



GEOENVIRONMENTAL PHASE 2 SITE INVESTIGATION

**LAND AT 351 PALATINE ROAD
NORTHENDEN
GREATER MANCHESTER
M22 4FY**

REPORT PREPARED FOR

**Oliver James Construction Limited
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 PEAK ENVIRONMENTAL SOLUTIONS		Document Verification Schedule		
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1.0 INTRODUCTION

Peak Environmental Solutions Limited (PESL) has been commissioned by Oliver James Construction Limited (OJCL) to undertake a geo-environmental Phase 2 Site Investigation for a proposed mixed commercial and residential apartment building at a ~0.11 hectare plot located at 351 Palatine Road, Northenden, Greater Manchester, M22 4FY ('the site'). Oliver James are the design & build contractor for the development. The site is currently occupied by two-storey dilapidated terraced properties, with commercial units on the ground floor and residences above, and a parking/yard area to the rear. Drawings in the figures section show the site location and current layout.

The site has planning permission from Manchester City Council (MCC Ref: January 2019 121828/FO/2018) for demolition of the existing buildings and erection of:

... 'a 4 storey building to form 16 two bed apartments with one commercial unit (Class A1 to Class A4)) on the ground floor, with associated car parking, refuse and cycle stores at the rear.'

The planning permission includes Conditions 8 & 9 to address potential land contamination issues. The proposed layout is shown in the attached project drawings.

A Phase 1 investigation for the site was completed by E3P for Gustav Bonnier Holdings Limited (Ref. 13-092-r1; 2018) and was submitted to MCC in 2018 as part supporting information for planning submissions. The Phase 1 report should be referred to for a description of the site, environmental setting and historical development; summary information is included in Section 2.0 of this report.

The Phase 2 site works were undertaken in January/February 2021 and included an underground utility survey, window sample borehole drilling, shallow in-situ geotechnical testing, soil logging & sampling, gas well installation and initial monitoring for ground gas, along with laboratory analytical testing of selected soil samples. The reporting elements include an assessment of the ground conditions in relation to foundation design and updated preliminary/generic quantitative land contamination risk assessments (PRA & GQRA) for human health, controlled waters and ground gas. Appropriate conclusions and recommendations are provided for foundation design and to assist with the discharge of land contamination Conditions 8 & 9. The site investigation location were limited to the external areas in the northern and eastern parts of the site; the Phase 2 rationale and scope of works and are detailed further in Sections 2.0 to 4.0.

The Phase 2 assessment has been prepared under the umbrella framework laid out in non-statutory guidance provided by 'Land Contamination: Risk Management' (LCRM) guidance, along with R&D66:2008 ('Guidance for the safe development of housing on land affected by contamination', which is broadly applicable across all land affected by contamination). The LCRM guidance replaces CLR-11 'Model Procedures for the Management of Land Contamination'; the EA has stated that the scope, framework & purpose of LCRM remains the same as CLR-11.

The report should only be used by competent persons for its intended purpose within the planning regime; no liability is accepted for any reliance placed upon it for any other uses or for use by any other parties unless specifically agreed in writing. The report was finalised in March 2021 and should be read in the light of any subsequent changes in legislation, statutory requirements, statutory and non-statutory guidance, relevant research and industry practices. Information provided to or obtained by Peak Environmental Solutions has been relied upon in good faith. Drawings reproduced with permission. This report is subject to the our standard 2021 terms of business, our standard limitations & exceptions and the site-specific limitations & exceptions detailed in Appendix A.

2.0 SITE SUMMARY

2.1 Overview

The 2018 Phase 1 report should be referred to for a detailed description of the site and historical development. Summary details are presented to assist in placing the Phase 2 works in context.

2.2 Existing Site Layout and Setting

The approximately square shaped 0.11 hectare site is located on the eastern side of Palatine Road in Northenden, Greater Manchester, M22 4FY. Drawings in the figures section show the site location and current layout.

The site is currently occupied by vacant two-storey dilapidated brick-built terraced properties, generally with commercial units on the ground floor and residences above; these front directly onto Palatine Road. Two basements are present below the terrace row, measuring 3m by 3m and 4m by 4m. The terrace end is close to the northern boundary (within the boundary), with the terrace extending to the south. The original structure appears to have been constructed in the early 1900s.

There is a poorly surfaced parking/yard area to the rear (east) that accessed from Palatine Road via an alleyway along northern boundary. It is probable that this area was originally gardens/yards for the properties fronting onto Palatine Road.

A topographical survey provided by OJCL is included in the figures section. The ground levels along the Palatine Road frontage are at ~30.1m above Ordnance Datum (mAOD), with the rear yard area at ~30.6 mAOD (sloping gently from south to north from 30.9m down to 30.5 mAOD).

The site is surrounded on all sides by further terraced commercial & residential properties, which also appear to date back to the early 1900s or earlier.

2.3 Development Proposals

Oliver James is the design & build contractor for the proposed mixed commercial and residential development that has MCC planning permission under ref : 121828/FO/2018 (January 2019). The planning permission allows for:

Demolition of existing buildings and erection of: ... 'a 4 storey building to form 16 two bed apartments with one commercial unit (Class A1 to Class A4)) on the ground floor, with associated car parking, refuse and cycle stores at the rear.'

The planning permission includes Conditions 8 & 9 to address potential land contamination issues. The currently proposed layout is shown in project drawings in the figures section.

The preliminary (i.e. pre-Phase 2 investigation) foundation design by the OJCL appointed structural engineer allowed for deep fill trench foundations for the proposed building. The structural engineer has also provided a specification to Oliver James for the backfilling of the existing basements following demolition of the existing buildings.

It is understood that OJCL plan to strip the upper ~200 to 300mm from the existing rear yard area (and dispose of appropriately) to provide a suitable reduced level for construction of the hard cover car parking surfacing at the rear of the development. No areas of soft landscaping are understood to be proposed in the final development scheme. The requirement for any radon protection measures in the building is to be agreed by OJCL with building control.

Although outside of the remit of the Phase 2 geo-environmental works, it is also understood that OJCL did not identify any significant volumes of asbestos containing materials within the building to be demolished. The Phase 2 report will not comment further on asbestos within the building fabric.

2.4 Geology, Hydrogeology and Hydrology

The British Geological Survey (BGS) mapping indicates that the site and surrounding area should be underlain by superficial deposits comprising sand and gravel 'glaciofluvial sheet deposits'. The bedrock geology at depth comprises siltstones, mudstones and sandstones of the Triassic Tarporley Siltstone Formation (part of the Mercia Mudstone Group). From the available mapping it is difficult to determine whether there are further superficial units under the glaciofluvial deposits.

The superficial sand and gravel deposits are classified by the Environment Agency (EA) as a Secondary 'A' Superficial Aquifer indicating that they may represent a significant groundwater resource (1:50,000 mapping viewed on Magic.gov.uk). The underlying bedrock aquifer is classified as a Secondary 'B' Bedrock Aquifer and is unlikely to be an important source of potable water or groundwater, though it may provide some baseflow to rivers; this aquifer classification is typically associated with water bearing units within former EA defined 'non-aquifers'.

The EA simplified Groundwater Vulnerability mapping (also viewed on Magic.gov.uk) classifies groundwater under the site as having 'Medium to High' vulnerability.

The nearest identifiable surface watercourse on OS mapping for the area is the meandering westwards flowing River Mersey located ~200m to the northeast; the Mersey is at an elevation of ~27 mAOD. The Mersey is an EA designated 'Main River'.

Shallow groundwater is expected to be present in the sand and gravel deposits, with groundwater flow expected to be to the northeast towards the Mersey

The River Mersey nearly breached flood defences in the week before the site investigation works (due to very heavy rainfall), so shallow groundwater levels beneath the site would be expected to be relatively high during the site works. At peak, the Mersey levels at Northenden were understood to have been ~2m higher than the week before.

2.5 Contaminating Land Uses of Potential Concern

The terraced buildings on the site and on immediately adjacent land date back to the 1900s or earlier. The historical mapping in the Phase 1 suggests that prior to the 1900s the site was an orchard, with the surrounding area predominately agricultural fields prior to the 1870s.

The Phase 1 did not identify any on-site historical land use of potential concern with respect to land contamination. The Phase 1 noted the following in the report conclusions:

Made Ground deposits associated with the existing and former structures on the site are a potential source of heavy metals and PAHs.

No historical industrial activities have been identified on site which would be a potential source of hydrocarbon contamination and no evidence was identified during the site walkover.

... there is a potential for historic spillages of hydrocarbon compounds to have occurred on the site

Asbestos containing materials may be present within the building fabric of the current building on site and associated with the former structures in the eastern sector of the site. Due to the age of the building it is considered likely that ACM material will be present, therefore a pre-demolition asbestos survey will be required.

Any soluble phase contaminants identified on the site could pose a potential risk to controlled waters. The underlying Secondary A Aquifer within the drift deposits could provide a pathway for any contaminants; however given the lack of a viable receptor within influencing distance of the site a complete pollutant linkage has not been identified, therefore a low risk to controlled waters is considered. However, a detailed controlled waters risk assessment will be required to satisfy the Environment Agency.

The nature of the Made Ground is currently unknown; however any organic materials present could be a potential source of methane and carbon dioxide. Carbon dioxide and methane have associated asphyxiation and explosive risks respectively and if present the risks can be appropriately mitigated through the careful design of building structures.

Based on existing information, it is considered the site will be suitable for PE water supply pipework.

The Phase 1 did not identify any off site historical land use of potential concern with 50m. The Phase 1 noted the following in the report conclusions:

... there is a potential for historic spillages of hydrocarbon compounds to have occurred on the site, potentially associated with the scrap metal works formally located 90m east of the site.

The Phase 1 historical maps show that the scrap metal works (breakers yard) to the east was present from the late 1970s to early 1990s. It is considered unlikely that the off-site scrap metal works could have led to any on-site contamination via spillages given the distance and the long established residential areas between the site and the breakers yard. As such, the Phase 1 concerns about the scrap metal works causing spillages on the site have been discounted.

The 2018 Phase 1 report identified two small stands of potential Japanese knotweed on the northern boundary. Although invasive weeds are outside of the remit of the Phase 2 works, it is understood that a OJCL are taking specialist advice with respect to invasive weeds.

3.0 POLLUTANT LINKAGES AND PHASE 2 OBJECTIVES

3.1 Land Contamination Pollutant Linkages

Based on the findings of the Phase 1 and additional considerations, PESL has identified the following relevant land contamination pollutant linkages (RPLs) that require further assessment/confirmation:

Future on-site Commercial Workers and Apartment Residents

RPL-1. Contaminant exposure in external site areas via soil/dust ingestion, dermal contact and indoor dust inhalation from contaminants in exposed shallow soils.

Expected to be Low Risk Due to site History and proposed Hard Cover

RPL-2a. Risks to proposed building from ground gases including methane & carbon dioxide from made ground and natural sources.

Expected to be Low to Moderate Risk Due to Site History and Site Geology

RPL-2b. Risks to proposed building from VOC vapour intrusion by from volatile organic contaminants sources under or close to the proposed building footprint.

Expected to be Low Risk due to Site History

Controlled Waters (Groundwater & Surface Water)

RPL-3. Risk to controlled waters posed by site contaminants.

Expected to be Low Risk Due to Site History, Geology, Hydrogeology and Hydrology

Buildings, Building Materials and Services (BBM&S)

RPL-4. Direct contact of BBM&S (including below ground water pipework) with shallow contaminant sources following redevelopment.

Expected to be Low to Moderate Risk due to Site History

The adopted qualitative risk assessment matrix is provided in Appendix B. Very low to low risks are considered acceptable for the redeveloped site use.

3.2 Land Contamination Objectives

To provide site data to help assess and/or confirm the expected significance of the potential risks posed by RPLs 1 to 4, the land contamination objectives of the investigation works were to:

1. Identify the shallow ground conditions in the rear and side alley area, especially with respect to the presence/absence of significant made ground/waste materials and impact to natural soils (relevant to all RPLs).
2. Install wells to allow ground gas monitoring (relevant to RPL 2a).
3. Provide data for the competition of appropriate risk assessments for RPLs 1-4
4. Provide data and risk assessments to assist with the scoping/timing of any required further investigation works and, if required, with the production of a land contamination Remedial Strategy (RemStrat).
5. Provide other relevant recommendations/suggestions, as required.

The borehole locations were in the rear yard and side alley area as the existing building was still in place. This does mean that ground conditions beneath the majority of the proposed building footprint have not been investigated and ground conditions and soil quality under the proposed building will have to be inferred from the available locations.

3.3 Geotechnical Objectives

The preliminary foundation design by the OJCL appointed structural engineer allowed for deep trench fill foundations. The geotechnical objectives of the Phase 2 works were to provide site data and a foundation assessment to support the preliminary trench fill foundation design by targeting site soils at five locations to depths of ~ 3m to 4m with SPT at ~1m intervals.

Ground conditions directly beneath the proposed building footprint have not been investigated as the existing building was still in place and ground conditions under the proposed building footprint have been inferred from the available locations.

It was known that if shallow (<3m) ground conditions suitable for a deep trench fill foundation solution were not identified, that additional investigation works may be required if a deeper engineered foundation solution was to be considered by the structural engineer.

The geotechnical elements of the Phase 2 also included sulphate and pH laboratory testing of soil for the purposes of buried concrete specification and groundwater observations with respect to excavation groundwater control.

The structural engineer has provided a specification to OJCL for the backfilling of the existing basements following building demolition.

4.0 SITE INVESTIGATION DETAILS

4.1 Overview and Scope of Works

The Phase 2 Investigation was designed to: (i) assess shallow ground conditions at the site, (ii) quantify potential land contamination issues identified by the Phase 1 report; (iii) provide a report to assist with planning condition discharge within the town and country planning regime; and (iv) provide data and assessment to assist with foundation design.

Details of the site investigation are presented in the following sections. Third party information has been referenced in the report or reproduced in the Appendices where appropriate, with additional references listed in Section 9.0.

The site investigation was based around window sampling at locations across the site, soil logging in general accordance with BS5930, well installation, initial gas monitoring and a laboratory soil chemical analysis programme. The investigation was primarily completed to identify the extent, thickness, physical nature and chemical quality of shallow soils, made ground and immediately underlying natural deposits.

4.2 Underground Service Location

A desktop search of utility plans was provided to PESL by OJCL.

A service avoidance survey of the investigation locations was completed on the 25th January 2021 by Avoin Maa Limited. The utility survey included utilisation of radio detection equipment and ground penetrating radar to identify underground services within the investigation areas. No excavations were completed close to known or suspected services. No underground services were encountered during the intrusive investigation.

The underground utility information provided in this report and presented in drawings must not be relied upon without proper due diligence taking into account guidance provided by HSE HSG47 (currently 2014: 3rd Edition).

4.3 Window Sampling and Monitoring Wells Installation

Borehole drilling was undertaken at five locations (BH-1 to BH-5) on the 29th January 2021 using a tracked window sampling mini-rig operated by a specialist drilling crew. The locations were selected based on the access to external areas, proposed development layout, site coverage and underground service locations. Borehole locations are shown in Figure 2.

The boreholes were advanced to a depths of between 3.0m and 5.5m below ground level (mbgl) under the instruction of the PESL site engineer. During drilling, the ground conditions were logged by the PESL engineer in general accordance with BS 5930. Notes on the presence of groundwater, sample recovery and visual evidence of potential ground contaminants were also recorded on the borehole logs. In-situ standard penetration testing (SPT) was completed at nominal 1m intervals in the boreholes.

Three boreholes (BH-2, BH-4 & BH-5) were completed as nominal 50mm internal diameter gas monitoring wells to depths of ~2.0 to 2.5 mbgl. Collapse of the window sample boreholes due to granular saturated soils prevented deeper well installation.

The logs, including well completion details and SPT/N-Values are presented in Appendix C, along with photographs. Approximate elevations (as mAOD) are provided on the logs, with the surface elevations estimated from the site topographical survey provided by OJCL.

4.4 Soil Sampling

Selected soil samples were recovered from the boreholes and submitted for chemical analysis at a UKAS accredited laboratory. All samples were placed in laboratory-supplied containers, labelled with a unique ID, date, location and depth and stored in cooler boxes. The soil samples were shipped to the laboratory by a laboratory arranged courier under chain of custody documentation.

4.5 Laboratory Analytical Suites

The analytical schedule included a range of potential brownfield-land contaminants. Five shallow soil samples (identified as likely worst-case with respect to potential for contamination) were selected from the boreholes and submitted for laboratory analysis. The adopted analytical testing schedule to characterise potential soil contaminants included:

-)] TPH: banded fractions total petroleum hydrocarbons C6 to C35
-)] Speciated PAH: Sixteen 'priority' polycyclic aromatic hydrocarbons
-)] Other organics testing: total monohydric phenols, total organic carbon (TOC)
-)] Arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, vanadium, zinc
-)] General inorganics: pH, total cyanide, total sulphate, water soluble sulphate
-)] Asbestos screen: Identifying the presence of asbestos and if present, assessment of type

Four additional soil samples were analysed solely for pH, water soluble sulphate & total sulphate.

The laboratory test certificate is presented in Appendix D.

4.6 Ground Gas Monitoring

Preliminary gas monitoring was undertaken in BH-2, BH-4 and BH-5 on two occasions during February 2021 (Round-1: 4th Feb; Round-2: 17th Feb). The following parameters were measured:

-)] Gas flow rate (litres/hour)
-)] Methane, carbon dioxide and oxygen: percentage concentration
-)] Carbon monoxide and Hydrogen sulphide: ppm concentration
-)] Water level and well depth (mbgl)
-)] Atmospheric pressure

Further gas monitoring is to be undertaken and will be reported under separate cover.

5.0 INVESTIGATION RESULTS

5.1 Ground and Groundwater Conditions

The borehole locations are shown in Figure 2, with the borehole logs, including well completion details & SPT values, and photographs presented in Appendix C. The investigation locations were restricted to the rear yard and side alley areas.

Near surface ground conditions generally comprised a thin (up to 0.5m) layer of made ground generally consisting of sandy/gravelly CLAY or clayey gravelly sand, with degraded tarmac surfacing in BH-1 to BH-4. No significant made ground (>1m thick) or any waste materials were identified in the boreholes.

The thin layer of made ground was underlain by a 0.4m to 1.1m thick upper layer of superficial deposits comprising sandy/gravelly CLAY. The upper layer was soft to very soft in BH-1, BH-3 & BH-4 and firm in BH-2. These deposits are interpreted to be either part of the fluvioglacial sheet deposits or unmapped alluvium (note: superficial deposits <1m thick may not show up on the BGS mapping). Note: this layer may be absent in BH-5, although the 0.5m thick layer of clayey materials identified as 'made ground' may be 'reworked' superficial deposits.

Beneath the upper clay layer was a 1.3m to 2.2m thick layer of granular superficial deposits comprising layers of very sandy GRAVEL (sometimes slightly clayey), slightly clayey SAND and slightly gravelly coarse SAND. These were generally wet below 1.5m to 2m (see previous notes about heavy rain prior to site works). These deposits are interpreted as being part of the expected fluvioglacial sheet deposits.

In all boreholes, the superficial deposits were underlain by weathered siltstone/mudstone bedrock interpreted to be part of the Tarporley Siltstone Formation. These weathered deposits were generally encountered as slightly clayey fine SAND and/or slightly sandy slightly gravelly CLAY (see logs for specific details).

The top of the weathered bedrock was encountered at depths of 2.5m to 2.9m; this approximates to an elevation range of around 27.5 to 28.0 mAOD. The boreholes were taken to rig refusal in BH-1, BH-3, BH-4 and BH-5, suggesting that (as expected) the bedrock is becoming less weathered with depth (see the logs for the SPT results).

5.2 Groundwater Conditions

Groundwater strikes were observed during drilling on 29th January 2021 as damp or wet sands/gravels from depths of ~1.5m to 2m. A shallower perched water strike was also noted during drilling in BH-2 at 0.9m. The drilling suggests that the bedrock is not significantly water bearing.

The three gas monitoring wells were installed to depths of ~2.0m to 2.5 mbgl; collapse of the window sample boreholes due to granular saturated soils prevented deeper well installation (note: the wells being shallower is preferable for gas monitoring purposes, as gas wells should ideally not penetrate significantly below the water table).

Groundwater was present near the base of the wells in monitoring Round-1 (4th Feb 2021) in BH-4 & BH-5, at depths below the strikes observed during drilling in late January 2021. In BH-2, the water level was much shallower at around 1.1m (reading checked a number of times), which is consistent with the shallow perched water strike noted during drilling.

By Round-2 (17th Feb 2021) all the wells were dry (groundwater >2.5m), indicating that water levels had continued to drop since the drilling in late January 2021. This is not unexpected given the exceptional levels of rain the week before the drilling; this rainfall appears to have raised shallow groundwater levels (and led to an even shallower perched water in BH-2).

The observations indicate that (as would be expected) the shallow groundwater in the granular superficial deposits responds quickly to rainfall and could be as shallow as 1m locally after extended periods of heavy rainfall (but would fall relatively quickly). It would not be unexpected for the shallow groundwater to be very limited (i.e. for there to be a very thin saturated thickness) during very dry periods as the top of the bedrock is at relatively shallow depths of 2.5m to 2.9m.

5.3 Evidence of Potential Contamination

No visual evidence or olfactory to suggest the presence of significant ground or groundwater contamination was identified during the borehole drilling. No visible fragments of potential asbestos containing materials were identified in shallow made ground soils.

5.4 Laboratory Results

Selected samples from the site investigation were submitted for a range of organic/inorganic chemical analysis and geotechnical testing. The soil chemical testing results are summarised in Tables 1 to 3. The analytical certificate is provided in Appendix D.

5.5 Gas Monitoring Results

The ground gas monitoring results to date are presented in Table 4.

Table 1: Soil Analysis for Metals Cyanide, TOC, Phenols, PAH and TPH in mg/kg

Location	LOD	BH-1 D1	BH-2 D1	BH-3 D1	BH-4 D1	BH-5 D1
Depth (mbgl)		0.3m	0.6m	0.5m	0.2m	0.25m
Lithology		Made Ground	Alluvium	Alluvium	Made Ground	MG/Alluvium
Arsenic	1	9.4	7.7	8	31	22
Cadmium	0.2	0.6	< 0.2	< 0.2	< 0.2	1.3
Chromium	1	31	15	17	19	18
Copper	1	54	22	27	72	62
Lead	1	110	48	34	210	220
Mercury	0.3	< 0.3	< 0.3	< 0.3	< 0.3	4.2
Nickel	1	20	13	14	23	20
Selenium	1	< 1	< 1	< 1	< 1	< 1
Vanadium	1	52	20	20	35	27
Zinc	1	190	59	49	360	260
Total Cyanide	1	< 1	< 1	< 1	< 1	< 1
Total Organic Carbon (%)	0.1%	1.4	0.7	1.1	1.9	1.7
Total Phenols (monohydric)	1	< 1	< 1	< 1	< 1	< 1
Naphthalene	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	0.05	0.2	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	0.05	0.78	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	0.05	1	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	0.05	8.9	< 0.05	< 0.05	0.64	0.26
Anthracene	0.05	3.4	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	0.05	19	< 0.05	< 0.05	1.2	0.74
Pyrene	0.05	17	< 0.05	< 0.05	1.2	0.73
Benzo(a)anthracene	0.05	14	< 0.05	< 0.05	0.93	0.52
Chrysene	0.05	9.2	< 0.05	< 0.05	0.71	0.47
Benzo(b)fluoranthene	0.05	14	< 0.05	< 0.05	1.1	0.65
Benzo(k)fluoranthene	0.05	4.1	< 0.05	< 0.05	0.25	0.32
Benzo(a)pyrene	0.05	11	< 0.05	< 0.05	0.79	0.5
Indeno(1,2,3-cd)pyrene	0.05	5.4	< 0.05	< 0.05	0.46	0.29
Dibenz(a,h)anthracene	0.05	1.4	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	0.05	5.7	< 0.05	< 0.05	0.55	0.39
Speciated Total 16 PAHs	0.8	115	< 0.8	< 0.8	7.79	4.87
TPH (C6 - C8)	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10)	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	4	36	< 4.0	< 4.0	< 4.0	< 4.0
TPH (C16 - C21)	1	200	< 1.0	< 1.0	9.7	8.4
TPH (C21 - C35)	1	1,200	< 1.0	< 1.0	17	19
TPH Total C6 - C35	10	1,400	< 10	< 10	27	28

Notes: LOD = Limit of Detection

Table 2: Sulphate & pH Analysis Results

Sample Location	Depth (mbgl)	pH (units)	Total Sulphate as SO ₄ (mg/kg)	Water Soluble SO ₄ 16 hour extraction 2:1 leachate equivalent (g/l)
BH-1 D1	0.3	8.2	1,000	0.13
BH-1 D2	1.8	6.2	260	0.042
BH-1 D3	3.6	8.3	220	0.019
BH-2 D1	0.6	7.4	290	0.022
BH-3 D1	0.5	7.3	250	0.012
BH-4 D1	0.2	7.2	520	0.008
BH-5 D1	0.25	7.6	540	0.11
BH-5 D2	1.5	8.0	100	0.031
BH-5 D3	2.9	8.3	100	0.014

Table 3: Asbestos Analysis Results

Sample Location	Depth (mbgl)	Asbestos in Soil	Asbestos Type	Stage 2 Quantification
BH-1 D1	0.3	Not Detected	n/a	n/a
BH-2 D1	0.6	Not Detected	n/a	n/a
BH-3 D1	0.5	Not Detected	n/a	n/a
BH-4 D1	0.2	Not Detected	n/a	n/a
BH-5 D1	0.25	Not Detected	n/a	n/a

Table 4: Summary of Gas Monitoring Results to Date

Borehole	Date	Flow (l/hr)	CH ₄ (%)	CO ₂ (%) (CO in ppm)	O ₂ (%)	Atmospheric (mbar)	Water Depth (mbgl)
BH-2 Well: 50mm TD: 2.5	4/2/2021	0.0 (<0.05)	0.0 (<0.05)	0.2	20.4	1006	1.12
	17/2/2021	0.0 (<0.05)	0.0 (<0.05)	0.1	20.7	1003	Dry
BH-4 Well: 50mm TD: 2.25	4/2/2021	0.0 (<0.05)	0.0 (<0.05)	5.5	11.3	1006	2.17
	17/2/2021	0.0 (<0.05)	0.0 (<0.05)	6.6	11.3	1003	Dry
BH-5 Well: 50mm TD: 2.5	4/2/2021	0.0 (<0.05)	0.0 (<0.05)	5.2	13.0	1006	2.24
	17/2/2021	0.0 (<0.05)	0.0 (<0.05)	4.7	15.3	1003	Dry
Readings: Peak/Steady are the same unless noted. Measured reading provided, with effective detection limit shown in bracket where appropriate. Well diameter is nominal. TD = approximate total well depth;							
Carbon monoxide (CO) and Hydrogen Sulphide (H ₂ S) concentrations <1 ppm(v) unless stated.							
R1. Pressure reasonably stable over ~24 hours							
R2. Pressure starting to fall over previous 24 hours							

6.0 GENERAL GEOTECHNICAL CONSIDERATIONS

6.1 Foundation Conditions

The ground conditions directly beneath the proposed building footprint have not been investigated and have been inferred from the available locations.

The allowable bearing capacity is a function of the foundation configuration, depth and the ability of the structure to tolerate such movements and should be validated during detailed design. The investigation in the rear yard and side alley areas indicates the shallow ground conditions provided by the superficial deposits varies laterally across the site (and is again likely to vary under the proposed building footprint) and this should be considered in the chosen foundation solution. The identified thin made ground, if it continues under the proposed footprint, is not suitable for founding upon.

A deep trench fill foundation design was the preliminary preferred foundation solution for the development, providing the encountered ground conditions were suitable. The geotechnical objectives were to provide site data and a foundation assessment to support the preliminary foundation design by targeting soils at five locations to depths of ~3-4m with SPT at ~1m intervals.

The Phase 2 works suggest that excavations into the sands/gravels are likely to become unstable at shallow depths and that the encountered cohesive superficial soils (assumed to be alluvium) above the sands/gravels are likely to provide low bearing capacities. Where foundations would span different materials, precautions would be required to limit potential differential settlement and protect adjacent structures.

Given the encountered variable shallow soil conditions (and depending on the structure loadings), a deep foundation solution such as piles may be required; a deep foundation solution is likely to found within the underlying mudstone bedrock strata. The advice of a specialist piling/ground improvement contractors will be required to confirm that ground conditions are suitable for these techniques.

The presence of the existing/former below ground structures, i.e. old foundations, basements and drainage/service runs, may also require foundations to be deepened locally to found in suitable natural strata. If a greater allowable bearing capacity is required, then foundations will be required to be found at greater depth and further investigation is likely to be required to confirm the deeper ground conditions. The structural engineer has provided a specification to OJCL for the backfilling of the existing basements following building demolition.

Structures located near existing or proposed new trees should have their foundations sited below any root growth zone; the NHBC Standards Chapter 4.2 '*Building Near Trees*' gives guidance on foundation criteria, depths and construction. All services will also have to be similarly protected. Where service trenches cross the site, foundations should be placed below a line drawn up at 45° from the base of any service excavations.

There is evidence of a relatively shallow water table beneath the site, that may become very shallow after heavy rainfall. Pumping and side support may be required to maintain stable, dry conditions in excavations into site soils.

6.1.1 Buried Concrete

Tests to determine the water-soluble sulphate content of soils yielded values in the range of 0.008 to 0.13 g/l. These can be compared to the level of 0.5 g/l suggested by BRE 2005 Special Digest 1 (BRE SD1) as the level above which special precautions to protect buried concrete from sulphate attack in natural ground may be appropriate. The measured pH values in site soils were in the range 7.2 to 8.3 indicating normal soil conditions and that strongly acidic conditions are not present. The site would not be classified as 'brownfield' under the meaning adopted in BRE Special Digest 1 (*'sites that might contain chemical residues produced or associated with industrial production'*).

Given the site data and encountered ground conditions, it is considered that the natural soils at the site may be classified as exhibiting Class DS-1/AC-1 conditions as per BRE SD1. Further guidance with regard to the design of buried concrete can be found in BRE SD1.

6.1.2 General

Further considerations with respect to the geotechnical findings are discussed in Section 8.0.

7.0 LAND CONTAMINATION RISK ASSESSMENT

7.1.1 Generic Human Health Risk Assessment

7.1.2 Selection of HHACs

To assess the potential significance of the long-term risks to human health posed by substances identified in shallow site soils, a human health GQRA has been undertaken to compare soil data with relevant reference human health assessment criteria (HHACs). If representative concentrations are considered to be significantly above the selected relevant HHACs, then this would normally trigger further appropriate actions, such as additional investigation, further consideration or risk assessment and/or remediation/mitigation.

Relevant soil HHACs can be selected from the following UK resources/references:

-)] 2015 LQM/CIEH GACs: 'suitable for use levels' (S4UL); latest revision August 2015
-)] Current EA/DEFRA GACs: 'soil guideline values' (SGV)
-)] 2009 EIC GACs; published by CL:AIRE
-)] DEFRA funded C4SLs; revised December 2014
-)] *References provided in Section 9.0*

The SGVs, GACs, S4UL, C4SLs have been calculated within the broad contaminated land exposure assessment (CLEA) methodology framework, with amendments to the CLEA approach adopted within the S4UL and C4SL methodologies. These reference-based HHACs are typically used within a tiered risk assessment as an initial means to evaluate the likely significance of long term human health risk posed by substance of concern concentrations identified in site soils.

The HHACs are provided for a number of standard land use scenarios and the commercial/industrial use and the residential use (without consumption of home-grown produce [HGP]) have been adopted for the site. These are the best available standard fits for the combined mixed commercial and residential apartment use (with no private gardens).

The available GACs (which include SGVs & S4ULs) are scientifically based screening criteria derived using the Agency CLEA computer model in accordance with the CLEA framework. Should soil concentrations be at or below a GAC relevant to the land use, then the long term health risks should be considered minimal/tolerable. The 2015 S4ULs have been adopted in preference to SGVs as the S4ULs reflect appropriate recent changes to toxicological profiles and exposure conceptual model amendments.

The C4SLs for the Part 2A contaminated land regime have also been published for a number of soil contaminants and land uses and these provide additional soil screening criteria that may be used appropriately within the town and country planning regime. The published C4SLs (and range of provisional C4SLs detailed in the C4SL document appendices) provide criteria that should lie within Category 4, but would be expected to be generally closer to the Category 3/4 boundary than 'low/minimal risk' GACs, i.e. the C4SL describe a 'low' level of risk and are intended to provide a 'higher simple test' for deciding whether land is suitable for use under the planning regime and definitely not Contaminated Land under Part 2A.

Where available, the 2015 S4ULs have generally been adopted in preference to the published C4SL (with C4SL shown for information where relevant) as the S4ULs reflect a lower ('minimal/tolerable' versus 'low') level of risk compared to the C4SL. For lead, the C4SLs has been adopted given the absence of a current published UK reference GAC.

The adopted HHAC are presented in Table 5 for a 1% SOM (soil organic matter) in line with the majority of the analysis results for total organic carbon (TOC) and are reported to two/three significant figures. The HHACs selected from the C4SLs are for a 6% SOM soil (the official published values). All of the analytical results have been included in the initial data screening with no consideration of sampling depth, location or lithology.

For TPH, the lowest HHAC for representative fractions has been selected for comparison. For PAHs, Public Health England (Ref: 2017/2010) recommend the use of a coal tar benzo-a-pyrene (BaP) surrogate marker approach for assessing carcinogenic/genotoxic risks posed by 8 of the 16 PAHs in soils, but only where there is sufficient confidence that the PAH profile was sufficiently similar to that of coal tar. The eight genotoxic PAHs are: benzo-a-anthracene, BaP, benzo-b-fluoranthene, benzo-ghi-perylene, benzo-k-fluoranthene, chrysene, dibenzo-ah-anthracene and indeno-123-cd-pyrene (8-PAHs). Given the historical site use, the coal tar surrogate approach is probably not appropriate and individual HHACs have also been provided for the eight genotoxic PAHs in addition to the BaP coal tar surrogate.

The asbestos 'GAC' (minimal risk level) been taken as 'not-identified' or <0.001% where quantified (providing there are no visible fragments of potential asbestos containing materials). The selected phenol HHAC considers potential acute risk exposures. Total Sulphate, pH and TOC are not of concern for chronic human health and do not require HHACs.

For cyanide species, easily liberatable (free) cyanide is the primary cyanide species of concern. Where both easily liberatable (free) and total cyanide results are available, only easily liberatable (free) cyanide results would normally be compared against the HHAC. Where only total cyanide results are available, using the cyanide HHAC is considered very conservative as it is based on acute risks posed easily liberatable (free) cyanide. The cyanide HHACs are based on a precautionary approach for acute risk using the EA/DEFRA Tox-5 free (easily liberatable) toxicological data and CLEA receptor weight. The acute risk HHAC assumes intake of a 3 g soil bolus containing the equivalent of the Tox 5 TDSI (TDI less MDI by kg body weight). The acute risk HHAC is then given by $TDSI \times body\ weight / (soil\ intake\ (kg/day))$, with necessary adjustment for a child receptor for the residential land use.

It is important that the HHACs are used carefully when comparing with site data and that their use appropriately takes into account the adopted sampling strategy. The HHACs are typically compared to average or representative source/averaging-area concentrations, rather than maximum or isolated elevated/peak levels. Where a HHAC represents a very low concentration (e.g. near to or less than method detection limit), due consideration should be given to adopting the method detection limit or other practical/pragmatic target as the HHAC. Background levels in the area may also need to taken into account when using the HHAC.

The references for the adopted HHACs are presented in Section 9.0. A comparison of the site analytical data with the adopted HHAC is presented in Table 5.

Table 5: Comparison of Soils Data with Adopted HHACs in mg/kg

Substance	No	HHAC Commercial	HHAC Residential (No HGP)	Source	Data Comparison
Arsenic	5	S4UL/C4SL 640	40	S4UL/C4SL	All <HHAC
Cadmium	5	S4UL 11; C4SL 410	85	S4UL/C4SL	All <HHAC
Chromium	5	8,600	910	S4UL	All <HHAC
Copper	5	>50,000	7,100	S4UL	All <HHAC
Lead	5	C4SL 2,300	310	C4SL	All <HHAC
Inorganic Mercury	5	1,100	56	S4UL	All <HHAC
Nickel	5	980	180	S4UL	All <HHAC
Selenium	5	12,000	430	S4UL	All <HHAC
Vanadium	5	9,000	1,200	S4UL	All <HHAC
Zinc	5	>50,000	40,000	S4UL	All <HHAC
Total Cyanide	5	100	26	Acute	All <HHAC
Total Phenols	5	440	440	S4UL	All <HHAC
Asbestos	5	Not Detected	Not Detected	See Text	All <HHAC
Naphthalene	5	190	2.3	S4UL	All <HHAC
Acenaphthylene	5	>50,000	2,900	S4UL	All <HHAC
Acenaphthene	5	>50,000	3,000	S4UL	All <HHAC
Fluorene	5	>50,000	2,800	S4UL	All <HHAC
Phenanthrene	5	2,200	1,300	S4UL	All <HHAC
Anthracene	5	>50,000	31,000	S4UL	All <HHAC
Fluoranthene	5	23,000	1,500	S4UL	All <HHAC
Pyrene	5	>50,000	3,700	S4UL	All <HHAC
Benzo(a)anthracene	5	170	11	S4UL	1 @ 14 mg/kg
Chrysene	5	350	30	S4UL	All <HHAC
Benzo(b)fluoranthene	5	44	3.9	S4UL	1 @ 14 mg/kg
Benzo(k)fluoranthene	5	1,200	110	S4UL	All <HHAC
Benzo(a)pyrene	5	35	3.2	S4UL	1 @ 11 mg/kg
Indeno(1,2,3-cd)pyrene	5	500	4.5	S4UL	1 @ 5.4 mg/kg
Dibenz(a,h)anthracene	5	3.5	0.31	S4UL	1 @ 1.4 mg/kg
Benzo(ghi)perylene	5	>50,000	360	S4UL	All <HHAC
BaP Coal Tar		S4UL 15; C4SL 77	S4UL 0.79; C4SL 5.0	S4UL/C4SL	1 @ 11 mg/kg
TPH C6-C8 (as aliphatic C5-7)	5	7,800	42	S4UL*	All <HHAC
TPH C8-C10 (as aliphatic C8-10)	5	2,000	27	S4UL*	All <HHAC
TPH C10-C12 (as aliphatic C10-12)	5	9,700	130	S4UL*	All <HHAC
TPH C12-C16 (as aliphatic C12-16)	5	36,000	1,100	S4UL*	All <HHAC
TPH C16-C21 (as aliphatic C16-21)	5	28,000	1,900	S4UL*	All <HHAC
TPH C21-C35 (as aliphatic C21-35)	5	28,000	1,900	S4UL*	All <HHAC

Notes: * Analysis results have been compared against the aliphatic OR aromatic HHAC, whichever is lower; DL = Detection Limit >50,000 mg/kg HHAC: it is not considered credible to quote HHAC in excess of 50,000 mg/kg (0.5% w/w).

7.1.3 Data Comparison with HHACs

Table 5 presents a comparison of the analytical data against the adopted HHACs. The screening shows that almost all of the levels of the potential contaminants identified in site soils are at concentrations lower or equal to the adopted HHAC.

One sample of the made ground from BH-101 at 0.3 mbgl was found to some concentrations of selected PAHs (probably associated with ash or tarmac residues) above the residential use HHACs.

Recommendations for the protection of future site occupants with regard to potential exposure to existing site soils are presented in Section 8.0.

7.1.4 Controlled Waters Risk Assessment

Concentrations of soluble/mobile contaminants significantly above expected typical background levels have not been identified in the samples and there was no field evidence to indicate significant ground or groundwater contamination.

Potential risks to controlled waters posed by the identified ground conditions and soil quality is considered to be very low to low (acceptable risk). No further assessment of the potential impacts to controlled waters is considered necessary to facilitate development at the site.

7.1.5 Building Envelope Gas Risk Assessment

Significant thicknesses of made ground, waste deposits or natural organic soils (such as peat) may represent a potential hazard to site buildings as a result of biodegradable components producing of gases including methane and carbon dioxide.

The identified very limited made ground, the lack of identified in-ground wastes and the natural site soils are considered to represent negligible potential sources of hazardous ground gases (methane and carbon dioxide). Significant thickness made ground materials of concern (with respect to ground gas) are not considered likely to be present beneath the existing buildings that have been in place for ~120 years.

The two rounds of gas monitoring undertaken to date identified:

-)] Non-detectable flow rates (<0.05 l/hour)
-)] Methane concentrations below detection limit (<0.05% v/v)
-)] Steady/Peak CO₂ concentrations of 4.7 to 6.6% v/v in BH-4 & BH-5
-)] Steady/Peak CO₂ concentrations of up to 0.2% v/v in BH-2
-)] Depleted O₂ concentrations of 11.3 to 15.3% v/v in BH-4 & BH-5
-)] A 'worst-case check' (BS8485:2015+A1:2019) Gas Screening Value (GSV) of 0.0033 l/hour

The preliminary worst-case-check provides a GSV of 0.0033 l/hour that suggests a Site Characteristic Situation CS-1 (very low hazard potential, where the GSV is <0.07 l/hour). Further monitoring is to be undertaken and will be reported under separate cover.

If the further monitoring confirms similar ground gas conditions, then no specific measures to protect the proposed building from ground gas are likely to be warranted. The identified CO₂ and depleted O₂ levels are considered to be associated with the natural soil/groundwater conditions and should not be considered unusual, and as such, should not be of concern.

7.2 Updated Risk Evaluation

And updated risk evaluation taking into account the findings of the Phase 1 and Phase 2 works is presented in Table 6, including generalised recommended next steps (if any) and/or approach.

The risk evaluation confirms the expected Very Low to Low risks for RPLs 1 to 4. The land contamination conclusions and recommendations are provided in Section 8.0.

Table 6: Updated Risk Evaluation for Redeveloped Use

Active RPL	Source	Sensitive Receptor	Pathway		Risk Evaluation without Additional Mitigation	Recommended Next Steps and/or Approach
RPL-1	Substances in Site Soils	Human Health Site Workers & Residents	Shallow Soils	Soil/dust Ingestion & dermal contact	Very Low No Active Pathways as Site all Hard Cover Generic Assessment Undertaken	Use proposed Hard Cover Adopt a ‘Discovery Strategy’ Appropriate Contractor RAMS Proposed shallow strip in rear yard No Additional Mitigation Required
RPL-1 & 2b				Indoor dust inhalation of tracked back soil		
				Outdoor Inhalation of soil dusts		
Outdoor Inhalation of VOC vapours						
RPL-3			Deeper Soils	Indoor Inhalation of VOC vapours	Very Low No VOCs Identified (via TPH) VOC sources very unlikely	
				Outdoor Inhalation of VOC vapours		
		Controlled Waters Superficial Aquifer	Recharge via surface infiltration Lateral groundwater flow	Very Low to Low Qualitative Assessment		
RPL-4		BBM&S Building materials Water pipes	Aggressive ground conditions impairing building material performance, including compromising below ground potable water pipes	Very Low to Low Qualitative Assessment	Appropriate material specification via Contractor & Building Control Adopt a ‘Discovery Strategy’ Water pipework to Utility Company requirements No Additional Mitigation Required	
RPL-1	Asbestos in Made Ground	Human Health Site Workers & Residents	Shallow Exposed Soils	Inhalation of fibres released from soils (ingestion a minor exposure pathway)	Very Low No Active Pathway as Site all Hard Cover No Asbestos Identified in soil Very Thin Made ground Generic Assessment Undertaken	Use proposed Hard Cover Adopt a ‘Discovery Strategy’ No Additional Mitigation Required
RPL-2a	Ground Gas	BBM&S (Human Health) Ground Gas risk to building	Asphyxiation & explosion risks from accumulation in buildings & services		Preliminary Assessment Very Low Hazard	Complete addition Monitoring Provide Final Gas Assessment in separate letter report
RPL-2b	VOC Vapours	BBM&S (Human Health) VOC vapour risk to building	VOC vapour intrusion into buildings & services		Very Low No VOCs Identified (via TPH) VOC sources very unlikely	As above for RPL-1 & RPL-3
Notes: RAMS = Risk Assessment / Method Statements						

8.0 CONCLUSIONS & RECOMMENDATIONS

8.1 Land Contamination

8.1.1 Conclusions

The overarching land contamination objective of the Phase 2 investigation was to establish site suitability for a mixed commercial/residential development by determining if the past use of the site and the surrounding land had resulted in significant contamination/ground-gas issues that could adversely affect the development or the environment.

No visual or olfactory evidence to suggest the presence of significant ground/groundwater contamination was observed during the site investigation. Natural ground conditions were identified beneath a thin layer of made ground at all the drilling locations and there was no evidence to suggest that waste disposal had been undertaken at the site. No visible fragments of potential asbestos containing materials were identified.

For the redeveloped site use, the risks to human health, controlled waters and BBM&S is judged to be very low to low (acceptable risk).

The shallow made ground and natural soil samples recovered from the upper 1m were generally found to contain contaminant concentrations below the adopted human health assessment criteria (HHAC). The exception was a few elevated PAHs in the sample of made ground from BH-1 (probably associated with ash/tarmac residues). Risk posed by PAHs, non-volatile TPH fractions and other inorganics will be mitigated by the hard cover site use. Any residual risk to human health posed by the made ground and natural soils will be further reduced by the proposed shallow soil strip in the rear yard/side alley areas.

No significant further specific land contamination mitigation measures are considered necessary to protect future site users, controlled waters and BBM&S with respect to risk posed by existing site soils/groundwater.

Some recommendations/suggestions for OJCL are provided in the following section, including recommendations with respect to further ground gas monitoring and a final ground gas risk assessment. No further land contamination Phase 2 works are considered necessary at this stage.

To manage unexpected contamination encountered during development, a Discovery Strategy is suggested to be included in the contractor RAMS (Risk Assessments / Method Statements). A discovery strategy template is included in Appendix E and this can be adopted/amended by OJCL for the purposes of their RAMS (see recommendations).

At present there is not likely to be a requirement for a land contamination RemStrat (Planning Condition 8), which would mean that a verification report would not be required under Planning Condition 9. This will be confirmed after completion of the additional ground gas monitoring.

8.1.2 Recommendations

The requirement for a land contamination RemStrat (Planning Condition 8) will be confirmed after completion of the additional ground gas monitoring.

Notwithstanding this, Peak Environmental Solutions recommends/suggests that the contractor(s) RAMS consider the following:

-)] A Discovery Strategy should be adopted for the development works. A template is included in Appendix E and this can be amended by OJCL as required for the RAMS.
-)] Asbestos identified in the existing building should be managed in line with statutory guidance, HSE asbestos guidance and industry good practice.
-)] Materials from the shallow soil strip from the existing rear yard area should be disposed of appropriately and the necessary waste transfer records retained by OJCL.
-)] Imported engineering fill, sub-base materials and sub-soils should be fit-for purpose and sourced from traceable well-established local/national 'reputable' suppliers. Records should be retained by OJCL.
-)] The re-use of site-won materials should be in line with current industry good practice.
-)] Invasive weeds should be managed in line with current industry good practice.
-)] The requirement for radon protection measures in the building should be agreed with building control.
-)] The specification of below ground potable water pipework should be to the satisfaction of the utility provider.

8.2 Geotechnical

The geotechnical conclusions are provided in Section 6.0 and are not repeated here.

8.3 Other Considerations

There is the potential for ground conditions between the exploration holes and beneath the existing building footprint to be different from those encountered by the Phase 2 ground investigation.

Should significantly different ground conditions be encountered, then the relevance of land contamination and geotechnical conclusions/recommendations included in this report should be reviewed in the light of new information.

Note: Section 8.1.2 includes a recommendation for the contractor RAMS to include a land contamination 'discovery strategy' for the development.

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FIGURES

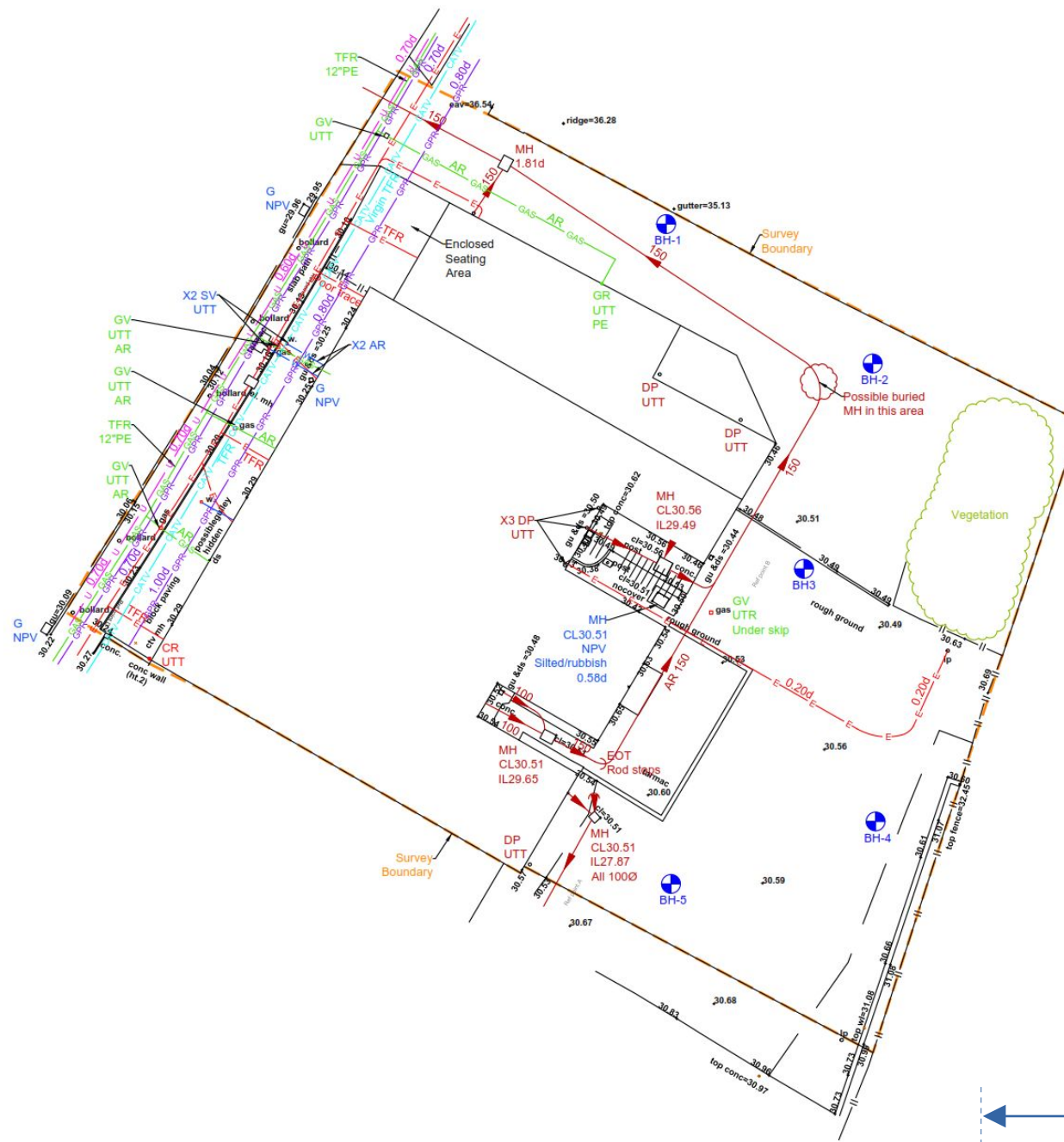


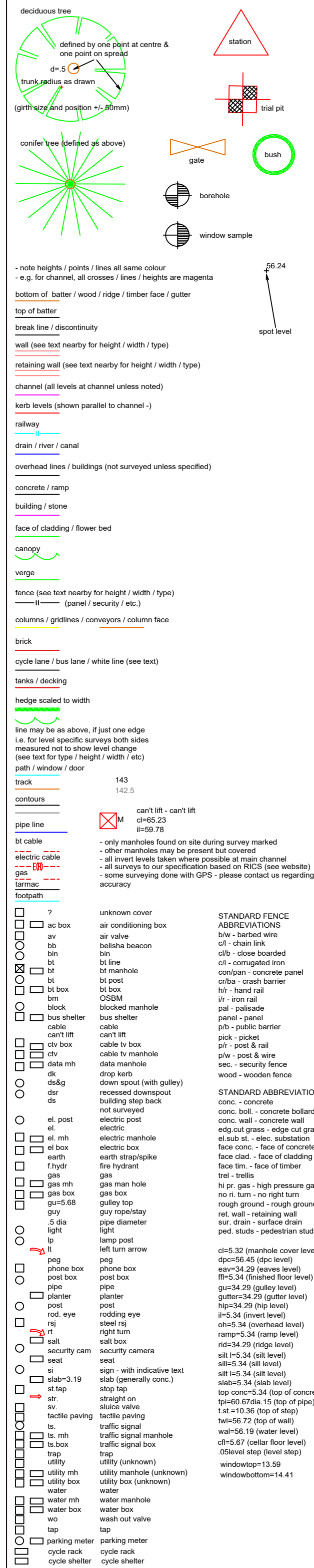
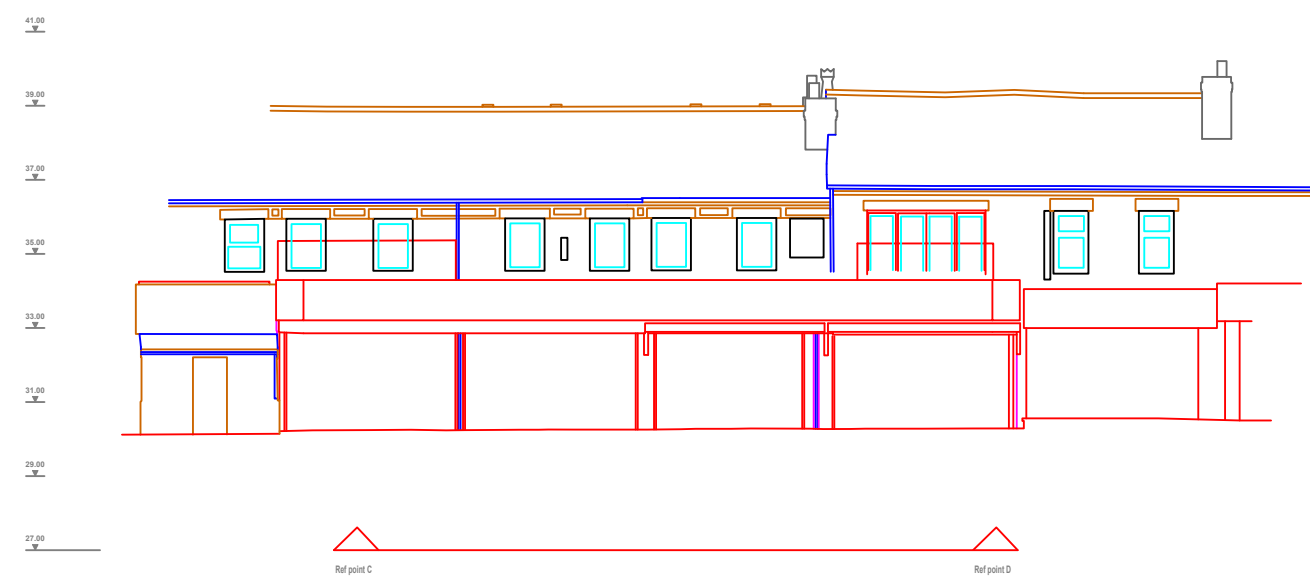
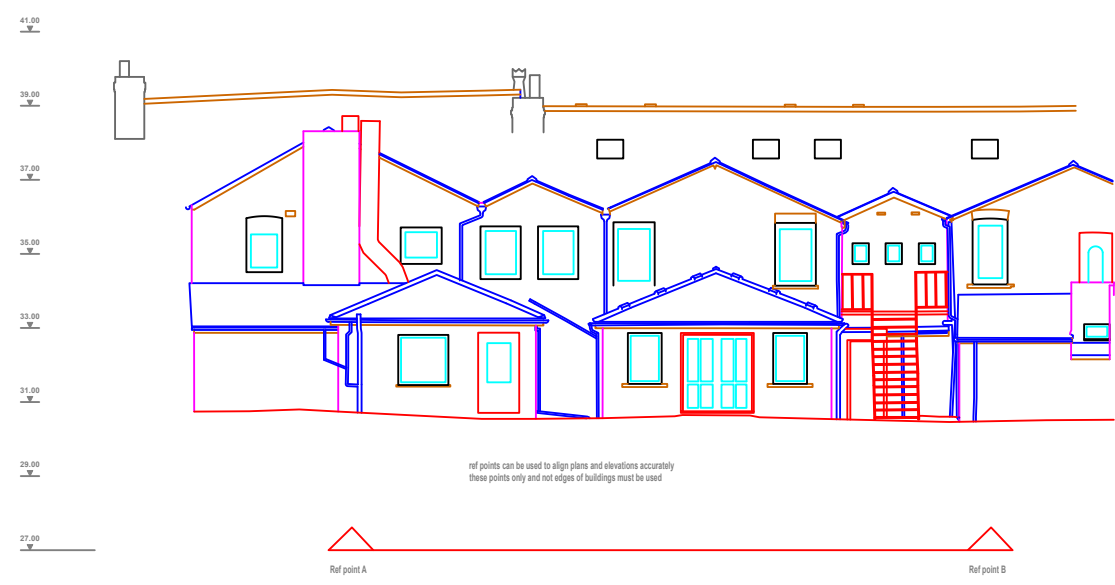
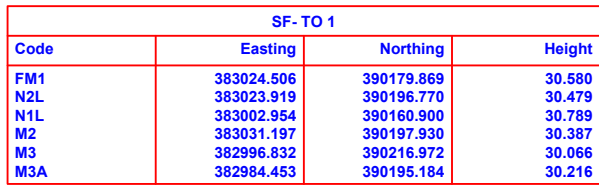
APPENDICES



Site Location: 

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Location Plan
Sheet 1 of *

Site Surveying Services - A.M.I.C.E.S.

Suite 7
Grindleton Business Centre
Grindleton, Lancs
BB7 4DH
Tel: 01200 438320
Fax: 07092376338
www.sitesurvey.co.uk

Land / Engineering Sur
Client / Location: Trinity

Viks Bar, Northenden

All work to our standard terms & conditions
(see website)

☐ Additional Comments:	
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Additional Comments: To local grid based on osth15/ocgm15 all w

specification, some by gps, contact us regard

Drawing Number:	sss-7774-Viks Bar, North		
Drawn By:	MR		Che

Date:	27/09/2017	
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on: A

NOTE: DO NOT SCALE FROM THIS DRAWING

REV	DESCRIPTION	DATE	DRAWN
A	BIN STORE AMENDED	27.1.18	EM
B	VEHICLE ACCESS WIDENED	17.12.18	JC
C	AMENDMENTS TO MASSING	16.04.19	EM
D	AMENDMENTS TO MASSING	28.08.19	EM
E	ELECTRIC CHARGE POINTS ADDED	28.10.19	EM
F	LANDSCAPING AND TREES ADDED	02.03.20	EM
G	GP LAYOUT AMENDED, RAMP ADDED TO FRONT ELEVATION, ADDITIONAL BIN STORE	14.01.21	SJC
H	OVERALL LENGTH OF BUILDING REDUCED, LAYOUT ADJUSTED TO SLOIT, COMMERCIAL BIN STORE ADDED, REDUCTION OF 1No. CAR SPACE	09.02.21	SJC



APPENDIX A: LIMITATIONS & EXCEPTIONS OF ASSESSMENT

LIMITATIONS AND EXCEPTIONS OF ASSESSMENT

Oliver James Construction Limited (the Client) has requested that a Phase 2 Site Investigation (the 'Project') be performed at the site. The report (and any copies of it) have been prepared for the sole use and reliance of the Client. This report s (and any copies of it) shall not be relied upon or transferred to any other parties without the express written authorisation of Peak Environmental Solutions limited. If an unauthorised third party comes into possession of this report, (and any copies of it) they rely on it at their peril and the authors owe them no duty of care and skill. Findings and opinions conveyed in the services should only be used by competent persons acting on the behalf of the Client and the findings and opinions conveyed in the services should only be used for the intended use. Copyright of reports & documents remains with Peak Environmental Solutions Limited. The project and report are subject to Peak Environmental Solutions standard terms and conditions.

Authorised or unauthorised copies of this document may come into the possession of organisations that are designated under the Freedom of Information Act 2000 ("the Act"). Such organisations that are designated in the Act are requested by Peak Environmental Solutions to respect the above statements relating to confidentiality and copyright.

The findings and opinions conveyed via this report are based on information obtained from a variety of sources as detailed within this report, and which Peak Environmental Solutions Limited believes are reliable. Nevertheless, Peak Environmental Solutions Limited cannot and does not guarantee the authenticity or reliability of the information it has relied upon. The report represents the findings and opinions of experienced geo-environmental consultants. Peak Environmental Solutions Limited does not provide legal advice and the advice of lawyers may also be required.

The opinions presented in this report are based on a review of records, available investigation reports and historical sources. Peak Environmental Solutions Limited has found indicators that suggest that geo-environmental hazards may exist at the site and these may warrant mitigation or consideration appropriate to the end use stated by the Client. Not finding such indicators does not mean that geo-environmental hazards do not exist at the site. In addition, the Risk Assessment did not include any enquiry with respect to substances not included within the substances of concern.

The Client is advised that the geo-environmental conditions stated within reports supplied to Peak Environmental Solutions Limited are subject to change. Certain indicators of the presence of geo-environmental hazards may have been latent at the time of the most recent site reconnaissance and may subsequently have become observable. It is possible that Peak Environmental Solutions research, while fully appropriate for the Project, failed to indicate the existence of important information sources. Assuming such sources actually exist, their information could not have been considered in the formulation of Peak Environmental Solutions findings and opinions.

Certain indicators or evidence of geo-environmental hazards may have been outside the very limited portion of the subsurface investigated or monitored, latent at the time of this work or only partially intercepted by the works and thus their full significance could not have been appreciated. Groundwater levels are particularly susceptible to variations due to seasonal or other effects. Accordingly, it is possible that Peak Environmental Solutions work, whilst fully appropriate for the Project failed to indicate the presence or significance of geo-environmental hazards. Assuming the presence of a hazard, it could not have been considered in the formulation of Peak Environmental Solutions findings and opinions. The subsurface geological profiles and other descriptions are generalised by necessity and have been based on the information found at the locations of the exploratory holes and depths sampled and tested.

The geotechnical comments given in this report and the opinions expressed are based on the ground conditions encountered during the site work and on the results of geotechnical and analytical tests made in the field and laboratory. However, there may be special geotechnical conditions prevailing at the site which have not been disclosed by the investigation and which have not been taken into account in the report. Accordingly, a careful watch should be maintained in any future groundworks and the geotechnical findings and recommendations of this report reviewed, if necessary as work proceeds.

Any interpretation of the results of the Project have been based on the proposed site usage and the findings are not valid should the proposed land use and/or the regulatory regime/guidance change. Where interpretation is based on public domain guidance/protocols/models/software/code, Peak Environmental Solutions is not liable for errors in the guidance/protocols/models/software/code.

Peak Environmental Solutions Limited believes that providing information about limitations is essential to help the Client identify and thereby manage their risks. These risks can be mitigated, but they cannot be eliminated, through additional research. Peak Environmental Solutions Limited will on request, advise the client of the additional research opportunities available, their impact on risk, and their cost.

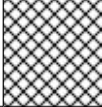
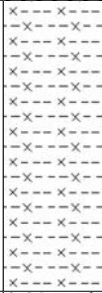
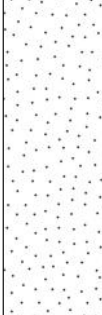
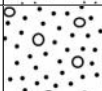
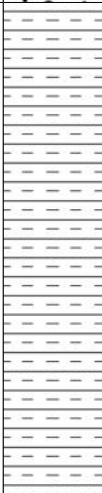
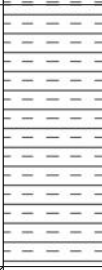
In preparing this report, it has been assumed that all past and present occupants have provided all relevant and other information, especially relating to known or potential geo-environmental hazards. This report is not required to identify insufficiencies or mistakes in the information provided by the user/owner or from any other source, but has sought to compensate for these where obvious in the light of other information.

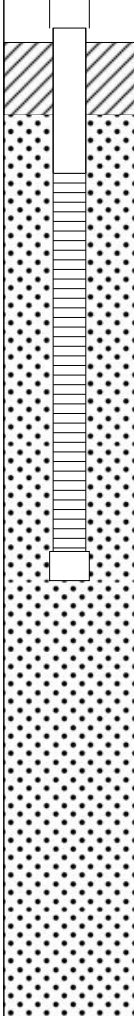
APPENDIX B: QUALITATIVE ASSESSMENT RISK MATRIX

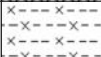
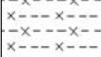
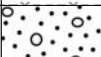
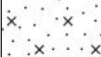
Table - Qualitative Risk Classification Matrix

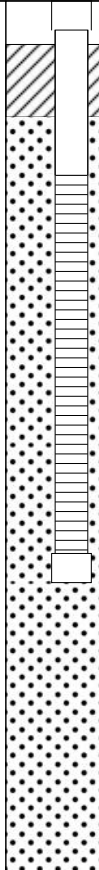
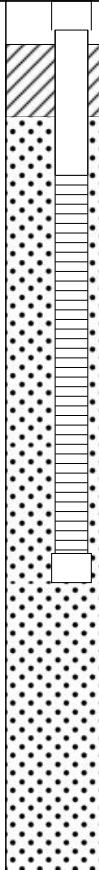
Probability (likelihood)	Consequence			
	Minor	Mild	Medium	Severe
High likelihood	Low risk	Moderate risk	High risk	Very High Risk
Likely	Low risk	Low to moderate risk	Moderate risk	High risk
Low likelihood	Very low risk	Low risk	Low to moderate risk	Moderate risk
Unlikely	Very low risk	Very low risk	Low risk	Low to moderate risk
No Pollutant Linkage	No potential risk			
Consequence	Minor	Mild	Medium	Severe
Ratings	- No measurable effect on humans - Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems - Repairable effects of damage to buildings, structures and services	- Exposure to human health unlikely to lead to "significant harm" - Equivalent to EA Category 3 pollution incident including minimal or short-lived effect on water quality; marginal effect on amenity value, agriculture or commerce - Minor or short lived damage to aquatic or other ecosystems, which is unlikely to result in a substantial adverse change in its functioning or harm to a species of special interest that would endanger the long term maintenance of the population - Minor damage to crops, buildings or property	- Elevated concentrations which could result in "significant harm" to humans health as defined by EPA 1990, Part 2A if exposure occurs - Equivalent to EA Category 2 pollution incident including significant effect on water quality; notification required to abstractors; reduction in amenity value or significant damage to agriculture or commerce - Significant damage to aquatic or other ecosystems, which may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long term maintenance of the population - Significant damage to crops, buildings or property	- Highly elevated concentrations likely to result in "significant harm" to humans health as defined by EPA 1990, Part 2A if exposure occurs - Equivalent to EA Category 1 pollution incident including persistent and/or extensive effects on water quality; leading to closure of a potable abstraction point; major impact on amenity value or major damage to agriculture or commerce - Major damage to aquatic or other ecosystems, which is likely to result in a substantial adverse change in its functioning or harm to a species of special interest that endangers the long term maintenance of the population - Catastrophic damage to crops, buildings or property
Probability	Unlikely	Low likelihood	Likely	High likelihood
Classification	Improbable that exposure/event would occur even in the long term	Possible that exposure/event could occur. However, not certain that even over a long period that exposure/event would occur and is less likely in the shorter term	Probable that exposure/event would occur. However, exposure/event is not inevitable, but is possible in the short term and likely over the long term.	Exposure/event very likely in the short term and almost inevitable over the long term, or evidence at the receptor of harm or pollution

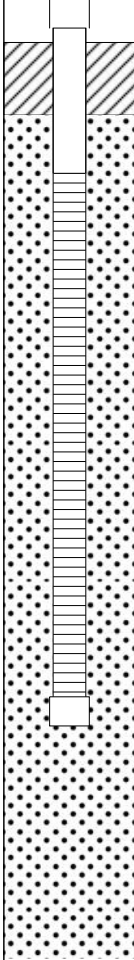
APPENDIX C: BOREHOLE LOGS

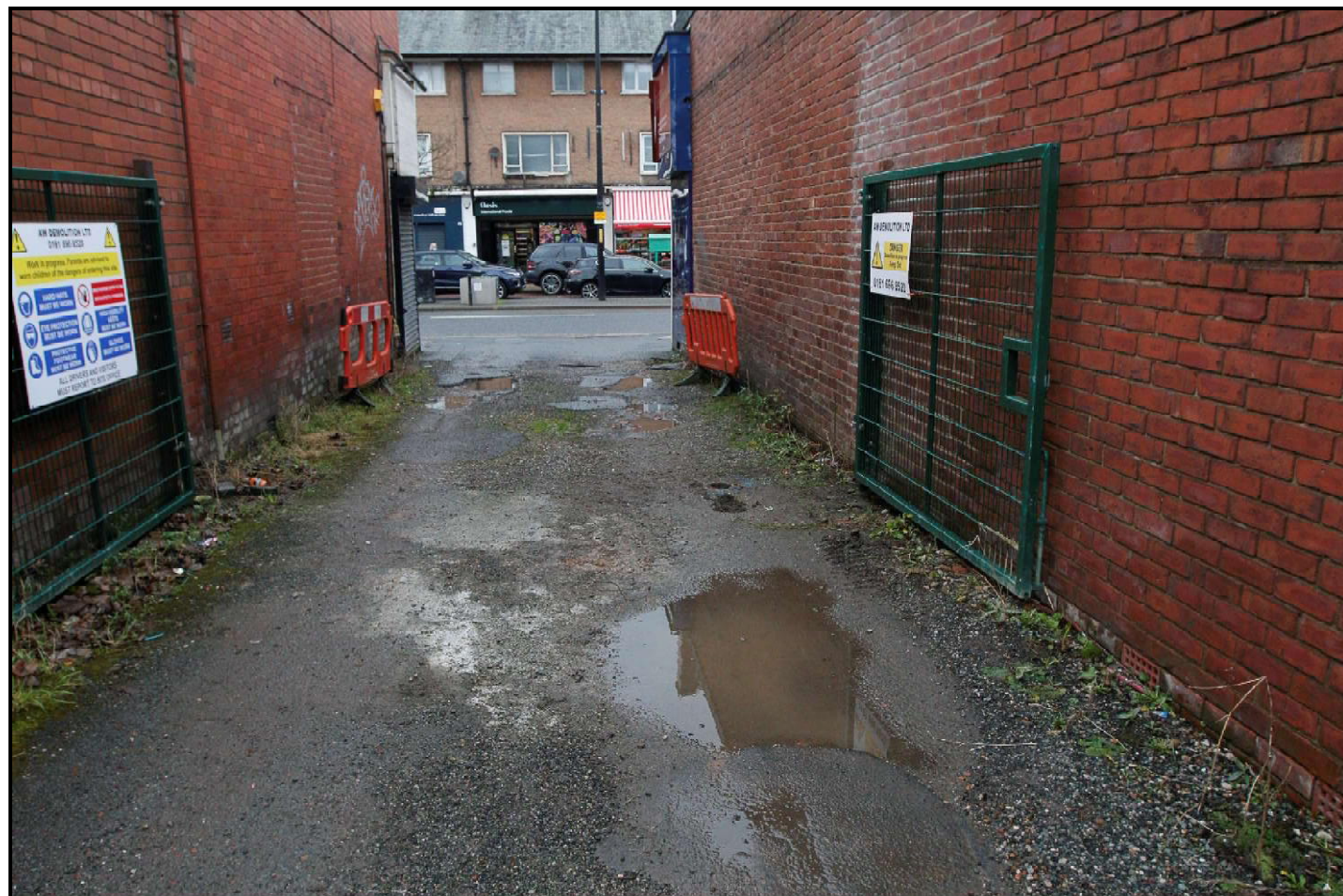
 PEAK ENVIRONMENTAL SOLUTIONS info@peakenvironmentalsolutions.com www.peakenvironmentalsolutions.com					Peak Environmental Solutions Limited Beechfield Ninelands Road Hathersage Derbyshire S32 1BJ Tel: 01433 659071		Project No 42127		BH-1 Page 1 of 1			
Client: Oliver James CL Project: Palatine Road Location: Northenden					Drilling Date: 29 Jan 2021 Drillers: Mugen Method: Tracked WS Rig		Drilled Depth: 5.5 (mBGL) Drill Diameter: 110 (mm) Well Diameter: (mm)		Gr Elevation: 30.4 (mDatum) TOC Elevation: (mDatum) Coordinates: :			
Depth (mbgl)	Elevation (m)	Samples	Tests/VOCs	CPT N Values	Soil or Rock Field Material Description			Depth (mbgl)	Well Details & Groundwater Levels			
0.0		D1	Lab/C		Degraded TARMAC.		0	Strike 				
					MADE GROUND. Black becoming brown sandy slightly clayey GRAVEL with occasional brick gravel.					0.1		
0.5	30.0									0.5		
		D2	Lab/S		Very soft to soft brown slightly sandy to sandy slightly gravelly CLAY. (Possible Alluvium).							
				SANK 0,0,0,0,0,0,0 N<4								
1.0	29.5											
										1.5		
1.5	29.0											
		D3	Lab/S		Light grey slightly mottled brown wet clayey SAND. Assessed as medium dense using field SPT N Value. (FLUVIO-GLACIAL SANDS AND GRAVELS).							
2.0	28.5			1,2,1,4,5,4 N=14								
2.5	28.0				Light orangish brown wet medium to coarse very sandy slightly clayey rounded GRAVEL. (FLUVIO-GLACIAL SANDS AND GRAVELS).		2.6					
		D3	Lab/S				2.9					
3.0	27.5			2,3,4,5,6,7 N=22								
3.5	27.0											
4.0	26.5											
		D3	Lab/S		Red brown silty slightly clayey fine SAND with lenses of very stiff sandy red brown mottled grey CLAY. Weathered destructured/residual SILTONE/MUDSTONE. (TARPORLEY SILTSTONE FORMATION).							
4.5	26.0			6,9,11,12,21,16 N>50								
5.0	25.5						4.6					
		D3	Lab/S		Very stiff red brown slightly fine sandy slightly gravelly CLAY. Gravel is fine lithorelics of siltstone/mudstone. Weathered destructured/distinctly SILTONE/MUDSTONE. (TARPORLEY SILTSTONE FORMATION).							
5.5	25.0			2,9,11,14,16,18 N>50								
		D3	Lab/S		Base of borehole. Drilled to refusal with SPT at 3.5m		5.5					
Remarks: 1: Gen Accordance BS5930:2015 2: No hydrocarbon odours 3: Lab/C = Contam Test					Key: D = Disturbed Sample U = Undisturbed Sample B = Bulk Sample		W = Water Sample VOC = PID Volatiles N Value = Stan Pen Test SWL = Standing Water Level			Driller: Mugen Logged: C Dainton Drawn: C Dainton		
4: Lab/S = Sulphate Testing 5: PP = Pocket Penetrom 6: PP = kg/cm2										Checked: C F Dainton Approved: C Dainton Scale:		

 PEAK ENVIRONMENTAL SOLUTIONS info@peakenvironmentalsolutions.com www.peakenvironmentalsolutions.com					Peak Environmental Solutions Limited Beechfield Ninelands Road Hathersage Derbyshire S32 1BJ Tel: 01433 659071	Project No 42127	BH-2 Page 1 of 1
Client: Oliver James CL Project: Palatine Road Location: Northenden					Drilling Date: 29 Jan 2021 Drillers: Mugen Method: Tracked WS Rig	Drilled Depth: 3.5 (mBGL) Drill Diameter: 110 (mm) Well Diameter: (mm)	Gr Elevation: 30.5 (mDatum) TOC Elevation: (mDatum) Coordinates: :
Depth (mbgl)	Elevation (m)	Samples	Tests/VOCs	CPT N Values	Soil or Rock Field Material Description	Depth (mbgl)	Well Details & Groundwater Levels
0.0	30.5	D1	Lab/C		Degraded TARMAC and CONCRETE	0	
0.5	30.0				Firm brown sandy to very sandy slightly gravelly CLAY. (Possible Alluvium)	0.3	
1.0	29.5		3,3,5,2,1,2 N=10		Light grey wet fine to medium SAND. Assessed as loose to medium dense using field SPT N Value. (FLUVIO-GLACIAL SANDS AND GRAVELS).	0.9	
1.5	29.0				Light brown mottled reddish/orangish brown very clayey fine to medium SAND. Assessed as medium dense using field SPT N Value. (FLUVIO-GLACIAL SANDS AND GRAVELS). Some rootlets.	1.4	
2.0	28.5		2,2,3,7,8,6 N=24		Light grey wet clayey gravelly medium to coarse SAND. (FLUVIO-GLACIAL SANDS AND GRAVELS).	2	
2.5	28.0				Red brown silty slightly clayey fine SAND. Weathered destructured/residual SILTONE/MUDSTONE. (TARPORLEY SILTSTONE FORMATION).	2.7	
3.0	27.5		8,8,9,9,10,11 N=39		Poor recovery & borehole collapsing. ... becoming stiff red brown slightly fine sandy slightly gravelly CLAY. Gravel is fine lithorelics of siltstone/mudstone. Weathered destructured/distinctly SILTONE/MUDSTONE. (TARPORLEY SILTSTONE FORMATION).	2.9	
3.5	27.0				Base of borehole.	3.5	
4.0	26.5						
4.5	26.0						
5.0	25.5						
5.5	25.0						
Remarks: 1: Gen Accordance BS5930:2015 2: No hydrocarbon odours 3: Lab/C = Contam Test					Key: D = Disturbed Sample U = Undisturbed Sample B = Bulk Sample	W = Water Sample VOC = PID Volatiles N Value = Stan Pen Test SWL = Standing Water Level	Driller: Mugen Logged: C Dainton Drawn: C Dainton
							Checked: C F Dainton Approved: C Dainton Scale:

 PEAK ENVIRONMENTAL SOLUTIONS info@peakenvironmentalsolutions.com www.peakenvironmentalsolutions.com					Peak Environmental Solutions Limited Beechfield Ninelands Road Hathersage Derbyshire S32 1BJ Tel: 01433 659071		Project No 42127		BH-3 Page 1 of 1														
Client: Oliver James CL Project: Palatine Road Location: Northenden					Drilling Date: 29 Jan 2021 Drillers: Mugen Method: Tracked WS Rig		Drilled Depth: 3.2 (mBGL) Drill Diameter: 110 (mm) Well Diameter: (mm)		Gr Elevation: 30.5 (mDatum) TOC Elevation: (mDatum) Coordinates: :														
Depth (mbgl)	Elevation (m)	Samples	Tests/VOCs	CPT N Values	Soil or Rock Field Material Description		Depth (mbgl)	Well Details & Groundwater Levels															
0.0	30.5	D1	Lab/C		Degraded TARMAC.		0	Strike															
					MADE GROUND. Dark grey slightly clayey slightly gravelly SAND.		0.1																
					Soft brown sandy to very sandy slightly gravelly CLAY. (Possible Alluvium).		0.2																
0.5	30.0																						
					Light orangish brown medium to coarse very sandy rounded GRAVEL. (FLUVIO-GLACIAL SANDS AND GRAVELS).		0.6																
1.0	29.5																						
					3,2,2,4,3,3 N=12	Light orangish brown wet medium to coarse very sandy slightly clayey rounded GRAVEL. Assessed as loose to medium dense using field SPT N Value. (FLUVIO-GLACIAL SANDS AND GRAVELS).				1.1													
1.5	29.0																						
					2,4,4,3,4,6, N=17	Orangish brown wet medium to coarse very sandy rounded GRAVEL. Assessed as medium dense using field SPT N Value. (FLUVIO-GLACIAL SANDS AND GRAVELS).				1.6													
2.0	28.5																						
2.5	28.0																						
					Red brown silty slightly clayey fine SAND. Weathered destructured/residual SILTONE/MUDSTONE. (TARPORLEY SILTSTONE FORMATION).		2.5																
3.0	27.5				... probably becoming ... stiff red brown sandy slightly gravelly CLAY. Destructured/distinctly weathered SILTONE/MUDSTONE. (TARPORLEY SILTSTONE FORMATION).		3																
					Base of borehole. Drilled to refusal with SPT from 3.00m to 3.2m.		3.2																
3.5	27.0																						
4.0	26.5																						
4.5	26.0																						
5.0	25.5																						
5.5	25.0																						
Remarks: 1: Gen Accordance BS5930:2015 2: No hydrocarbon odours 3: Lab/C = Contam Test 4: Lab/S = Sulphate Testing 5: PP = Pocket Penetrom 6: PP = kg/cm2										Key: D = Disturbed Sample U = Undisturbed Sample B = Bulk Sample W = Water Sample VOC = PID Volatiles N Value = Stan Pen Test SWL = Standing Water Level										Driller: Mugen Logged: C Dainton Drawn: C Dainton		Checked: C F Dainton Approved: C Dainton Scale:	

 PEAK ENVIRONMENTAL SOLUTIONS info@peakenvironmentalsolutions.com www.peakenvironmentalsolutions.com					Peak Environmental Solutions Limited Beechfield Ninelands Road Hathersage Derbyshire S32 1BJ Tel: 01433 659071		Project No 42127		BH-4 Page 1 of 1						
Client: Oliver James CL Project: Palatine Road Location: Northenden					Drilling Date: 29 Jan 2021 Drillers: Mugen Method: Tracked WS Rig		Drilled Depth: 3 (mBGL) Drill Diameter: 110 (mm) Well Diameter: (mm)		Gr Elevation: 30.6 (mDatum) TOC Elevation: (mDatum) Coordinates: :						
Depth (mbgl)	Elevation (m)	Samples	Tests/VOCs	CPT N Values	Soil or Rock Field Material Description				Depth (mbgl)	Well Details & Groundwater Levels					
0.0	30.5	D1	Lab/C		MADE GROUND. Tarmac scalpings and MOT type granualr sub-base.				0	 Strike					
					Dark grey clayey slightly gravelly SAND.				0.1						
0.5	30.0				Soft to very soft brown to light brown sandy slightly gravelly CLAY. (Possible Alluvium).				0.3						
1.0	29.5				1,1,1,1,1 N=4										
1.5	29.0								1.4						
2.0	28.5	4,4,3,4,3,2 N=12	Orangish brown wet medium to coarse very sandy rounded GRAVEL. Assessed as loose to medium dense using field SPT N Value. (FLUVIO-GLACIAL SANDS AND GRAVELS).												
2.5	28.0						2.7								
3.0	27.5		Stiff becoming very stiff red brown slightly fine sandy slightly gravelly CLAY. Gravel is fine lithorelics of siltstone/mudstone. Weathered destructured/distinctly SILTONE/MUDSTONE. (TARPORLEY SILTSTONE FORMATION).				3								
		Refusal 3m N>50		Base of borehole. Refusal with SPT at 3m.											
3.5	27.0														
4.0	26.5														
4.5	26.0														
5.0	25.5														
5.5	25.0														
Remarks: 1: Gen Accordance BS5930:2015 2: No hydrocarbon odours 3: Lab/C = Contam Test					Key: D = Disturbed Sample U = Undisturbed Sample B = Bulk Sample			W = Water Sample VOC = PID Volatiles N Value = Stan Pen Test SWL = Standing Water Level				Driller: Mugen Logged: C Dainton Drawn: C Dainton		Checked: C F Dainton Approved: C Dainton Scale:	

 PEAK ENVIRONMENTAL SOLUTIONS info@peakenvironmentalsolutions.com www.peakenvironmentalsolutions.com					Peak Environmental Solutions Limited Beechfield Ninelands Road Hathersage Derbyshire S32 1BJ Tel: 01433 659071	Project No 42127	BH-5 Page 1 of 1
Client: Oliver James CL Project: Palatine Road Location: Northenden					Drilling Date: 29 Jan 2021 Drillers: Mugen Method: Tracked WS Rig	Drilled Depth: 3.3 (mBGL) Drill Diameter: 110 (mm) Well Diameter: (mm)	Gr Elevation: 30.6 (mDatum) TOC Elevation: (mDatum) Coordinates: :
Depth (mbgl)	Elevation (m)	Samples	Tests/VOCs	CPT N Values	Soil or Rock Field Material Description	Depth (mbgl)	Well Details & Groundwater Levels
0.0	30.5	D1	Lab/C		Probable MADE GROUND. Firm to stiff very sandy slightly gravelly CLAY with rare brick gravel. (Probable reworked Alluvium)	0	
0.5	30.0					0.5	
1.0	29.5	D2	8,8,8,8,8 N=32		Light orangish brown medium to coarse very sandy rounded GRAVEL. Borehole collapsing from 2m. Assessed as medium dense possibly locally dense using field SPT N Value. (FLUVIO-GLACIAL SANDS AND GRAVELS).		
1.5	29.0		Lab/S				
2.0	28.5		6,3,5,4,2,4 N=15				
2.5	28.0	D3			Wet light brown fine to medium rounded slightly gravelly medium to coarse SAND. Assessed as medium dense using field SPT N Value. (FLUVIO-GLACIAL SANDS AND GRAVELS).	2.3	
3.0	27.5		Lab/S		Very stiff red brown slightly gravelly fine sandy SILT/CLAY. Gravel is fine lithorelics of siltstone/mudstone. Weathered destructured/residual SILTONE/MUDSTONE. (TARPORLEY SILTSTONE FORMATION). No sample recovery beyond 3m, SPT only: becoming stiffer with depth, assumed to be less weathered.	2.7	
			8,16,18,18,14,X N>50				
					Base of borehole. Drilled to refusal with SPT from 3.00m to 3.3m.	3.3	
3.5	27.0						
4.0	26.5						
4.5	26.0						
5.0	25.5						
5.5	25.0						
Remarks: 1: Gen Accordance BS5930:2015 2: No Hydrocarbon odours 3: Lab/C = Contam Test					Key: D = Disturbed Sample U = Undisturbed Sample B = Bulk Sample	W = Water Sample VOC = PID Volatiles N Value = Stan Pen Test SWL = Standing Water Level	Driller: Mugen Logged: C Dainton Drawn: C Dainton
4: Lab/S = Sulphate Testing 5: PP = Pocket Penetrom 6: PP = kg/cm2					Checked: C F Dainton Approved: C Dainton Scale:		



BH-1-2101_MG_3881:



BH-1-2101_MG_3882:



BH-1-2101_MG_3886:



BH-2-2101_MG_3888:



BH-2-2101_MG_3890:



BH-2-2101_MG_3893:



BH-3-2101_MG_3895:



BH-3-2101_MG_3899:



BH-4-2101_MG_3904:



BH-4-2101_MG_3906:



BH-5_MG_3901:



BH-5-2101_MG_3873:



BH-5-2101_MG_3878:



BH-5-2101_MG_3877:



APPENDIX D: LABORATORY TEST CERTIFICATE

Chris Dainton

Peak Environmental Solutions
Beechfield
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Hathersage
Hope Valley
Derbyshire
S32 1BJ

t: 01433 659071

e: cdainton@peakenvironmentalsolutions.com

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

t: 01923 225404

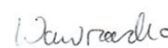
f: 01923 237404

e: reception@i2analytical.com

Analytical Report Number : 21-54325

Project / Site name:	Palatine Rd, Northenden	Samples received on:	01/02/2021
Your job number:	42127	Samples instructed on/ Analysis started on:	01/02/2021
Your order number:	42127-1	Analysis completed by:	11/02/2021
Report Issue Number:	1	Report issued on:	11/02/2021
Samples Analysed:	9 soil samples		

Signed:



Joanna Wawrzeczko
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 21-54325
Project / Site name: Palatine Rd, Northenden
Your Order No: 42127-1

Lab Sample Number				1755644	1755645	1755646	1755647	1755648
Sample Reference				BH-1	BH-1	BH-1	BH-2	BH-3
Sample Number				D1	D2	D3	D1	D1
Depth (m)				0.30	1.80	3.60	0.60	0.50
Date Sampled				29/01/2021	29/01/2021	29/01/2021	29/01/2021	29/01/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	5.7	14	13	14	15
Total mass of sample received	kg	0.001	NONE	0.5	0.5	0.5	0.5	0.5

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	-	Not-detected	Not-detected
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General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.2	6.2	8.3	7.4	7.3
Total Cyanide	mg/kg	1	MCERTS	< 1	-	-	< 1	< 1
Total Sulphate as SO ₄	mg/kg	50	MCERTS	1000	260	220	290	250
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.13	0.042	0.019	0.022	0.012
Total Organic Carbon (TOC)	%	0.1	MCERTS	1.4	-	-	0.7	1.1

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	-	-	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	-	-	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	0.2	-	-	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.78	-	-	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	1	-	-	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	8.9	-	-	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	3.4	-	-	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	19	-	-	< 0.05	< 0.05
Pyrene	mg/kg	0.05	MCERTS	17	-	-	< 0.05	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	14	-	-	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	9.2	-	-	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	14	-	-	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	4.1	-	-	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	11	-	-	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	5.4	-	-	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	1.4	-	-	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	5.7	-	-	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	115	-	-	< 0.80	< 0.80
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	9.4	-	-	7.7	8
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.6	-	-	< 0.2	< 0.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	31	-	-	15	17
Copper (aqua regia extractable)	mg/kg	1	MCERTS	54	-	-	22	27
Lead (aqua regia extractable)	mg/kg	1	MCERTS	110	-	-	48	34
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	-	-	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	20	-	-	13	14
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	-	-	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	52	-	-	20	20
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	190	-	-	59	49

Analytical Report Number: 21-54325
Project / Site name: Palatine Rd, Northenden
Your Order No: 42127-1

Lab Sample Number				1755644	1755645	1755646	1755647	1755648
Sample Reference				BH-1	BH-1	BH-1	BH-2	BH-3
Sample Number				D1	D2	D3	D1	D1
Depth (m)				0.30	1.80	3.60	0.60	0.50
Date Sampled				29/01/2021	29/01/2021	29/01/2021	29/01/2021	29/01/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)				Units	Limit of detection	Accreditation Status		

Petroleum Hydrocarbons

TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	-	-	< 0.1	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	-	-	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	-	-	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	36	-	-	< 4.0	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	200	-	-	< 1.0	< 1.0
TPH (C21 - C35)	mg/kg	1	MCERTS	1200	-	-	< 1.0	< 1.0
TPH Total C6 - C35	mg/kg	10	NONE	1400	-	-	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 21-54325
Project / Site name: Palatine Rd, Northenden
Your Order No: 42127-1

Lab Sample Number				1755649	1755650	1755651	1755652
Sample Reference				BH-4	BH-5	BH-5	BH-5
Sample Number				D1	D1	D2	D3
Depth (m)				0.20	0.25	1.50	2.90
Date Sampled				29/01/2021	29/01/2021	29/01/2021	29/01/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	17	11	5.5	9.8
Total mass of sample received	kg	0.001	NONE	0.2	0.5	0.7	0.7

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	-	-
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General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.2	7.6	8	8.3
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	-	-
Total Sulphate as SO ₄	mg/kg	50	MCERTS	520	540	100	100
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.008	0.11	0.031	0.014
Total Organic Carbon (TOC)	%	0.1	MCERTS	1.9	1.7	-	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	-	-
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-
Phenanthrene	mg/kg	0.05	MCERTS	0.64	0.26	-	-
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-
Fluoranthene	mg/kg	0.05	MCERTS	1.2	0.74	-	-
Pyrene	mg/kg	0.05	MCERTS	1.2	0.73	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.93	0.52	-	-
Chrysene	mg/kg	0.05	MCERTS	0.71	0.47	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	1.1	0.65	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.25	0.32	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.79	0.5	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.46	0.29	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.55	0.39	-	-

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	7.79	4.87	-	-
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	31	22	-	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	1.3	-	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	19	18	-	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	72	62	-	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	210	220	-	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	4.2	-	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	23	20	-	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	-	-
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	35	27	-	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	360	260	-	-

Analytical Report Number: 21-54325
Project / Site name: Palatine Rd, Northenden
Your Order No: 42127-1

Lab Sample Number				1755649	1755650	1755651	1755652
Sample Reference				BH-4	BH-5	BH-5	BH-5
Sample Number				D1	D1	D2	D3
Depth (m)				0.20	0.25	1.50	2.90
Date Sampled				29/01/2021	29/01/2021	29/01/2021	29/01/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
Petroleum Hydrocarbons							
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	-	-
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	-	-
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	-	-
TPH (C12 - C16)	mg/kg	4	MCERTS	< 4.0	< 4.0	-	-
TPH (C16 - C21)	mg/kg	1	MCERTS	9.7	8.4	-	-
TPH (C21 - C35)	mg/kg	1	MCERTS	17	19	-	-
TPH Total C6 - C35	mg/kg	10	NONE	27	28	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 21-54325

Project / Site name: Palatine Rd, Northenden

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1755644	BH-1	D1	0.3	Brown gravelly sand.
1755645	BH-1	D2	1.8	Brown clay and sand with gravel.
1755646	BH-1	D3	3.6	Brown clay and sand with gravel.
1755647	BH-2	D1	0.6	Brown clay and sand with gravel.
1755648	BH-3	D1	0.5	Brown clay and sand with gravel.
1755649	BH-4	D1	0.2	Brown loam with gravel.
1755650	BH-5	D1	0.25	Brown loam with gravel.
1755651	BH-5	D2	1.5	Brown clay and sand with gravel.
1755652	BH-5	D3	2.9	Brown clay and sand with gravel.

Analytical Report Number : 21-54325

Project / Site name: Palatine Rd, Northenden

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

APPENDIX E: DISCOVERY STRATEGY TEMPLATE

TEMPLATE FOR: Land Contamination Discovery Strategy

Site staff and contractors involved in groundworks should all be briefed about the potential for known and unexpected ground contamination. All personnel will be instructed to report evidence of unexpected contamination to the site manager.

The following are examples of unexpected ground contamination that should be reported:

- J Fuel or oil like substances in soils or groundwater/perched water
- J Any potentially asbestos containing materials
- J Buried waste materials including intact containers, tar and ash
- J Rapid changes in soil colour including to red, orange, yellow, green, light or dark blue, etc
- J Any other unexpectedly odorous, unusual or discoloured soils
- J Unexpected in-ground/structures and unexpected types of made ground soils.
- J Any unexpected light headedness or feelings of nausea occurring during the groundworks
- J Any other concerns or areas of uncertainty

The site manager will be responsible for collating information, recording observations and contacting an environmental consultant to assist in dealing with any potential unexpected contamination issues. Materials potentially contaminated with asbestos should be dealt with in accordance with HSE guidance, CAR-2012 and current UK good practice.

Where required, an appointed environmental consultant may assist in some of the following ways:

- J Informing the planning authority and providing appropriate information about the findings.
- J Investigation, sampling and laboratory analysis of potentially contaminated materials to assess the severity and scale of the suspected contamination.
- J Where required, chemical analysis of samples for the range of potential relevant contaminants. A testing suite would typically include:
 - J *Arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, vanadium, zinc*
 - J *Banded total petroleum hydrocarbons (TPH) fractions C6-C35*
 - J *Priority 16 polycyclic aromatic hydrocarbons PAHs*
 - J *Cyanides, asbestos, phenols*
- J Comparison of the analysis results against the appropriate site assessment criteria.
- J Agreement of any necessary remedial works with the planning authority
- J Verification of any necessary remedial/verification works.