mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	0.09	0.98	0.71	1.83				mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	0.48	5.80	3.95	12.2				mg/kg	0.01	A-T-019s

Envirolab Job Number: 22/05029

Client Project Name: Huyton

Client Project Ref: 9333G

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Depth To Bottom	0.50	0.30	0.30	0.50						
Date Sampled	20-May-22	20-May-22	20-May-22	20-May-22						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4AE	5AE	4A	4A						
PAH 16MS (leachable)										
Acenaphthene (leachable) _A	-	-	0.10	0.37				µg/l	0.02	A-T-019w
Acenaphthylene (leachable) _A	-	-	<0.02	0.07				µg/l	0.02	A-T-019w
Anthracene (leachable) _A	-	-	<0.02	0.13				µg/l	0.02	A-T-019w
Benzo(a)anthracene (leachable) _A	-	-	0.03	<0.02				µg/l	0.02	A-T-019w
Benzo(a)pyrene (leachable) _A	-	-	<0.02	<0.02				µg/l	0.02	A-T-019w
Benzo(b)fluoranthene (leachable) _A	-	-	0.03	0.02				µg/l	0.02	A-T-019w
Benzo(ghi)perylene (leachable) _A	-	-	<0.02	<0.02				µg/l	0.02	A-T-019w
Benzo(k)fluoranthene (leachable) _A	-	-	<0.02	<0.02				µg/l	0.02	A-T-019w
Chrysene (leachable) _A	-	-	0.04	0.03				µg/l	0.02	A-T-019w
Dibenzo(ah)anthracene (leachable) _A	-	-	<0.02	<0.02				µg/l	0.02	A-T-019w
Fluoranthene (leachable) _A	-	-	0.09	0.27				µg/l	0.02	A-T-019w
Fluorene (leachable) _A	-	-	0.04	0.16				µg/l	0.02	A-T-019w
Indeno(123-cd)pyrene (leachable) _A	-	-	<0.02	<0.02				µg/l	0.02	A-T-019w
Naphthalene (leachable) _A	-	-	0.06	0.06				µg/l	0.02	A-T-019w
Phenanthrene (leachable) _A	-	-	0.10	0.29				µg/l	0.02	A-T-019w
Pyrene (leachable) _A	-	-	0.10	0.20				µg/l	0.02	A-T-019w
Total PAH 16MS (leachable) _A	-	-	0.59	1.60				µg/l	0.02	A-T-019w

REPORT NOTES

General

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The results reported herein relate only to the material supplied to the laboratory.

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Soil chemical analysis:

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

EPH CWG results have humics mathematically subtracted through instrument calculation

TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921
email. ask@envirolab.co.uk

Client:	WML Construction , No 8 Oak Green, Earl Road, Stanley Green Business Park, Cheadle Hulme, Cheshire, SK8 6QL	Project No:	22/05029
Project:	Huyton	Date Received:	24/05/2022 (am)
Clients Project No:	9333G	Cool Box Temperatures (°C):	12.0

NO DEVIATIONS IDENTIFIED

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

Envirolab Analysis Dates

Lab Sample ID	22/05029/1	22/05029/2	22/05029/3	22/05029/4
Client Sample No	1	1	1	1
Client Sample ID/Depth	WS102 0.30-0.50m	WS103 0.15-0.30m	WS104 0.20-0.30m	WS108 0.30-0.50m
Date Sampled	20/05/22	20/05/22	20/05/22	20/05/22
A-T-019s	26/05/2022	26/05/2022	26/05/2022	26/05/2022
A-T-019w			31/05/2022	31/05/2022
A-T-024s	30/05/2022	30/05/2022	01/06/2022	01/06/2022
A-T-025w			31/05/2022	31/05/2022
A-T-026s	27/05/2022	27/05/2022	27/05/2022	27/05/2022
A-T-026w			31/05/2022	31/05/2022
A-T-027s	27/05/2022	27/05/2022	27/05/2022	27/05/2022
A-T-028s	30/05/2022	30/05/2022	30/05/2022	30/05/2022
A-T-031s	27/05/2022	27/05/2022	27/05/2022	27/05/2022
A-T-031w			31/05/2022	31/05/2022
A-T-032 OM	27/05/2022	27/05/2022	27/05/2022	27/05/2022
A-T-040s	27/05/2022	27/05/2022	27/05/2022	27/05/2022
A-T-040w			31/05/2022	31/05/2022
A-T-042sTCN	26/05/2022	26/05/2022	26/05/2022	26/05/2022
A-T-042wTCN			31/05/2022	31/05/2022
A-T-044	26/05/2022	26/05/2022	26/05/2022	26/05/2022
A-T-045	25/05/2022	25/05/2022	25/05/2022	25/05/2022
A-T-050s	28/05/2022	28/05/2022	28/05/2022	28/05/2022
A-T-050w			31/05/2022	31/05/2022

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

End of Report

APPENDIX 07

Ground Gas Monitoring

TEST DATE AND CONDITIONS	
Date	04/10/21
Atmospheric pressure	993mb
Ambient Temp	22.9°C
Enviroics Serial No.	2518

GAS DATA LTD
Unit 4 Fairfield court
Seven Stars Estate
Coventry
CV3 4LJ, UK
+44 (0) 24 7630 3311



GFM436-1 FINAL INSPECTION & CALIBRATION CHECK CERTIFICATE

INSTRUMENT DETAILS	
Serial No	Customer
12969	WML Consulting Ltd

INSTRUMENT CHECKS			
Keyboard	✓	Pump Flow	500cc/min
Display Contrast	✓	Pump Flow @ -200mB	300cc/min
Clock Set / Running	✓	S/W Version	G436.0027/0010
Labels Fitted	✓	Recalibration Date	04/10/22

GAS CHECKS							
Calibration Gas		Instrument Gas Channels Read					
Gas Type	Applied Conc.	CH4 (%)	tol. (% vol.)	CO2 (%)	tol. (% vol.)	O2 (%)	tol. (% vol.)
N2	100%	0.0	0.0	0.0	0.0	0.0	+/-0.1
CH4	5%	5.0	+/-0.3	0.0	0.0	0.0	+/-0.1
	60%	59.8	+/-3.0	0.0	0.0	0.0	+/-0.1
CO2	5%	0.0	0.0	4.9	+/-0.3	0.0	+/-0.1
	40%	0.0	0.0	39.7	+/-3.0	0.0	+/-0.1
O2	20.9%	0.0	0.0	0.1	+0.1	20.8	+/-0.5

OPTIONAL GAS CHECKS							
Calibration Gas		Instrument Gas Channels Read					
Gas Type	Applied Conc.	Label Range	H2S 5000ppm	CO 2000ppm		Hexane 2.00%	tol. (% vol.)
N2	100%		0	0		0	+/- 5.0
H2S	1500ppm		1500	0			+/- 5.0
CO	1000ppm		70	1002			+/- 5.0
Hexane	2.00%					1.912	+/- 10.0

TEST DATE AND CONDITIONS	
Date	04/10/21
Atmospheric pressure	993mb
Ambient Temp	22.9°C
EnviroNics Serial No.	2518

GAS DATA LTD	
Unit 4 Fairfield court	
Seven Stars Estate	
Coventry	
CV3 4LJ, UK	
+44 (0) 24 7630 3311	

GFM436-1 FINAL INSPECTION & CALIBRATION CHECK CERTIFICATE

PRESSURE CHECKS							
Calibration Pressure		Instrument Pressure Channels Read					
Pressure @	Applied Pressure	Atmospheric [Ap] (mB)	tol. (mB)				
All ports	current atmospheric	992	+/-2.0				
Ap port (internal)	+800mB(a)	801	+/-5.0				
	+1200mB(a)	1197	+/-5.0				

FLOW CHECKS					
Calibration Flow		Instrument Flow Channels Read			
Applied Flow	Applied Pressure (Pa)	Flow [Flow] (l/hour)	tol. (l/hour)	Differential Pressure [Dp] (Pa)	tol. (Pa)
-30.0 l/hour	-360	-29.2	+/-3.0	-388	+/-50
-3.0 l/hour	-16	-3.2	+/-1.0	-14	+/-6
0.0 l/hour	0	0.0	0.0	0	+/-0.5
+3.0 l/hour	14	3.1	+/-0.5	16	+/-3
+30.0 l/hour	343	29.5	+/-3.0	353	+/-50
+60.0 l/hour	1030	59.4	+/-6.0	1075	+/-130
+90.0 l/hour	2019	88.3	+/-9.0	2006	+/-250

TEMPERATURE CHECK		
Calibration Temperature	Instrument Temperature Channel Read	
Applied Equivalent Temperature	Temperature [Temp] (°C)	tol. (°C)
-10.0 °C	-10.0	+/- 2.0
0.0 °C	0.0	+/- 1.0
30.0 °C	30.0	+/- 1.0
60.0 °C	60.0	+/- 1.0
100.0 °C	100.0	+/- 1.0

Notes:

The instrument identified by the serial number stated above has been tested by Gas Data personnel for calibration accuracy on the date and under the ambient conditions stated. Gas Data Ltd internal BS EN ISO9001:2015, BS EN ISO 14001:2015 and BS EN ISO 45001:2018 compliant workshop procedures were followed to apply known calibration test gases, gas flow rates, pressures and temperatures of the values stated. The results displayed on the instrument at each stage are recorded above.

Gas Data Ltd is certified to: BS EN ISO 9001:2015
BS EN ISO 14001:2015
BS EN ISO 45001:2018

TEST DATE AND CONDITIONS	
Date	5/10/21
Atmospheric pressure	983 mb
Ambient Temp	23.4 °C
EnviroNics Serial No.	N/A

GAS DATA LTD
Unit 4 Fairfield court
Seven Stars Estate
Coventry
CV3 4LJ, UK
+44 (0) 24 7630 3311



GFM436-1 OUTWARD INSPECTION & QUALITY CHECK SHEET

INSTRUMENT DETAILS			
SO Number	Instrument Banner	Instrument Serial Number + SW Version	Job Number(s)
329344	GFM 436	12969 / 27-10	22124

Calibration Technician *[Signature]*

DATE 6-10-21

Inspection Technician *[Signature]*

DATE 5/10/21

INSTRUMENT CHECKS		Pass (P), Fail (F) or not applicable(NA)	INSTRUMENT PACKING LIST		Tick if included
Function Tests	Dust Caps Fitted	P	Instrument		✓
	Keyboard Test (All keys)	P	Leather Case		✓
	Backlight Test	P	Instrument Strap		✓
	Clock Set / Running	P	AC Battery Charger (UK)		✓
	Comms Test	P	AC Battery Charger (EURO)		X
	Pump Flow Test (In & Out)	P	AC Battery Charger (US)		X
	Overall Leak Test (30mb)	N/A	AC Battery Charger (AUS)		X
	Battery Charge Test	P	Gas Sample Pipe		✓
	Service Date set to?	4/10/22	Hard Carry Case		✓
Channel Tests	Data Logging Enabled?	P	Spares Pot		✓
	Verify CH4/LEL/Hexane/PID	P	Allen Key		X
	Verify CO2	P	Flow Sample Pipe		✓
	Verify O2	P	Temperature Probe		X
	Verify H2S	P	Vane Anemometer		X
	Verify CO	P	USB Cable		X
	Verify LEL	P	USB Memory Stick		X
	Verify 1st Option gas	N/A	SM V5 Software	Ver	X
	Verify atmospheric pressure	P	Internal Filter Pack	Qty 1	✓
	Verify differential pressure	P	External Filter Pack	Qty	X
	Verify flow	P	Field Guide		X
	Verify temperature probe input	P	Extra Items: CUSTOMER'S TOOLS - (SCREWDRIVERS, ADJUSTABLE + ALLEN KEYS).		
	Verify vane anemometer input	P			
		P			
DataBase Checks	Jobcard(s) completed and signed	P			
	Jobcard(s) booked off database	P			
	Calibration certificate completed	P			
	Complete & print QI record	N/A			
Label Checks	No. of Calibration label fitted	10723	Comments		
	MCERTS label not displayed	P			
	Warranty label fitted	P			
H2S Range	H2S Range from SO	5000 ppm			
	H2S Range from cal cert	5000 ppm			
	Over-range value correct?	P			

APPENDIX 08

Chemical Assessment Criteria

Screening Levels for “Commercial” end use assuming a 1% SOM for Hydrocarbons.

Contaminant	Screening Levels for Commercial End Use (mg/kg)
Metals	
Arsenic	640
Boron	240,000
Cadmium	190
Chromium III	8,600
Chromium VI	33
Copper	68,000
Lead*	2330
Mercury	58
Nickel	980
Selenium	12,000
Vanadium	9,000
Zinc	730,000
Non Metals	
Phenol	440
Polyaromatic Hydrocarbons (PAHs)	
Benz[a]anthracene	170
Benzo[a]pyrene	35
Benzo[b]fluoranthene	44
Benzo[ghi]perylene	3,900
Benzo[k]fluoranthene	1,200
Chrysene	350
Dibenz[ah]anthracene	3.5
Fluoranthene	23,000
Indeno[123-cd]pyrene	500
Naphthalene	190
Pyrene	54,000

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* Where not included in the S4UL's criteria for a limited number of contaminants, namely lead, have been derived by DEFRA in their document entitled SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination, April 2014.

Contaminant	Screening Levels for Commercial End Use (mg/kg)
Volatile Organic Compounds	
Benzene	27
Ethylbenzene	5,700
Toluene	56,000
M - Xylene	6,200
O - Xylene	6,600
P - Xylene	5,900
Total Petroleum Hydrocarbons	
Aliphatic C5-6	3,200
Aliphatic C6-8	7,800
Aliphatic C8-10	2,000
Aliphatic C10-12	9,700
Aliphatic C12-16	59,000
Aliphatic C16-35	1,600,000
Aliphatic C35 - 44	1,600,000
Aromatic C5 - 7	26,000
Aromatic C7 - 8	56,000
Aromatic C8-10	3,500
Aromatic C10-12	16,000
Aromatic C12-16	36,000
Aromatic C16-21	28,000
Aromatic C21-35	28,000
Aromatic C35 - 44	28,000

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* Where not included in the S4UL's criteria for a limited number of contaminants, namely lead, have been derived by DEFRA in their document entitled SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination, April 2014.

The GAC's for the assessment of potential groundwater contamination have been derived from very conservative guidelines protective of drinking water and environmental quality, namely:

- UK Environmental Quality Standards (EQS) for Freshwater, 2000;
- Petroleum Products in Drinking-water, Background document for development of WHO Guidelines for Drinking-water Quality, 2011.

Table 1: Inorganic Tier 1 Water Environment Screening Criteria

Contaminant	Units	Hardness Banding (CaCO ₃ mg/l)	EQS /WFD (Freshwater)	UK DWS
Arsenic	µg/l	-	50	10
Ammonia	mg/l	-	0.2	0.5
Boron	µg/l	-	2000	1000
Cadmium	µg/l	-	5	5
Chromium	µg/l	0-50	2	50
		50-100	10	
		100-150	10	
		150-200	20	
		200-250	20	
Copper	µg/l	0-10	0.5	2000
		10-50	0.5	
		50-200	3	
		200-250	8	
		>250	12	
Cyanide (Free)	µg/l	-	1	-
Cyanide		-	-	50
Iron	µg/l	-	1000	200
Lead	µg/l	0-50	4	10
		50-150	10	
		150-250	20	
		>250	20	
Mercury	µg/l	-	1	1
Nickel	µg/l	0-50	8	20
		50-100	20	
		100-150	20	
		150-250	40	
		>250	40	
Selenium	µg/l	-	-	10
Sulphate (SO ₄)	mg/l	-	400	250
Zinc	µg/l	0-50	8	5000
		50-150	15	
		150-250	50	
		>250	50	
pH	-	-	6-9	-

Table 2: Organic Tier 1 Water Environment Screening Criteria

Contaminant	Units	UK DWS	WHO
PAHs - The sum of • Benzo(b)fluoranthene, • Benzo(ghi)perylene, • Benzo(k)fluoranthene, • indeno(1,2,3-c,d)pyrene)	µg/l	0.1	-
Phenol (total)	µg/l	0.5	-
MTBE	µg/l	-	15
Aliphatic C5-C6	µg/l	-	15,000
Aliphatic C6-C8	µg/l	-	15,000
Aliphatic C8-C10	µg/l	-	300
Aliphatic C10-C12	µg/l	-	300
Aliphatic C12-C16	µg/l	-	300
Aliphatic C16-21	µg/l	-	(300) *
Aliphatic C21-35	µg/l	-	(300)*
Aromatic C6-C7	µg/l	1 (benzene)	10 (benzene)
Aromatic C7-C8	µg/l	-	700 (toluene)
Aromatic C8-C10	µg/l	-	300 (ethylbenzene)
Aromatic C10-12	µg/l	-	100
Aromatic C12-C16	µg/l	-	100
Aromatic C16-C21	µg/l	-	90
Aromatic C21-C35	µg/l	-	90

Notes

The WHO Guideline Values for petroleum products in drinking water have been applied in the absence of current TPH water quality standards. However, for the aromatic TPH bandings of C6-C7, C7-C8 and C8-C10, the more conservative UK specific WQS for benzene, toluene and ethylbenzene have been used.

In the absence of specific WHO Guideline Values for the aliphatic ranges C16-C21 and C21-C35, the guideline values for the aliphatic C8-C10 through to C12-C16 ranges of 300µg/l have been used. This is however considered conservative due to the increased stability and lower volatility of the longer chain aliphatics.