



**PHASE 2 GROUND INVESTIGATION:
THE SHAMROCK PUB, BENGAL
STREET**

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EXECUTIVE SUMMARY

Introduction	GroundSolve Ltd (GSL) was commissioned by John Dixon & Associates LTD to undertake a site investigation at the Shamrock Pub, Bengal Street. This report presents the findings of the site investigation and makes recommendations based upon those findings. It is to be read in conjunction with the desk study and Preliminary Risk Assessment (GSL report ref: 3046R01-1 - Phase I PRA).
Site Location and Name:	The Shamrock Pub, Bengal Street , The Shamrock Inn, 17 Bengal St, Ancoats, Manchester M4 6AQ.
Land Use History	The site has comprised commercial and residential land use from at least 1848. Circa 1953 a public house located in the south of the site ceases to exist, and instead a property, in the northwest of the site, which once comprised three plots is shown to have a new public house present. The site configuration is not believed to have changed since this date. A substation is present adjacent to east of the site since 1970s.
Development	It is understood that the development will comprise of 2-storey extension to the existing Shamrock Pub to extend seating capacity.
Geoenvironmental Setting	Geology: The site is underlain by Made Ground of brick and gravel backfill, which overlies cohesive glacial till underlain by bedrock of the Chester Pebble Beds Formation. Hydrogeology: The Glacial Till is a Secondary Undifferentiated Aquifer. The Chester Pebble Formation is classified as a Principal Aquifer. The nearest groundwater abstraction point is located 1202m to the west of the site. The site is not situated within a source protection zone. Hydrology: The nearest surface water feature is a Canal 260m southwest of the site. All surface water features within 1000m of the site are limited to those associated with the canals. Mining & Quarrying: Great Mine Limestone seam (Hole High Limestone Group) runs approximately 850m southeast of the site, oriented southeast to northwest, however is limited in extent toward the site due to an erosional unconformity. The site is not impacted by activity associated with historical working of the limestone. Unexploded Ordnance: A non-specialist UXO screening exercise in general accordance with CIRIA report C681 indicates a low to moderate risk. A preliminary risk assessment was undertaken and concluded a detailed desk study was not needed.
Phase 1 Preliminary Risk Assessment	Based on the former land uses at the site the potential for contamination to be present is considered relatively high. Based upon the results of the current and previous ground investigations, plausible contaminant linkages have been identified. The receptors of concern are human health and groundwater.
Scope of Phase 2 Site Investigation	The scope of ground investigation works carried out at the site by GroundSolve comprised: 3 Machine excavated trial pits to a maximum depth of 2.25 mbgl; - Laboratory testing for chemical contamination and geotechnical.
Findings of the Phase 2 Ground Investigation	The ground conditions at the site (from ground level, down) comprise: Made Ground Bituminous slab, over gravels and red brick concrete cobbles (demolition rubble); over Glacial Till¹ From 1.00m described as stiff grey sandy clay proven to a depth of 2.25 ¹ The Glacial Till is was only encountered in TP01, however is likely to be present under existing concrete slabs at the bases of the historical basement structures No groundwater was encountered.

	Elevated PAHs were present however did not exceed relevant GACs, along with an exceedance of Dibenzo(a,h)anthracene which was elevated above commercial GACs with 1% OM
Phase 2 Conclusions – Geoenvironmental	Human Health: Slightly elevated levels of PAHs are present. However, subject to EHO approval is not considered a significant risk. An exceedance of Dibenzo(a,h)anthracene was identified within the made ground around TP01. This impacted material will be under hard standing post construction, eliminating plausible SPR linkages. Made Ground across the site, is classified as hazardous from a waste characterisation standpoint, and as such if taken off site should be disposed of accordingly. Plant growth: No unacceptable risks (based on current proposed development plans) Controlled Waters: No unacceptable risks. Ground Gases (Human Health / Property): No radon protective measures are indicated by the current guidance. Water Supply Pipework: Based on a brownfield classification and the presence of hydrocarbon contamination, barrier pipe will be required. GroundSolve recommend that discussions be undertaken with the relevant water supply company at the earliest opportunity.
Reuse of Site-won Materials	Made ground (where present) on site is chemically not suitable for use in any soft standing areas, and will only be suitable for reuse under hard standing. Following treatment the majority of the made ground should be suitable for reuse as engineered fill (subject to additional testing and specification) (subject to the necessary approvals/consents)
Foundations	Existing relict foundations and basements will need to be grubbed out and replaced with a suitably engineered fill. The foundations could then take the form of a conventional reinforced concrete raft based on an allowable bearing capacity of 50kN/m²
Buried Concrete	It is recommended that DS-1 and AC-1 be adopted for the design of all buried concrete equating to a designated concrete class DC-2
Further Work	It would be prudent to undertake a formation inspection of the underlying natural strata once the existing basement and floor slabs have been removed.
This summary forms part of a Tier 2 Risk Assessment (Ground Condition) report prepared by GroundSolve Ltd and contains an overview of the key findings and conclusions. The summary should not be treated as an independent document.	

1 Introduction

GroundSolve Ltd (GSL) was commissioned John Dixon & Associates Ltd to undertake a second phase site investigation and contaminated land risk assessment for the Shamrock Pub on Bengal Street, Manchester referred to as The Shamrock Pub, Bengal Street (the "Site").

This report has been devised to generally comply with the relevant principles and requirements of a range of guidance including:

- Part IIA of the Environment Protection Act, 1990;
- BS5930:2015 +A1:2020: "Code of practice for site investigations";
- BS10175: 2011 +A2:2017 "Investigation of Potentially Contaminated Sites - Code of Practice";
- The Building Regulations 2010. Part C (HM Government 2013)
- Environment Agency: Land Contamination Risk Management (LCRM), Version 3, October 2020;
- Environment Agency (2017) "The Environment Agency's Approach to Groundwater Protection" November 2018 Version 1.2;

1.1 Objectives

The purpose of the report is to provide an assessment of the site using published information and information on conditions at the site in relation to the proposed commercial development.

The findings and conclusions of the risk assessments have been set out and recommendations given for the proposed commercial end use. If there is a subsequent change in the proposed land, the risk assessments and conclusions should be reviewed to determine whether they are still applicable for the revised end use.

This document is a working document and may need to be updated, in agreement with the relevant regulatory bodies, at any stage during development dependent on the conditions encountered. This version of this document is to be issued to regulators for approval (Manchester City Council).

1.2 Proposed Development

The proposed development of the site is understood to comprise:

- The demolition of the single storey existing buildings within the central part of the site;
- The removal from site or the treatment of any contaminated material encountered during demolition;
- The construction of two storey extension to the main public house building to extend seating capacity and provide an extension of lounge area to the existing pub structure. The existing hard standing area will be used as a garden area.

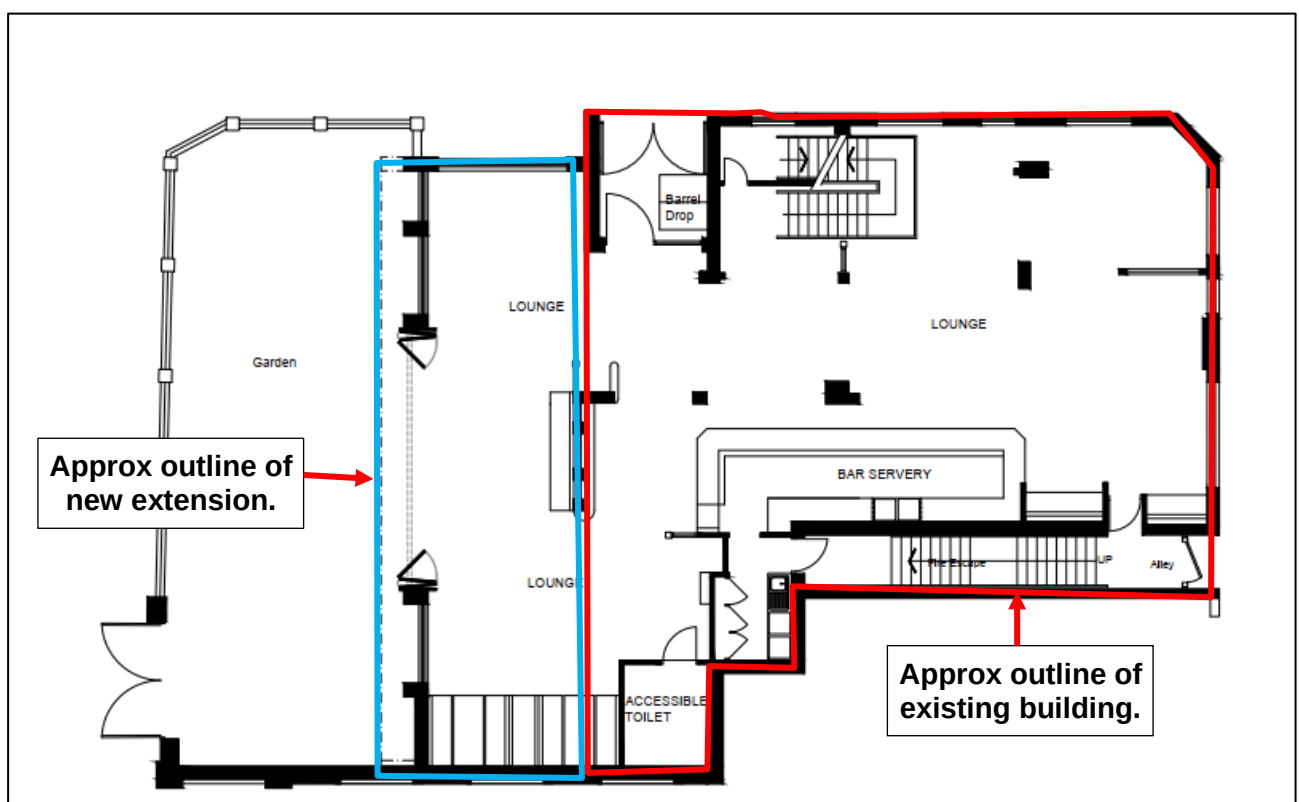


Figure 1 – Extract from Proposed Development Plan

1.3 Previous Investigations

A phase one desk study report was undertaken by GroundSolve Ltd (GSL). Findings of the desk study can be found in **Section 2**

1.4 Limitations

This report has been prepared for the sole use of John Dixon and Associates Ltd. No other third party may rely upon or reproduce the contents of this report without the written approval of GroundSolve Ltd. If any unauthorised third party comes into possession of this report, they rely on it entirely at their own risk.

The current buildings occupy the majority of the site, therefore limiting the areas where an intrusive investigation could be carried out. Three machine excavated trial pits were limited to the southern part of the site, which is currently used as a storage yard.

2 SITE DETAILS AND DESCRIPTION

Table 2.1 Current Site Overview.

Site name	The Shamrock Pub, Bengal Street
Site address	The Shamrock Inn, 17 Bengal St, Ancoats, Manchester M4 6AQ
National Grid Reference (NGR)	384995 , 398815
Approximate Site area	
Site shape	Irregular, with a length of 26m (northwest to southeast) and 17m width (northeast to southwest).
General topography and ground levels	The site is generally flat, however no topographical data has been provided.

Table 2.2 – Summary of Description of the Site and its Environs

Current Use:	Current land use on the site is as a delivery yard for the Shamrock Pub, which is temporarily closed.
Access	Via Bengal Street, with a 4.50m access gate leading to the yard.
Existing Buildings& Structures	Existing structure on the site is the Shamrock Pub, with some associated outbuildings understood to be used for storage.
Site Surface	The site surface comprises of asphalt with evident scaring noted during the field work.
Vegetation	No vegetation is present on the site
Storage Tanks	Below Ground Tanks: No evidence/none suspected. Above Ground Tanks: None present.
Services	Services running into the property include gas (LP) to the main building and electric running into the site between the building and the yard area. Whilst the investigation took place, a signal was identified on the CAT and Genny Power setting, running along the boundary of the yard and storage garages.
Asbestos	No potential Asbestos Containing Materials (ACMs) noted in the buildings or on the ground surface. However, a refurbishment / demolition asbestos survey will be required prior to demolition
Waste Disposal/ Materials Storage	Site materials storage limited to heras fencing, general metal waste and redundant signage (See photos in Appendix B)
Surrounding Area	Residential and commercial units on all site boundaries.
Local / Background Knowledge	The site has comprised commercial and residential land use from at least 1848. Circa 1953 a public house located in the south of the site ceases to exist, and instead a property in the northwest of the site which once comprised three plots is shown to have a new public house present. The site configuration is not believed to have changed since this date. Substation present adjacent to east of the site since 1970s.

A photographic survey of the site was undertaken on 03/07/24 and is presented in **Appendix B**.

3 PREVIOUS INVESTIGATIONS

3.1 Review

A summary of the findings from previous reports is given in **Table 3.1** below:

Table 3.1: Summary of Previous Investigations.

Summary of main findings from the previous reports	
Site History	The site has comprised commercial and residential land use from at least 1848. Circa 1953, a public house located in the south of the site ceases to exist, and instead a property in the northwest of the site which once comprised three plots is shown to have a new public house present. The site configuration is not believed to have changed since this date. A substation is present adjacent to east of the site since 1970s.
Geological Setting	Published geology indicates the underlying site geology comprises superficial deposits of glacial till (clay) with bedrock geology consisting of Sandstone. Due to the historical land use on site, it is likely that made ground will be encountered. Great Mine Limestone seam (Hole High Limestone Group) runs approximately ~850m south east of the site, running south east to north west, however is limited in extent toward the site due an erosional unconformity. The site is likely not impacted by activity associated with historical working of the limestone.
Mining	No onsite mining or extraction is noted to have occurred; it is unlikely the site has been influenced by any activity.
Hydrogeology	The superficial deposits are classified as a Secondary Undifferentiated Aquifer, and the bedrock is classified as a Principal Aquifer. No potable extractions are recorded within 1000m. The closest extraction is 1202m west of site. The site is not situated within a source protection zone.
Potential Contamination Sources	On site: Made Ground – Historic buildings and potential basement located within the southern part of the site. The infilled basement will likely to have been backfilled with demolition material from the former buildings. Potential for asbestos (ACMs), heavy metals, PAHs. There is a low potential for ground gas. Service Yard – Limited potential for small scale hydrocarbon spillages from vehicle movements and storage of materials. Off-site: Substation(s) – There is a substation present adjacent to the eastern boundary, identified on the 1978 historical mapping. PCBs were used as insulating oil within substations from the 1950s up to 1981. There is the potential that PCBs were used on the adjacent site. However, PCBs are typically not very mobile and the underlying ground conditions are likely to reduce migration on to the site. It is recommended that the fieldwork confirms ground conditions and absence of any impacted soils from adjacent substation. Historical Industrial land uses - The surrounding areas have had numerous industrial land uses dating back to the 1800s. Within 250m of the site there has been railway sidings and buildings, garages, mills and depots. There are no specific risks identified from the past industrial land uses to the study site.

4 FIELDWORK

4.1 Introduction

The fieldwork was carried out 03/07/2024. GroundSolve personnel were present to supervise all work, describe the ground encountered, and take samples. Fieldwork procedures were undertaken in accordance with the relevant sections of:

- BS5930:2015 + A1:2020 "Code of Practice for Site Investigations;"
- BS10175:2011 + A2:2017 "Investigation of Potentially Contaminated Sites – Code of Practice."

The investigation included:

- 3 No. machine excavated trial pits to maximum depth of 2.25m bgl,
- Sampling for chemical and geotechnical testing of soils,
- Description of the ground encountered in accordance with BS5930:2015 + A1:2020, Code of Practice for Site Investigations.

4.2 Trial Pits

3No. trial pits (TP01 - TP03) were dug using an 8-tonne excavator. The exploratory hole locations are included on Drawing No. 2 in **Appendix A** along with logs and photographs presented in **Appendix B**.

4.3 Samples and Sample Containers

Soil samples for chemical analysis each comprised a pair of samples: a plastic tub for metals and inorganics and an amber glass jar for organics.

Soil samples were stored in cool boxes with ice packs and dispatched directly to the testing laboratory, for all phases of the investigation.

Samples for physical testing comprising 4 Point Atterberg and Moisture Content tests were dispatched to The Testing Laboratory (TTL) a UKAS accredited laboratory.

5 LABORATORY TESTING

5.1 Chemical Laboratory Testing

Chemical samples were submitted to a UKAS accredited laboratory in accordance with ISO17025 and are also MCERTS accredited for soil analysis in accordance with the Environment Agency's scheme. The laboratory carries out Quality Assurance and Quality Control in accordance with BS ISO 17025 and participate in external laboratory comparison and quality control schemes. Details of the accreditation and the methods of analysis are provided on the relevant test reports.

The selection of samples for laboratory testing and analytes to be determined were made based on the preliminary CSM and relevant observations during the investigations. The sample selection rationale is as follows:

- To gain a good coverage across the Site of the various material types and strata encountered;
- To investigate the specific locations of previous potentially contaminative land uses as identified within the Phase 1 desk study and subsequent CSM (i.e. adjacent the boundary of the substation and the area of site used as a service yard, with potential for small scale hydrocarbon spillages);
- To fully characterise the potential made ground materials within the identified higher-risk areas.

The selected soil samples were tested for a range of typical contamination indicators including specific tests for contaminants suspected as being present from the desk study, CSM, and observations made on-site. Tests were also performed which were used to support the modelling of contaminant transport and impacts (e.g. TOC) and for waste classification purposes.

Each of the soil samples were analysed for the 'total' concentration of a suite of potential contaminants.

The results of the laboratory analysis are presented in **Appendix D**. The various suites of analysis for the soil are presented in **Table 5.1** below:

Table 5.1: Suites of Analysis for Environmental Soil Samples

Determinand	Number of Samples
Index Tests	-
Asbestos Screen / Quantification	4
pH	4
Metals	-
As, Cd, Cr, Cu, Pb, Hg, Ni, Se, Zn (all totals)	4
Inorganics	-
Acid Soluble Sulphate	4
Cyanide - Total	4
Sulphate (2:1 extract on soil samples)	4
Organics	-
Phenols - Total (monohydric)	4
Total Organic Carbon (TOC)	4
PAH (Speciated USEPA 16)	4
Speciated TPH (C5-C35)	1
Benzene, Toluene, Ethyl Benzene, Xylenes (BTEX);	1

5.2 Physical Laboratory Testing

Samples were submitted to Professional Soils Laboratory (PSL) who are UKAS accredited in accordance with ISO17025. The following geotechnical testing was undertaken with the results of this testing presented in are presented in **Appendix E**. The various suites of analysis for the soil are presented in **Table 5.2**:

Table 5.2: Summary of Physical Testing

Determinant	Samples Used in Testing
Index Tests	
Atterberg	2
Moisture Content	2

6 GROUND CONDITIONS

6.1 General

The site investigations have allowed the site-specific ground conditions to be described and this information was used to provide an improved conceptual ground model. The geology encountered during the site investigations was generally consistent with existing publicly available information online on the British Geological Survey (BGS) GeoIndex (onshore) viewer. A summary of the general strata encountered across the site is provided in the following sub sections.

6.2 Ground Surface

The ground surface across the site comprises asphalt of 0.05m thickness, with evidence of scaring noted.

6.3 Anthropogenic Materials

Made ground was encountered in all exploratory holes and comprised of loose grey slightly silty sandy gravel of bituminous material, limestone and red brick and ranged in thickness from 0.35m and 0.85m. This material was underlain by loose angular cobbles of red brick in TP02 and TP03, likely backfill of historical basements associated with the previous properties on the site. Evidence of basement structures was seen on the sides of the excavations, as well as the presence of a fireplace, and a tank (suspected hot water tank) with piping identified in TP02. In both TP02 and TP03 a concrete slab was encountered at 2.10 (TP03) and 2.20m (TP02) bgl, which proved difficult to excavate through with a hydraulic breaker attachment. TP01 encountered potentially reworked brown clay with red brick cobbles and coal fragments, to a depth of 1.00m bgl.

No visual or olfactory evidence of contamination was noted during the fieldwork.

6.4 Natural Deposits

Underlying the Made Ground in TP01, natural deposits consistent with the anticipated glacial till were encountered and described as stiff grey sandy clay.

Soil classification tests were carried out on the glacial till samples which revealed TP01 at 2.00m consistent with a clay of high plasticity with a liquid limit of 54%, plastic limit of 26%, plasticity index of 28% and a moisture content of 32%. The sample from TP01 taken at 1.30m bgl recorded a clay of intermediate plasticity with a liquid limit of 44%, plastic limit of 20%, plasticity index of 24% and a moisture content of 28%, with both samples classified as desiccated. All results are presented in **Appendix E**.

6.5 Bedrock

Bedrock was not encountered during this investigation.

6.6 Groundwater

No groundwater was encountered in any of the exploratory holes.

6.7 Surface Water

No surface water is located on or proximal to the site.

7 GENERIC QUANTITATIVE RISK ASSESSMENT

7.1 Assessment for the Protection of Human Health

The results of the soil analyses are presented below, where they have been compared to suitable generic assessment criteria (GACs), in order to allow a generic quantitative risk assessment (GQRA) to be carried out for the site and the proposed development.

The Category 4 Screening Levels (C4SLs) published by DEFRA (2014) have been adopted in the first instance, which have been published for six substances to date. Where a C4SL is unavailable, the “Suitable 4 Use Levels” (S4ULs) published by LQM/CIEH (2015) have been adopted.

These criteria have been derived using the CLEA model for a range of standard end-use scenarios and a range of soil organic matter (SOM) contents. It should be noted that the C4SL values are derived on the basis of a “low level of toxicological concern”, while the S4UL values are based on a “tolerable” or “minimal” level of risk. As such, the S4ULs describe a lower level of risk than the C4SLs, and are equivalent to the former Soil Guideline Values (SGVs, published by the Environment Agency) and the previous editions of the LQM/CIEH GAC values.

The GQRA is based on a soil with a Soil Organic Matter of 1.0%, for a commercial end use.

A full summary of the chemical test results is presented in **Appendix F**.

7.2 Results

Metals

The results from the metal analysis have recorded very low concentrations with no exceedances of the applicable GACs.

Table 7.1: Metals Suite

Metals	Min (mg/kg)	Max (mg/kg)	Average (mg/kg)	Count	Adopted Guideline (mg/kg)	Source	Exceedances
Arsenic	8.8	42.8	18.08	4	640	C4SL	0
Cadmium	< 0.5	0.8	0.8	4	410	C4SL	0
Copper	32.9	169	74.58	4	68000	S4UL	0
Lead	26	673	210.15	4	2300	C4SL	0
Mercury	< 0.5	1	1	4	58	S4UL	0
Nickel	27.1	33.1	31.33	4	980	S4UL	0
Total Phenols	< 5	< 5	< 5	4	440	S4UL	0
Selenium	< 1.0	< 1.0	< 1.0	4	12000	S4UL	0
Zinc	63.3	233	127.85	4	730000	S4UL	0

GroundSolve conclude that the risk from metal concentrations to the proposed development is considered low.

PAHs

All samples selected for analysis have generally recorded low PAHs, with the exception of 1 No. exceedance for Dibenzo(a,h)anthracene within TP01 at a depth of 0.30m bgl. The exceedance of dibenzo(ah)anthracene is discussed further in **Section 7.6**.

Table 7.2: Polyaromatic Hydrocarbons

Polyaromatic Hydrocarbons (PAH)	Min (mg/kg)	Max (mg/kg)	Average (mg/kg)	Count	Adopted Guideline (mg/kg)	Source	Exceedances
Acenaphthene	< 0.5	0.6	0.6	4	84000	S4UL	0
Acenaphthylene	< 0.5	1.1	0.85	4	83000	S4UL	0
Anthracene	< 0.5	3.8	2.23	4	520000	S4UL	0
Benzo(a)anthracene	< 0.5	20.5	11.13	4	170	S4UL	0
Benzo(a)pyrene	< 0.5	22.7	12.57	4	77	C4SL	0
Benzo(b)fluoranthene	< 0.5	21	11.07	4	44	S4UL	0
Benzo(g,h,i)perylene	< 0.5	16	7.7	4	3900	S4UL	0
Benzo(k)fluoranthene	< 0.5	19.9	10.73	4	1200	S4UL	0
Chrysene	< 0.5	23.9	12.53	4	350	S4UL	0
Dibenzo(a,h)anthracene	< 0.5	6	2.73	4	3.5	S4UL	1
Fluoranthene	< 0.5	22.9	13.37	4	23000	S4UL	0
Fluorene	< 0.5	0.6	0.6	4	63000	S4UL	0
Indeno(1,2,3-c,d)pyrene	< 0.5	17.3	8.17	4	500	S4UL	0
Naphthalene	< 0.5	0.8	0.8	4	190	S4UL	0
Phenanthrene	< 0.5	5.1	4	4	22000	S4UL	0

Polyaromatic Hydrocarbons (PAH)	Min (mg/kg)	Max (mg/kg)	Average (mg/kg)	Count	Adopted Guideline (mg/kg)	Source	Exceedances
Pyrene	< 0.5	22.5	12.6	4	54000	S4UL	0

Petroleum Hydrocarbons (PHC)

No hydrocarbon impacted material was encountered during the fieldwork.

Table 7.3: Petroleum Hydrocarbons

Petroleum Hydrocarbons	Min (mg/kg)	Max (mg/kg)	Average (mg/kg)	Count	Adopted Guideline (mg/kg)	Source	Exceedances
Aliphatic C5-C6	< 0.01	< 0.01	< 0.01	3	3200	S4UL	0
Aliphatic C6-C8	< 0.01	< 0.01	< 0.01	3	7800	S4UL	0
Aliphatic C8-C10	< 1.0	< 1.0	< 1.0	3	2000	S4UL	0
Aliphatic C10-C12	< 1.0	< 1.0	< 1.0	3	9700	S4UL	0
Aliphatic C12-C16	< 1.0	< 1.0	8.05	3	59000	S4UL	0
Aliphatic C16-EC35	7.3	1600	811.77	3	1600000	S4UL	0
Aliphatic C35-C40	4.4	591	324.13	3	1600000	S4UL	0
Aromatic C5-C7	< 0.01	< 0.01	< 0.01	3	26000	S4UL	0
Aromatic C7-C8	< 0.01	< 0.01	< 0.01	3	56000	S4UL	0
Aromatic C8-C10	< 1.0	< 1.0	< 1.0	3	3500	S4UL	0
Aromatic C10-C12	< 1.0	< 1.0	< 1.0	3	16000	S4UL	0
Aromatic C12-C16	< 1.0	5.7	4.05	3	36000	S4UL	0
Aromatic >C16-C21	< 1.0	41	29.5	3	28000	S4UL	0
Aromatic >C21-C35	4.6	1610	750.53	3	28000	S4UL	0
Aromatic >C35-EC40	2.9	557	274.3	3	28000	S4UL	0

The speciated Total Petroleum Hydrocarbons (TPH) results have shown the majority below the relevant detection limits, however material from TP01 at 0.30m bgl and TP02 at 0.15m has total concentrations <1000mg/kg. The concentrations fall below GACs and therefore are not likely to represent a significant increased risk to long term human health and give no cause for concern. Bituminous fragments were noted as present within this material, and as such the elevated PAHs are likely the result of these fragments.

Asbestos

Asbestos can be present in soil as fragments of bulk Asbestos Containing Materials (ACMs) (e.g., asbestos cement sheeting) and also as discrete asbestos fibres within the soil matrix. This investigation has carried out assessments to determine whether both bulk fragments of asbestos and discrete fibres are present in the soil at the site. The asbestos

assessment commenced on site with inspection of the Made Ground by our site staff for the presence of bulk ACMs. During the fieldwork no suspected ACMs were identified.

Laboratory assessments were carried out in order to confirm the site assessment that ACMs were absent, and no asbestos was detected in any of the samples retrieved from site.

7.3 Assessment for the Protection of Controlled Waters

The total concentrations detected within soil samples are predominantly relatively marginal in human health terms and do not indicate particularly high concentrations which would be indicative of a significant source of groundwater contamination. Whilst only encountered within exploratory hole TP01 it is likely there is a significant layer of low permeability Glacial Till between the made ground and underlying aquifer. Overall, it is assessed that there is a low possibility of a contaminant linkage between the potential source and the underlying principle aquifer because:

- No potable extractions are within 1000m
- Closest potable extraction is located 1202m W
- The site lies outside of a source protection zone
- There is likely a significant amount of clay between potentially impacted material and the principal bedrock aquifer.

7.4 Permanent Ground Gases

The risks from permanent ground gases are considered low as no active or recent landfills are recorded within 500m of the site, with deep made ground only associated with filled basements from historical onsite structures, of which no elevated volatiles have been identified in such materials. Despite higher concentrations of TPHs, vapor risk is considered low as these elevated concentrations are likely derived from bituminous fragments being present within the samples taken for analysis, therefore classifying these largely as mobile and not likely to cause a vapor risk.

7.5 Risks to Human Health (Construction Phase)

Whilst overall contaminant levels are low during the construction works there will be a risk from dust to on-site workers and people occupying adjacent properties. Appropriate risk assessments should be carried out by the contractor to allow appropriate controls for the mitigation of risk to health of construction workers to be put in place. This risk can be controlled to within acceptable limits by:

- Method statement for site activities including control of dust generation;
- Having adequate site hygiene facilities allowing staff to keep a good level of personal hygiene;
- The method statement shall have a contingency plan which should be implemented if the presence of significantly elevated levels of lead is suspected in groundworks; and
- Only permitting smoking or eating on site in appropriate pre-designated areas.

As a minimum it is anticipated the works will be undertaken in accordance with BRE best practise guidance, and that the following measures will be introduced to assist with control of dust generation during the groundworks phase of the works:

- Access roads and any stockpiles created during groundworks should be regularly damped down with water;
- Vehicles used to transport materials/wastes and aggregates should be enclosed or tarpaulined;
- Vehicle movements and speed should be kept to a minimum within the site ;
- Dust generating equipment (e.g., mobile crushing and screening equipment) should be located to minimise potential nuisance impacts to receptors as far as practicable; and
- Minimising drop heights of all loading and unloading activities that involve the transfer of soils and demolition materials.

7.6 Conceptual Site Model

The proposed development comprises of an extension of the existing Shamrock Pub with the addition of extra floor space, consisting of 2 storeys, in the footprint of the existing service yard.

The conceptual site model has been updated since the Phase 1 Preliminary Risk Assessment, as the findings of the Phase 2 site investigation revealed the following general downward succession:

- Site surface: Asphalt hardstanding;
- Deep Made Ground (across the site): Predominantly comprising of loose red brick cobbles underlying loose grey slightly silty sandy gravel of limestone, red brick and bituminous material
- Devensian Till: Encountered in TP01 beyond 1.65m, comprising of stiff grey sandy clay

The results of site investigation and laboratory analysis generally record negligible to zero concentrations of potential contaminants, however there are elevated concentrations of Dibenzo(a,h)anthracene within TP01 at a depth of 0.30m

bgl and high TPHs concentrations in TP01 at a depth of 0.30m and TP02 at a depth of 0.15m bgl, which as previously discussed are likely resultant from bituminous material being present within the samples.

GroundSolve conclude that the risk from elevated Dibenzo(a,h)anthracene concentrations to the proposed development is considered low as the area with impacted material is within the footprint of the proposed extension, and therefore will be under hard standing, as such it will likely not require any additional remediation due to the following factors:

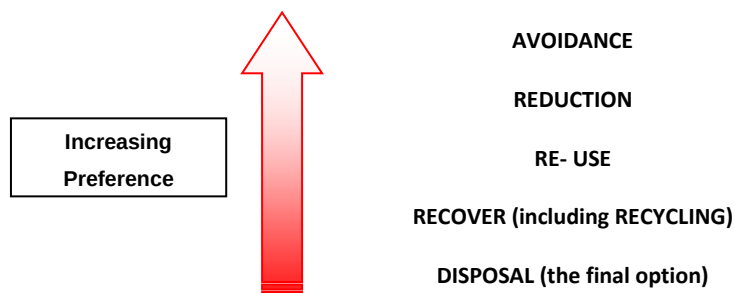
- The elevated concentrations are located within the area of the proposed extension therefore not in an area of soft landscaping;
- The shallower materials are likely to be removed from site during site clearance and preparation for the proposed development.
- Material which recorded high concentrations of TPHs are those of which contained bituminous fragments, as noted within field logs found in **Appendix C**.

Whilst unexpected contamination is not anticipated, the proposed development could encounter previously unrecorded hotspots of contaminants. These will be assessed and mitigated in accordance with current good practice.

8 WASTE ASSESSMENT

8.1 Waste Hierarchy

In accordance with government guidance, it is required that the production and disposal of waste is managed in accordance with the following hierarchy of preference:



8.2 Waste Characterisation and Classification

If there is a portion of excess soil this will then have to be sent to a suitable landfill site. A two-phase approach is required comprising:

- Waste Characterisation; and
- Waste Classification (Waste Acceptance Criteria).

Waste Characterisation

The results of the total concentrations from the chemical testing on soil samples have been assessed to determine whether or not they are hazardous in terms of waste characterisation. The results of this assessment indicate that the materials encountered during the investigation should be classified as hazardous, due to high concentrations of TPHs found within 2 No. shallow samples.

Waste Classification

In order to determine whether soils can be sent to a licensed landfill for disposal further testing is required comprising landfill Waste Acceptance Criteria (WAC) analysis for both total concentrations for certain chemicals and for leachate analysis. No WAC testing was carried out as part of this investigation. WAC testing will have to be carried out to confirm the landfill waste classification and if any pre-treatment is required. This is best carried out once all material to be disposed of is stockpiled, and volumes can be accurately assessed. It should be noted that natural clay can likely be classified as Inert Waste 17 05 04: Soil and stones only (excluding topsoil, peat, soil and stones).

Testing Frequency

There are also set requirements for the required sampling and testing frequencies for materials being sent for disposal at landfills. The required testing frequencies for each different waste type are summarised in **Table 8.1** below.

Table 8.1: Laboratory Sampling Testing Frequencies

Testing Level	Quantity of Waste	Number of Samples	
		Homogeneous	Heterogeneous & New Wastes
Level 1 Characterisation (Description, Total Concentrations & Leaching)	<100T	2	5
	<500T	3	8
	<1000T	5	14
	10,000 T	11	22
	Per additional 10,000T	+5 pro rata	+10 pro rata
Level 2 Compliance For Regularly Generated Wastes (Total Concentrations & Leaching)		1 per defined waste sub-population per year	3 per defined waste sub-population per year
Level 3 Verification Delivery document & visual check Chemical testing as per Level 2 suite		Visual – Each Load	Visual – Each Load
		1 per year per waste stream	3 per year per waste stream

9 GEOTECHNICAL ASSESSMENT AND RECOMMENDATIONS

9.1 Fieldwork and Laboratory Data Review

The proposed development includes the construction of a 2-storey extension to the existing Shamrock Pub, on Bengal Street Manchester.

No loading information has been provided for this report.

The shallow ground conditions predominantly comprise loose grey silty sandy gravel of bituminous fragments, limestone and red brick varying in thickness from 0.35m to 0.85m. This material typically overlies loose red brick cobbles which extend to a maximum proven depth of 2.20m bgl and 2.10m bgl in TP02 and TP03 respectively, where excavations encountered concrete obstructions anticipated to be basement floor slabs.

The underlying drift deposits have been confirmed to comprise stiff grey sandy clay encountered at a depth of 1.00m in TP01 and proven to 2.25m bgl.

Classification testing was undertaken on disturbed samples of the natural clay strata and are summarised in **Table 9.1** below:

Table 9.1 Summary of Classification Testing

Hole	Depth (m)	Moisture Content (%)	% passing 425um sieve	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	Modified Plasticity Index	Plasticity	Volume Change Potential
TP01	2	32	98	54	26	28	27	High	Medium
TP01	1.3	28	99	44	20	24	24	Intermediate	Medium
Minimum		28	98	44	20	24	23.76	28	98
Average		30.0	98.5	49.0	23.0	26.0	25.6	30.0	98.5
Maximum		32	99	54	26	28	27.44	32	99

Testing indicates that the clays show evidence of desiccation with moisture contents higher than the plastic limits, and medium volume change potential.

Pocket penetrometer tests were carried out on the recovered clay to estimate the shear strength, with results recording values of 100kN/m².

Test results are recorded on the exploratory hole records and are summarised in **Table 9.2** below:

Table 9.2: Summary of In-Situ Hand Shear Vane Tests

Location	Depth (m bgl)	Estimated Undrained Shear strength (kPa) *
TP01	1.20	100
	2.00	100

9.2 Trees

No trees or vegetation are on or bounding the site and therefore a comprehensive tree survey is not likely required.

9.3 Foundation Recommendations

For the purpose of this assessment, it is assumed the site will not be subject to extensive reprofiling.

The previous building's basement has been shown to be at a depth of 2.10m below existing ground level and underlie the majority of the proposed development see **Figure 2**,

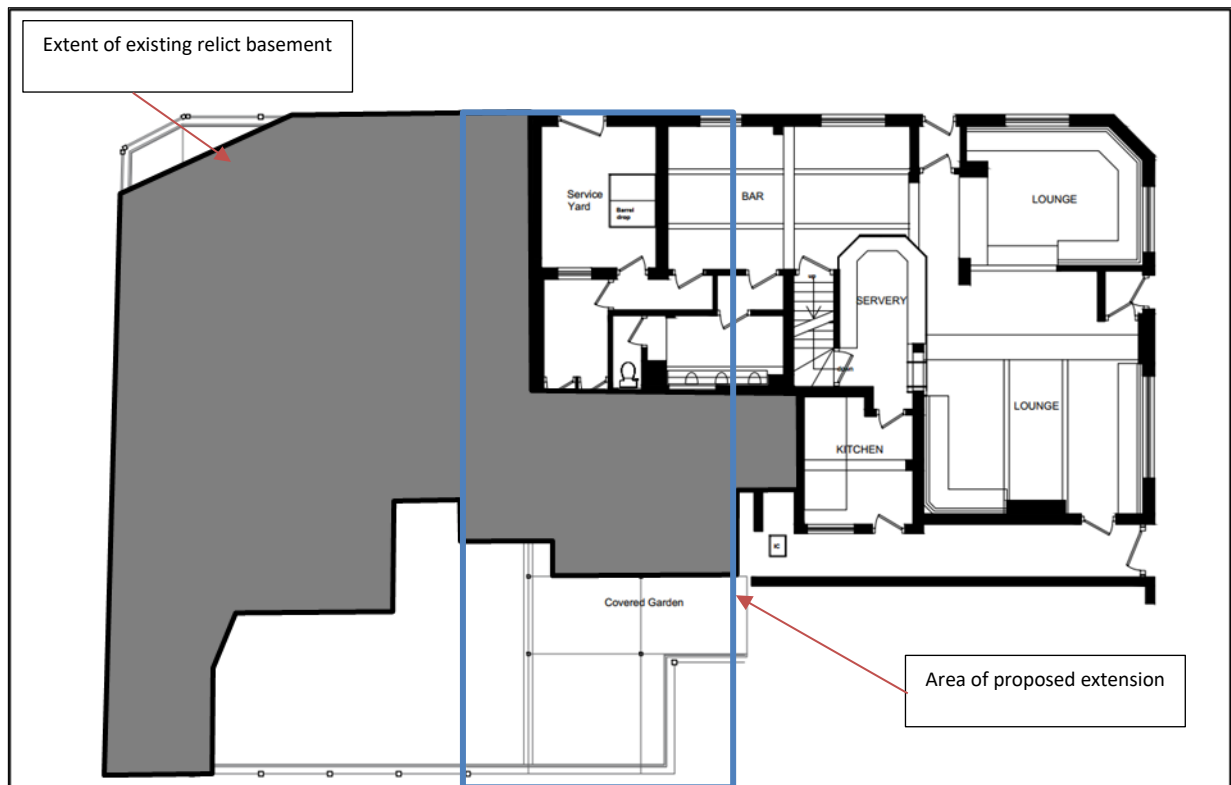


Figure 2 - Approximate Extent of Existing Relict Basement

Given the absence of any details as to the age, composition and strength of the relict basement slabs it is recommended these are removed prior to the construction of the new development, likewise any, relict walls and foundations. These materials could then be screened, crushed and reused as a suitably engineered backfill. The development could then be constructed on a conventional reinforced concrete raft designed based on an allowable bearing capacity of 50kN/m^2

Whilst conventional strip foundations may be possible to the southern portion of the extension where the natural clay deposits lie at shallow depth this would significantly increase the risk of differential settlement between the two foundation types and as such is not recommended.

9.4 Reuse of Materials

As part of the site preparation all relict foundations, floor slabs and walls underlying the proposed development will need to be grubbed out and replaced with a suitably compacted granular material. It should be feasible to screen, crush and reuse the majority of excavated made ground and relict foundations as engineered backfill. This material could be placed and compacted in accordance with a suitable earthworks specification to allow the utilisation of a conventional reinforced raft foundation. Due to exceedances of PAH and TPHs within made ground material, it is recommended that this material is not reused under any areas of soft landscaping. The glacial till materials encountered in TP01 should be suitable for reuse under any proposed soft landscaping areas.

9.5 Groundwater & Excavations

It is not expected that shallow excavations (<2.50m) within the glacial till or made ground will encounter significant groundwater entries. Some perched water contained within the relict basements and made ground should be anticipated however it is predicted that these should be controllable via conventional pumping from sumps. If inflows are relatively localised, this may cause softening of the ground and require localised excavation support in order to prevent instability of the sides of excavations.

Excavations through the made ground are liable to encounter extensive obstructions associated with relict foundations and basements which will require mechanical or hydraulic breaking. The presence of numerous obstructions and former developments mean significant amounts of overbreak during excavation should be expected. Fill materials predominantly comprised loose granular material and whole bricks and as such excavations will require temporary support. Any temporary works design will also need to consider support of the existing structure foundations.

Whilst excavation depths should generally be readily achieved using conventional hydraulic plant, with breaker attachments careful consideration should be given to plant and breaker sizes following difficulty observed during the site investigation works.

All excavations should be carried out in accordance with CIRIA Report 97 "Trenching Practice" and BS6031: 2009: Code of Practice for Earthworks. Further guidance on this aspect of site works is given in the British Standards for "Workmanship on Building Sites", BS 8000, Part 1, and in the Construction Industry Training Board's Site Safety Note 10.

9.6 Buried Concrete and Pipework

The results of laboratory pH and sulphate content indicate that ACEC Class AC-1 conditions prevail in accordance with BRE Special Digest 1, 2005 (the Design Concrete Class). Therefore, special precautions are not required at the site for the design of concrete in terms of the durability and structural performance.

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- <http://www.warstateandsociety.com/Bombing-Britain>

<https://www.epa.gov/pfas/basic-information-pfas>

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BGS Geology of Britain Viewer <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

11 DEFINITIONS

AOD	Above Ordnance Datum
bgl	Below ground level
BGS	British Geological Survey
BRE	Building Research Establishment
CBR	California Bearing Ratio (test)
COMAH	Control of Major Accident Hazards (regulations)
DQRA	Detailed Quantitative Risk Assessment
DWS	Drinking Water Standard
EQS	Environmental Quality Standard
GAC	Generic Assessment Criterion
GQA	General Quality Assessment (Environment Agency)
GQRA	Generic Quantitative Risk Assessment
GSV	Gas Screening Value
HCV	Health Criteria Value
IPPC	Integrated Pollution Prevention and Control (regulations)
NGR	National Grid Reference
NIHHS	Notification of Installations Handling Hazardous Substances (regulations)
OS	Ordnance Survey
ppm	Parts per million
ppmv	Parts per million by volume
SAC	Special Area of Conservation
SPZ	Source Protection Zone (see Error! Reference source not found.)
SSAC	Site-Specific Assessment Criterion
SSSI	Site of Special Scientific Interest

APPENDIX A – DRAWINGS



KEY



Site Location

(C) OpenStreetMap Contributors

Sampling locations and features annotated are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor.

Client:

John Dixon & Associates LTD

Site:

The Shamrock Pub, Bengal Street

Title:

Site Location and Boundary Plan

Job No.:

GS3127

Drawn By:

AR

Checked By:

SF

Drawn:

25/07/2024

Scale (see scale bar):

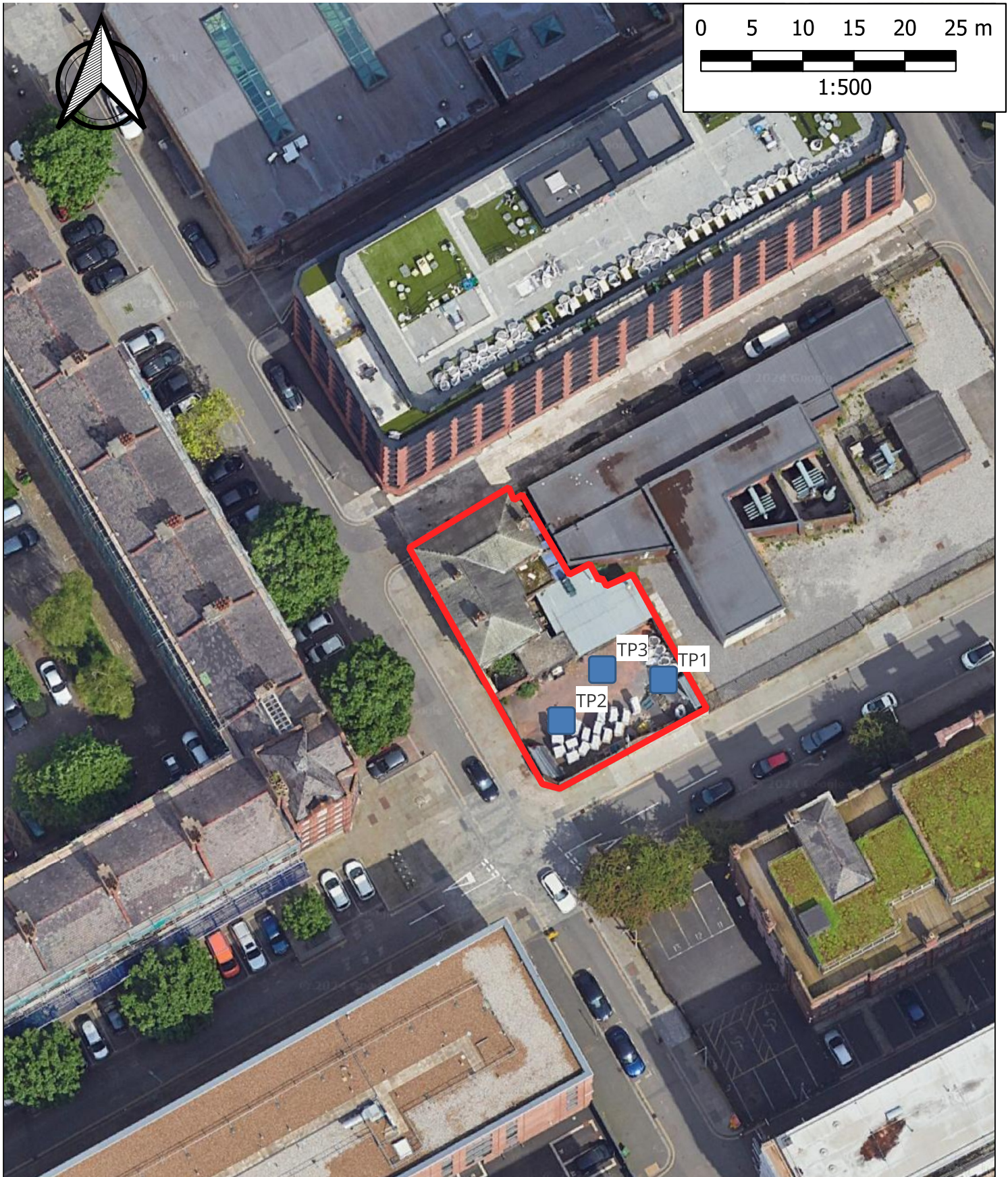
1:20,000 @ A4
1:500 @ A4

Figure:

1

Revision:

GroundSolve Ltd
Consulting Geotechnical Engineers



KEY



Site Location



Trial Pit Location

(C) OpenStreetMap Contributors

Sampling locations and features annotated are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor.

Client:

John Dixon & Associates LTD

Site:

The Shamrock Pub, Bengal Street

Job No.:

GS3127

Drawn By:

AR

Checked By:

SF

Drawn:

25/07/2024

Title:

Exploratory Hole Location
Plan

Scale (see scale bar):

1:500 @ A4

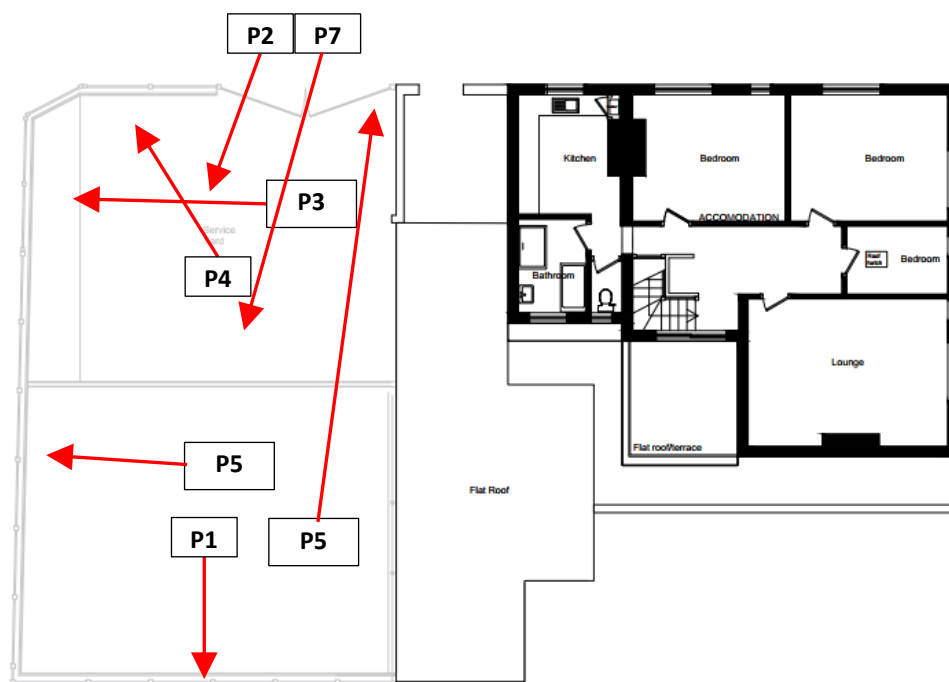
Figure:

2

Revision:

GroundSolve Ltd
Consulting Geotechnical Engineers

APPENDIX B – SITE PHOTOGRAPHS



EXISTING FIRST FLOOR PLAN
Scale 1:50 @ A1



Photo 1



Photo 2



Photo 3

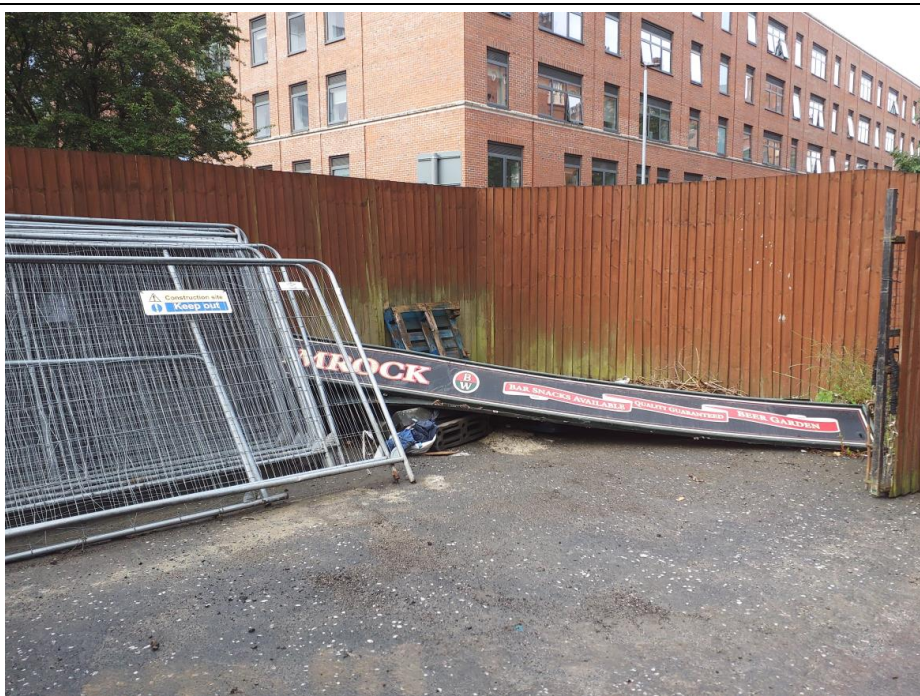


Photo 4



Photo 5



Photo 6



Photo 7

APPENDIX C – EXPLORATORY HOLE RECORDS

Project Name: The Shamrock Pub, Bengal Street		Client: John Dixon & Associates Ltd		Date: 03/07/2024	
Location: Bengal Street, Manchester		Contractor: GroundSolve		Co-ords: E384994.98 N398821.75	
Project No. : 3127		Crew Name: Hurt Plant Hire		Equipment: 8T	
Location Number TP01	Location Type TP	Level	Logged By AR	Scale 1:25	Page Number Sheet 1 of 1

Backfill/ Instal'n	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description				
		Depth (m)	Type	Results								
		0.20 - 0.80	B	100.0kPa	0.05			Bituminous slab (MADE GROUND)	1			
		0.30	ES		Loose grey slightly silty sandy subangular to angular fine to coarse GRAVEL of bituminous material, limestone and red brick (MADE GROUND)							
		From 0.20m to 1.20m bgl Vertical extent of brick wall										
								Stiff brown mottled grey slightly sandy CLAY with occasional charcoal fragments (MADE GROUND)				
		1.20	ES		100.0kPa			1.00			Stiff grey sandy CLAY (GLACIAL TILL)	
		1.20	PP								From 0.30m to 1.00m whole red bricks	
		1.30	D									
		1.80 - 2.20	B									2
		2.10	D		100.0kPa		2.25			End of Trial Pit at 2.250m		
		2.20	PP									
						3						
								4				
										5		

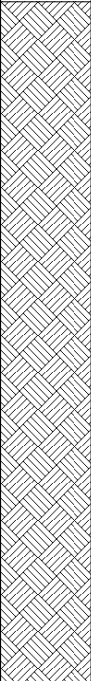
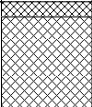
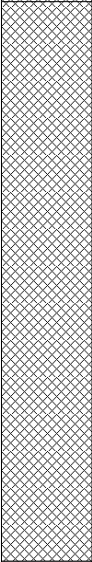
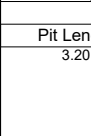
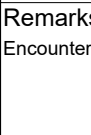


TP01



TP01 Arisings

Project Name: The Shamrock Pub, Bengal Street		Client: John Dixon & Associates Ltd		Date: 03/07/2024	
Location: Bengal Street, Manchester		Contractor: GroundSolve		Co-ords: E385006.70 N398807.38	
Project No. : 3127		Crew Name: Hurt Plant Hire		Equipment: 8T	
Location Number TP02	Location Type TP	Level	Logged By AR	Scale 1:25	Page Number Sheet 1 of 1

Backfill/ Instal'n	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20 - 0.30 0.25	B ES		0.05			Bituminous slab (MADE GROUND)	1
					0.35			Loose grey slightly silty sandy subangular to angular fine to coarse GRAVEL of bituminous material, limestone and red brick (MADE GROUND) Loose angular red brick COBBLES (MADE GROUND)	
					2.20 2.25			Concrete slab (MADE GROUND) End of Trial Pit at 2.250m	
									2
									3
									4
									5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
3.20	0.80	Unstable					

Remarks	
Encountered concrete slab. Difficulty progressing beyond 2.25m bgl. Hot water tank recovered at 2.00m along with pipe.	



TP02

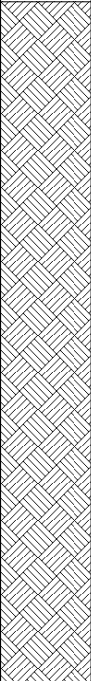
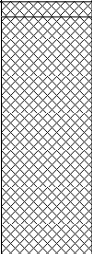
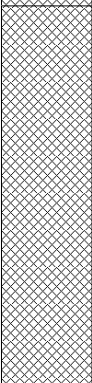


TP02 - Arisings



TP02 – Concrete Slab

Project Name: The Shamrock Pub, Bengal Street		Client: John Dixon & Associates Ltd		Date: 03/07/2024	
Location: Bengal Street, Manchester		Contractor: GroundSolve		Co-ords: E385005.03 N398809.59	
Project No. : 3127		Crew Name: Hurt Plant Hire		Equipment: 8T	
Location Number TP03	Location Type TP	Level	Logged By AR	Scale 1:25	Page Number Sheet 1 of 1

Backfill/ Instal'n	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.40 0.40 - 0.70	ES B		0.05			Bituminous slab (MADE GROUND) Loose grey slightly silty sandy subangular to angular fine to coarse GRAVEL of bituminous material, limestone and red brick (MADE GROUND)	1
					0.85			Loose angular red brick COBBLES (MADE GROUND)	
					2.10 2.15			Concrete slab (MADE GROUND) End of Trial Pit at 2.150m	2
									3
									4
									5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length 3.10	Pit Width 0.60	Pit Stability Unstable	Shoring Used	Remarks	Date	Rate	Remarks

Remarks	
Encountered concrete slab. Difficulty progressing beyond 2.30m bgl	



TP03



TP03 – Concrete Slab



TP03 - Arisings

APPENDIX D – CHEMICAL TEST RESULTS



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Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY
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info@elab-uk.co.uk

Certificate of Analysis

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number: 24-54698

Issue: 1

Date of Issue: 12/07/2024

Contact: Alex Ridge

Customer Details: GroundSolve Ltd
Unit 1 Well House Barns
Chester Road
Bretton
FlintshireCH4 0DH

Quotation No: Q24-04319

Order No: Not Supplied

Customer Reference: 3127

Date Received: 05/07/2024

Date Approved: 12/07/2024

Details: Bengal Street Manchester

Approved by:

Ben Rees, Customer Services Assistant



Sample Summary

Report No.: 24-54698, issue number 1

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
366331	TP01 0.30	03/07/2024	05/07/2024	Loamy sand	
366332	TP01 1.20	03/07/2024	05/07/2024	Clay	
366333	TP02 0.25	03/07/2024	05/07/2024	Loamy sand	
366334	TP03 0.40	03/07/2024	05/07/2024	Sandy loam	

Results Summary

Report No.: 24-54698, issue number 1

ELAB Reference				366331	366332	366333	366334
Customer Reference							
Sample ID							
Sample Type				SOIL	SOIL	SOIL	SOIL
Sample Location				TP01	TP01	TP02	TP03
Sample Depth (m)				0.30	1.20	0.25	0.40
Sampling Date				03/07/2024	03/07/2024	03/07/2024	03/07/2024
Determinand	Codes	Units	LOD				
Soil sample preparation parameters							
Moisture Content	N	%	0.1	9.2	22.2	8.8	13.8
Stones Content	N	%	0.1	5.3	< 0.1	< 0.1	4.4
Material removed	N	%	0.1	5.3	< 0.1	< 0.1	4.4
Description of Inert material removed	N		0	Stones	None	None	Stones
Metals							
Arsenic	M	mg/kg	1	8.8	11.9	8.8	42.8
Cadmium	M	mg/kg	0.5	< 0.5	< 0.5	< 0.5	0.8
Chromium	M	mg/kg	5	25.1	35.6	30.2	26.0
Copper	M	mg/kg	5	35.1	32.9	61.3	169
Lead	M	mg/kg	5	59.0	26.0	82.6	673
Mercury	M	mg/kg	0.5	< 0.5	< 0.5	< 0.5	1.0
Nickel	M	mg/kg	5	27.1	32.7	33.1	32.4
Selenium	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0
Zinc	M	mg/kg	5	91.1	63.3	124	233
Anions							
Water Soluble Sulphate	M	g/l	0.02	0.05	0.03	0.03	0.03
Inorganics							
Total Cyanide	M	mg/kg	1	1.1	< 1.0	< 1.0	< 1.0
Acid Soluble Sulphate (SO4)	U	%	0.02	0.07	< 0.02	0.06	n/t
Miscellaneous							
pH	M	pH units	0.1	8.7	7.8	8.8	8.6
Soil Organic Matter	U	%	0.1	6.5	0.4	5.1	2.8
Total Organic Carbon	U	%	0.01	3.7	0.55	3.2	5.4
Organics							
>C8-C10 BCB (EH_1D_Total)	N	mg/kg	1	< 1.0	< 1.0	< 1.0	n/t
>C10-C12 BCB (EH_1D_Total)	N	mg/kg	1	< 1.0	< 1.0	< 1.0	n/t
>C12-C16 BCB (EH_1D_Total)	N	mg/kg	1	< 1.0	< 1.0	< 1.0	n/t
>C16-C21 BCB (EH_1D_Total)	N	mg/kg	1	31.4	< 1.0	26.1	n/t
Diesel Range Organics (>C8-C21) (EH_1D_Total)	N	mg/kg	1	30	< 1	26	n/t
Phenols							
Total Monohydric Phenols	N	mg/kg	5	< 5	< 5	< 5	< 5

Results Summary

Report No.: 24-54698, issue number 1

ELAB Reference				366331	366332	366333	366334
Customer Reference							
Sample ID							
Sample Type				SOIL	SOIL	SOIL	SOIL
Sample Location				TP01	TP01	TP02	TP03
Sample Depth (m)				0.30	1.20	0.25	0.40
Sampling Date				03/07/2024	03/07/2024	03/07/2024	03/07/2024
Determinand	Codes	Units	LOD				
Polyaromatic hydrocarbons							
Naphthalene	N	mg/kg	0.5	0.8	< 0.5	< 0.5	< 0.5
Acenaphthylene	N	mg/kg	0.5	1.1	< 0.5	< 0.5	0.6
Acenaphthene	N	mg/kg	0.5	0.6	< 0.5	< 0.5	< 0.5
Fluorene	N	mg/kg	0.5	0.6	< 0.5	< 0.5	< 0.5
Phenanthrene	N	mg/kg	0.5	5.1	< 0.5	1.6	5.3
Anthracene	N	mg/kg	0.5	3.8	< 0.5	0.9	2.0
Fluoranthene	N	mg/kg	0.5	22.9	< 0.5	6.3	10.9
Pyrene	N	mg/kg	0.5	22.5	< 0.5	6.0	9.3
Benzo(a)anthracene	N	mg/kg	0.5	20.5	< 0.5	5.8	7.1
Chrysene	N	mg/kg	0.5	23.9	< 0.5	6.4	7.3
Benzo(b)fluoranthene	N	mg/kg	0.5	21.0	< 0.5	6.6	5.6
Benzo(k)fluoranthene	N	mg/kg	0.5	19.9	< 0.5	6.5	5.8
Benzo(a)pyrene	N	mg/kg	0.5	22.7	< 0.5	7.9	7.1
Indeno(1,2,3-cd)pyrene	N	mg/kg	0.5	17.3	< 0.5	3.9	3.3
Dibenzo(a,h)anthracene	N	mg/kg	0.5	6.0	< 0.5	1.2	1.0
Benzo[g,h,i]perylene	N	mg/kg	0.5	16.0	< 0.5	4.0	3.1
Coronene	N	mg/kg	0.5	0.7	< 0.5	3.4	1.3
Total PAH(16)	N	mg/kg	2	205	< 2.0	58.1	69.3
BTEX							
Benzene	M	ug/kg	10	< 10.0	< 10.0	< 10.0	n/t
Toluene	M	ug/kg	10	< 10.0	< 10.0	< 10.0	n/t
Ethylbenzene	M	ug/kg	10	< 10.0	< 10.0	< 10.0	n/t
Xylenes	M	ug/kg	10	< 10.0	< 10.0	< 10.0	n/t
MTBE	N	ug/kg	10	< 10.0	< 10.0	< 10.0	n/t
TPH CWG							
>C5-C6 Aliphatic (HS_1D_MS_AL)	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	n/t
>C6-C8 Aliphatic (HS_1D_MS_AL)	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	n/t
>C8-C10 Aliphatic (EH_CU_1D_AL)	N	mg/kg	1	< 1.0	< 1.0	< 1.0	n/t
>C10-C12 Aliphatic (EH_CU_1D_AL)	N	mg/kg	1	< 1.0	< 1.0	< 1.0	n/t
>C12-C16 Aliphatic (EH_CU_1D_AL)	N	mg/kg	1	11.7	< 1.0	4.4	n/t
>C16-C21 Aliphatic (EH_CU_1D_AL)	N	mg/kg	1	56.9	< 1.0	25.1	n/t
>C21-C35 Aliphatic (EH_CU_1D_AL)	N	mg/kg	1	1600	7.3	828	n/t
>C35-C40 Aliphatic (EH_CU_1D_AL)	N	mg/kg	1	591	4.4	377	n/t
Total (>C5-C40) Aliphatic (HS_1D_MS+EH_CU_1D_AL)	N	mg/kg	1	2260	11.7	1230	n/t
>C5-C7 Aromatic (HS_1D_MS_AR)	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	n/t
>C7-C8 Aromatic (HS_1D_MS_AR)	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	n/t
>C8-C10 Aromatic (EH_CU_1D_AR)	N	mg/kg	1	< 1.0	< 1.0	< 1.0	n/t
>C10-C12 Aromatic (EH_CU_1D_AR)	N	mg/kg	1	< 1.0	< 1.0	< 1.0	n/t
>C12-C16 Aromatic (EH_CU_1D_AR)	N	mg/kg	1	5.7	< 1.0	2.4	n/t
>C16-C21 Aromatic (EH_CU_1D_AR)	N	mg/kg	1	41.0	< 1.0	18.0	n/t
>C21-C35 Aromatic (EH_CU_1D_AR)	N	mg/kg	1	1610	4.6	637	n/t
>C35-C40 Aromatic (EH_CU_1D_AR)	N	mg/kg	1	557	2.9	263	n/t
Total (>C5-C40) Aromatic (HS_1D_MS+EH_CU_1D_AR)	N	mg/kg	1	2220	7.5	921	n/t
Total (>C5-C40) Ali/Aro (HS_1D_MS+EH_CU_1D_Total)	N	mg/kg	1	4480	19.2	2160	n/t
Total Petroleum Hydrocarbons							
Mineral Oil w Florisil (EH_CU_1D_Total)	N	mg/kg	5	207	8	228	n/t



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Results Summary

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Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #) in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

In accordance with procedures, a 1kg soil sample should be analysed. For amounts less than this caution should be used when analysing the data as sample size is smaller than the recommended amount, therefore samples could be deemed as not being representative of the materials present on site.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)	F/mm2 (l)
366331	0.30	TP01	Brown Sandy Soil, Stones, Tar	No asbestos detected	n/t	n/t	n/t	n/t	n/t
366332	1.20	TP01	Brown Soil	No asbestos detected	n/t	n/t	n/t	n/t	n/t
366333	0.25	TP02	Brown Sandy Soil, Stones, Tar	No asbestos detected	n/t	n/t	n/t	n/t	n/t
366334	0.40	TP03	Brown Sandy Soil, Stones, Tar, Brick	No asbestos detected	n/t	n/t	n/t	n/t	n/t

Method Summary

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Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
pH	M	Air dried sample	08/07/2024	113	Electromeric
Acid Soluble Sulphate	U	Air dried sample	10/07/2024	115	Ion Chromatography
Aqua regia extractable metals	M	Air dried sample	08/07/2024	300	ICPMS
Phenols in solids	N	As submitted sample	08/07/2024	121	HPLC
PAH (GC-FID)	N	As submitted sample	08/07/2024	133	GC-FID
Water soluble anions	M	Air dried sample	08/07/2024	172	Ion Chromatography
Low range Aliphatic hydrocarbons soil	N	As submitted sample	10/07/2024	181	GC-MS
Low range Aromatic hydrocarbons soil	N	As submitted sample	10/07/2024	181	GC-MS
BTEX in solids	M	As submitted sample	10/07/2024	181A	GC-MS
Total cyanide	M	As submitted sample	08/07/2024	204	Colorimetry
Total organic carbon	U	Air dried sample	09/07/2024	210	IR
Aliphatic hydrocarbons in soil	N	As submitted sample	10/07/2024	214	GC-FID
Aliphatic/Aromatic hydrocarbons in soil	N	As submitted sample	10/07/2024	214	GC-FID
Aromatic hydrocarbons in soil	N	As submitted sample	10/07/2024	214	GC-FID
Basic carbon banding in soil	N	As submitted sample	08/07/2024	218	GC-FID
Diesel range organics in soil	N	As submitted sample	09/07/2024	257	GC-FID
Asbestos identification	U	Air dried sample	10/07/2024	281	Microscopy
Soil organic matter	U	Air dried sample	08/07/2024	BS1377:P3	Titrimetry
TPH with Florisil clean up solids	N	As submitted sample	08/07/2024	GCL117	GC-FID

Tests marked N are not UKAS accredited

Report Information

Report No.: 24-54698, issue number 1

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"
LOD	LOD refers to limit of detection, except in the case of pH soils and pH waters where it means limit of discrimination. Soil sample results are expressed on an air dried basis (dried at < 30°C), and are uncorrected for inert material removed. ELAB are unable to provide an interpretation or opinion on the content of this report. The results relate only to the sample received. PCB congener results may include any coeluting PCBs Uncertainty of measurement for the determinands tested are available upon request Unless otherwise stated, sample information has been provided by the client. This may affect the validity of the results.

Deviation Codes

- | | |
|---|--|
| a | No date of sampling supplied |
| b | No time of sampling supplied (Waters Only) |
| c | Sample not received in appropriate containers |
| d | Sample not received in cooled condition |
| e | The container has been incorrectly filled |
| f | Sample age exceeds stability time (sampling to receipt) |
| g | Sample age exceeds stability time (sampling to analysis) |

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month

All water samples will be retained for 7 days following the date of the test report

Charges may apply to extended sample storage

TPH Classification - HWOL Acronym System

HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
2D	GC-GC - Double coil gas chromatography
#1	EH_Total but with humics mathematically subtracted
#2	EH_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry

End of Report

APPENDIX E – GEOTECHNICAL TEST RESULTS

Summary of Classification Test Results

Project No. J277969

Project Name	The Shamrock Pub, Bengal Street
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[illegible]

All tests performed in accordance with BS1377:1990 unless specified otherwise

Date Printed	22/07/2024
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22/07/2024

Key		
Density test	Liquid Limit	Particle density
Linear measurement unless :	4pt cone unless :	sp - small pyknometer
wd - water displacement	cas - Casagrande method	gj - gas jar
wi - immersion in water	1pt - single point test	

Key Density test Linear measurement unless : wd - water displacement wi - immersion in water	Liquid Limit 4pt cone unless : cas - Casagrande method 1pt - single point test	Particle density sp - small pyknometer gj - gas jar			INDEX
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APPENDIX F – SUMMARY OF CHEMICAL TESTING

Job No: 3127
Site Location: Shamrock Pub, Bengal Street
Commercial (1% SOM)



	TP01	TP01	TP02	TP03							
	0.30	1.20	0.25	0.40	Min (mg/kg)	Max (mg/kg)	Average (mg/kg)	Count	Adopted Guideline (mg/kg)	Source	Exceedance s
Metals & Non-Metals											
Arsenic	8.8	11.9	8.8	42.8	8.8	42.8	18.08	4	640	C4SL	0
Cadmium	< 0.5	< 0.5	< 0.5	0.8	< 0.5	0.8	0.8	4	410	C4SL	0
Copper	35.1	32.9	61.3	169	32.9	169	74.58	4	68000	S4UL	0
Lead	59	26	82.6	673	26	673	210.15	4	2300	C4SL	0
Mercury	< 0.5	< 0.5	< 0.5	1	< 0.5	1	1	4	58	S4UL	0
Nickel	27.1	32.7	33.1	32.4	27.1	33.1	31.33	4	980	S4UL	0
Total Monohydric Phenols	< 5	< 5	< 5	< 5	< 5	< 5	< 5	4	440	S4UL	0
Selenium	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	4	12000	S4UL	0
Zinc	91.1	63.3	124	233	63.3	233	127.85	4	730000	S4UL	0

	TP01	TP01	TP02	TP03							
	0.3	1.2	0.25	0.4	Min (mg/kg)	Max (mg/kg)	Average (mg/kg)	Count	Adopted Guideline (mg/kg)	Source	Exceedance s
Petroleum Hydrocarbons											
Benzene	< 10.0	< 10.0	< 10.0	-	< 10.0	< 10.0	< 10.0	3	98	C4SL	0
Toluene	< 10.0	< 10.0	< 10.0	-	< 10.0	< 10.0	< 10.0	3	56000	S4UL	0
Ethylbenzene	< 10.0	< 10.0	< 10.0	-	< 10.0	< 10.0	< 10.0	3	5700	S4UL	0
xylene	< 10.0	< 10.0	< 10.0	-	< 10.0	< 10.0	< 10.0	3	-	S4UL	0
>C5-C6 Aliphatic	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	3	3200	S4UL	0
>C6-C8 Aliphatic	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	3	7800	S4UL	0
>C8-C10 Aliphatic	< 1.0	< 1.0	< 1.0	-	< 1.0	< 1.0	< 1.0	3	2000	S4UL	0
>C10-C12 Aliphatic	< 1.0	< 1.0	< 1.0	-	< 1.0	< 1.0	< 1.0	3	9700	S4UL	0
>C12-C16 Aliphatic	11.7	< 1.0	4.4	-	< 1.0	< 1.0	8.05	3	59000	S4UL	0
>C16-C35 Aliphatic	1600	7.3	828	-	7.3	1600	811.77	3	1600000	S4UL	0
>C35-C40 Aliphatic	591	4.4	377	-	4.4	591	324.13	3	1600000	S4UL	0
>C5-C7 Aromatic	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	3	26000	S4UL	0
>C7-C8 Aromatic	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	3	56000	S4UL	0
>C8-C10 Aromatic	< 1.0	< 1.0	< 1.0	-	< 1.0	< 1.0	< 1.0	3	3500	S4UL	0
>C10-C12 Aromatic	< 1.0	< 1.0	< 1.0	-	< 1.0	< 1.0	< 1.0	3	16000	S4UL	0
>C12-C16 Aromatic	5.7	< 1.0	2.4	-	< 1.0	5.7	4.05	3	36000	S4UL	0
>C16-C21 Aromatic	41	< 1.0	18	-	< 1.0	41	29.5	3	28000	S4UL	0
>C21-C35 Aromatic	1610	4.6	637	-	4.6	1610	750.53	3	28000	S4UL	0
>C35-C40 Aromatic	557	2.9	263	-	2.9	557	274.3	3	28000	S4UL	0

	TP01	TP01	TP02	TP03							
	0.3	1.2	0.25	0.4	Min (mg/kg)	Max (mg/kg)	Average (mg/kg)	Count	Adopted Guideline (mg/kg)	Source	Exceedance s
Polyaromatic Hydrocarbons (PAH)											
Acenaphthene	0.6	< 0.5	< 0.5	< 0.5	< 0.5	0.6	0.6	4	84000	S4UL	0
Acenaphthylene	1.1	< 0.5	< 0.5	0.6	< 0.5	1.1	0.85	4	83000	S4UL	0
Anthracene	3.8	< 0.5	0.9	2	< 0.5	3.8	2.23	4	520000	S4UL	0
Benzo(a)anthracene	20.5	< 0.5	5.8	7.1	< 0.5	20.5	11.13	4	170	S4UL	0
Benzo(a)pyrene	22.7	< 0.5	7.9	7.1	< 0.5	22.7	12.57	4	77	C4SL	0
Benzo(b)fluoranthene	21	< 0.5	6.6	5.6	< 0.5	21	11.07	4	44	S4UL	0
Benzo[g,h,i]perylene	16	< 0.5	4	3.1	< 0.5	16	7.7	4	3900	S4UL	0
Benzo(k)fluoranthene	19.9	< 0.5	6.5	5.8	< 0.5	19.9	10.73	4	1200	S4UL	0
Chrysene	23.9	< 0.5	6.4	7.3	< 0.5	23.9	12.53	4	350	S4UL	0
Dibenzo(a,h)anthracene	6	< 0.5	1.2	1	< 0.5	6	2.73	4	3.5	S4UL	1
Fluoranthene	22.9	< 0.5	6.3	10.9	< 0.5	22.9	13.37	4	23000	S4UL	0
Fluorene	0.6	< 0.5	< 0.5	< 0.5	< 0.5	0.6	0.6	4	63000	S4UL	0
Indeno(1,2,3-cd)pyrene	17.3	< 0.5	3.9	3.3	< 0.5	17.3	8.17	4	500	S4UL	0
Naphthalene	0.8	< 0.5	< 0.5	< 0.5	< 0.5	0.8	0.8	4	190	S4UL	0
Phenanthrene	5.1	< 0.5	1.6	5.3	< 0.5	5.1	4	4	22000	S4UL	0
Pyrene	22.5	< 0.5	6	9.3	< 0.5	22.5	12.6	4	54000	S4UL	0

	TP01	TP01	TP02	TP03							
	0.3	1.2	0.25	0.4	Min (mg/kg)	Max (mg/kg)	Average (mg/kg)	Count	Adopted Guideline (mg/kg)	Source	Exceedance s
Other Contaminants / Testing											
Soil Organic Matter	6.5	0.4	5.1	2.8	0.4	6.5	3.7	4	-	-	-
pH	8.7	7.8	8.8	8.6	7.8	8.8	8.48	4	-	-	-
Sulphide	-	-	-	-	-	-	-	0	-	-	-
Total Cyanide	1.1	< 1.0	< 1.0	< 1.0	< 1.0	1.1	1.1	4	-	-	-
Sulphur (free)	-	-	-	-	-	-	-	0	-	-	-
Water Soluble Sulphate	0.05	0.03	0.03	0.03	0.03	0.05	0.04	4	-	-	-

APPENDIX G – GUIDANCE FOR CLASSIFICATION OF SOIL FOR OFF SITE DISPOSAL AT A LANDFILL SITE

Guidance for Classification of Soil for Off Site Disposal at a Landfill Site

Many site developments create a portion of excess soils and Made Ground which if not re-usable, are required to be disposed off-site at a suitably licensed landfill site. The regulations and associated guidance published by the Environment Agency is relatively complex and lengthy. This guidance provides a summary of the following documents which should be referred to when assessing soil (and common constituents found within Made Ground on remediation sites) for off-site disposal:

- Guidance for Waste destined for disposal in landfills: Interpretation of the Waste Acceptance Requirements of the Landfill (England and Wales) Regulations 2002 (as amended) (EA, 2004);
- Guidance on Sampling and Testing of Wastes to Meet Landfill Waste Acceptance Procedures (EA, April 2005);
- WM3 - Hazardous Waste: Interpretation of the Definition and Classification of Hazardous Wastes (EA, May 2015);
- European Regulation No 1272/2008 on Classification, Labelling and Packaging of substances 2015 (CLP 2015);
- Guidance on Waste Destined for Disposal in Landfill (EA, June 2006);
- Treatment of Non-hazardous wastes for Landfill (EA, February 2007).

It is important to distinguish between the waste classification system and the designation of materials as “suitable for use” on site. A material may be retained on site for an appropriate end use if that end-use is clearly designated and that a site-specific risk assessment ensures that it does not pose a risk to human health or controlled waters. However, if this material is excavated and sent for disposal, the material is then subject to waste management regulations and the two systems cannot be directly correlated. It is therefore important to note that classifying a material as hazardous (should it be excavated and become a waste) does not necessarily indicate that it might not be suitable to be kept on site for re-use. Separate guidance in the form of a Code of Practice (CL:AIRE Version 2, 2011) has been developed jointly between the development industry and the Environment Agency to provide best practice when assessing whether materials are wastes or not, and for determining when waste can cease to be waste for a particular use.

In accordance with the current waste regulations (or Landfill Directive, as they are more commonly known), from 30th October 2007 all waste materials produced from construction sites have to be pre-treated prior to disposal. Pre-treatment includes waste minimisation, recovery (e.g., separation of demolition waste to be used as hardcore) and separation of materials into different waste categories (e.g., separate inert waste from hazardous waste etc). Mixing of different waste types shall be avoided and intentional mixing of inert materials with hazardous waste to ‘dilute it’ and hence change its waste classification, is illegal.

The current waste regulations (based on the EU landfill directive) introduced a two-tier classification system for waste materials, defining them as either being hazardous or non-hazardous. Landfills are licensed to take wastes based on a three-tier classification system with the non-hazardous waste divided into two sub-categories:

- Non-Hazardous - inert;
- Non-Hazardous - non-hazardous;
- Hazardous.

Waste materials are categorised with a six-figure numeric code in the European Waste Catalogue. Commonly found construction and demolition wastes including excavated soil from contaminated sites and Made Ground with their waste codes are summarised below (this is not a comprehensive list):

Waste Code	What is it?	Likely Waste Category–		
		Inert Waste	Non-Hazardous	Hazardous Waste
17 01 01 Concrete	Concrete, possibly with reinforcement (from Construction & Demolition)	✓		
17 01 02 Bricks		✓		
17 01 06* Mixtures of concrete, bricks, tiles & ceramics containing dangerous substances	These are not normally considered hazardous but if they are contaminated (e.g., by asbestos) then could be hazardous – see comment above			✓
17 01 07 Mixtures of concrete, bricks, tiles & ceramics other than those in 17 01 06	This is mixed inerts c.f. 17 09 04	✓		
17 05 03* soils and stones containing dangerous substances				✓
17 05 04 soils and stones other than those mentioned in 17 05 03	Soil and stones only (excluding top soil, peat, soil and stones from contaminated sites)	✓		
17 06 05* Construction materials containing asbestos	e.g., corrugated asbestos sheeting			✓
17 08 02 Gypsum-based construction materials other than those mentioned in 17 08 01	Plaster & plasterboard (although specific disposal requirements are required for high sulphate waste – see EA guidance ‘Understanding the Landfill Directive’ version 1.0 March 2010.		✓	
17 09 01* Construction & demolition wastes containing mercury				✓
17 09 02* Construction & demolition wastes containing PCBs	Waste with more than 50 mg/kg of PCB’s are hazardous			✓

Waste Code	What is it?	Likely Waste Category–		
		Inert Waste	Non-Hazardous	Hazardous Waste
17 09 03* Other mixed construction & demolition wastes containing dangerous substances	Broad range of potentially (see notes below – if asterix the waste is hazardous) hazardous wastes			✓
17 09 04 Mixed construction & demolition wastes other than those mentioned in 17 09 01, 17 09 02 & 17 09 03	Mixed inerts with soil, tarmac, cables, vegetation, plaster, etc. (this waste can only be considered inert if it passes the waste acceptance criteria identified in the regulations).	✓	✓	

Note: all wastes with an asterix code are hazardous regardless of whether they are mirror or absolute entries in the EWC list the decision to with regard to composition must come before applying the code for mirror entries.

Some materials are classified as Inert Waste based in its origin (e.g., 17 01 01 Concrete, or glass) without any requirement for laboratory chemical analysis.

However, most soils will require laboratory testing to confirm whether they are classified as Hazardous Waste. The protocol for assessing these materials and the appropriate threshold values is complicated and are set out in the Environment Agency's "Technical Guidance WM3 Hazardous Waste – Interpretation of the Definition and Classification of Hazardous Waste" (2015). If the test results for the waste indicates that it is not hazardous then further analysis of the waste is required to determine whether it is Inert Waste. If the waste does not meet the criteria for either Hazardous or Inert, then it is by default classified as Non-hazardous Waste.

As an alternative location to landfills for off-site disposal of inert and non-hazardous waste, there are a number of sites which have Waste Permit Exemptions that can accept certain categories of inert and non-hazardous wastes. Additionally, some quarries can accept certain types of wastes to be used for quarry restoration material. For both alternatives to disposal at landfill sites the material still requires chemical testing as these sites have site specific acceptance criteria for wastes. It should also be noted that these types of sites do not incur landfill tax which in the 2018/19 tax year is £2.80 for inactive waste (inert and some types of non-hazardous waste) and £88.95/Tonne for active waste (some types of non-hazardous waste and hazardous waste. Note that the Inland Revenue uses a different classification scheme for waste for tax purposes to the European Waste Classification scheme.

Waste Categorisation

The process of determining the category of wastes is a three-stage process:

- Stage 1 – is the waste either Hazardous or Inert by definition without the requirement for chemical analysis (if it is then Stages 2 and 3 are not required);
- Stage 2 - Waste characterisation;
- Stage 3 - WAC classification.

Waste characterisation determines if a waste is hazardous or not. Excavated soil is characterised using a system based on the contaminants present and their hazardous properties. The system uses total concentrations of the contaminants. Thresholds (as a percentage of the waste) have been set for the various hazardous properties.

Fourteen hazardous properties together with other scenarios where material could cause a hazard have been defined:

- Hazardous properties: explosive, oxidising, highly flammable/flammable, irritant, harmful, toxic, carcinogenic, corrosive, infectious, toxic for reproduction, mutagenic and ecotoxic;
- Substances which can release toxic/very toxic gases in contact with water, acid or air;
- Substances which, after disposal, can yield another substance, e.g., a leachate, which possesses any of the above hazardous properties.

Some of the hazardous properties are sub-divided e.g., there are three categories of carcinogenic, mutagenic and toxic for reproduction substances. The hazardous properties were originally defined in the European Hazardous Waste Directive 91/689/EC. Should a waste contain a contaminant with one or more of the listed hazardous properties at a concentration equal to or above the threshold value for the particular property, then the waste is hazardous. The hazardous properties of a wide range of chemicals are sourced from CLP 2015.

There are many reasons why waste soil is classified as being hazardous, but the majority of reasons can be divided into the following four groups:

- Hydrocarbons – this is probably the most common reason for the hazardous classification of soils. For most soils hydrocarbon analysis will be required for both Polycyclic Aromatic Hydrocarbons (PAH) and speciated Petroleum Hydrocarbons (PHCs) but depending on the site's history other groups of organic contaminants may also be included in any analysis suite for soil samples;
- Metals – Particularly sites from former metal processing or mining sites and also some types of ash have metal concentrations that are sufficiently high to characterise materials requiring disposal as hazardous waste.
- Asbestos;
- Anions – e.g., sulphate in plasterboard (there are special disposal requirements for high sulphate waste and specific WAC requirements); it is possible that sulphate salts of metals and semi-metals could make the waste hazardous – the sulphate concentration could possibly be significant under H12, H13 and H14.

The characterisation of wastes with significant metal concentrations involves some processing of the analysis data. The chemical analysis results for inorganic substances are generally reported as total concentrations e.g., total lead, total arsenic, total sulphate etc. However, CLP 2015 deals with the hazardous properties of actual compounds e.g., lead sulphate, arsenic pentoxide, nickel carbonate. Therefore, the total metal results have to be converted into assessed chemical analysis results for the compound most likely to be present in the soil samples. For example, if the sample contains high total lead concentrations and high sulphate concentrations, then the lead is likely to be present

in the soil as lead sulphate. The most likely compounds can often be determined from a desk study or previous site uses. If the site has been derelict for a number of years, consideration should be given as to whether water soluble compounds should or should not be chosen, as rainfall could have removed them from the soil (this does not apply if the soil has been taken from below under a concrete slab etc). Chemical knowledge and common sense needs to be used in choosing a suitable compound.

If no data is available, then a worst-case scenario has to be assumed and the most hazardous compound likely to be present has to be chosen. For example, metal chromates (lead chromate, nickel chromate) are often the most hazardous compounds formed by many metals, but if the chromium concentrations in the soil are low, chromates are unlikely to be present. It should also be noted that for many of the hazard categories, the cumulative hazard from different compounds is added (e.g., add the concentrations of the copper, lead and zinc compounds together to assess the Hazard Category H14 Ecotoxicity).

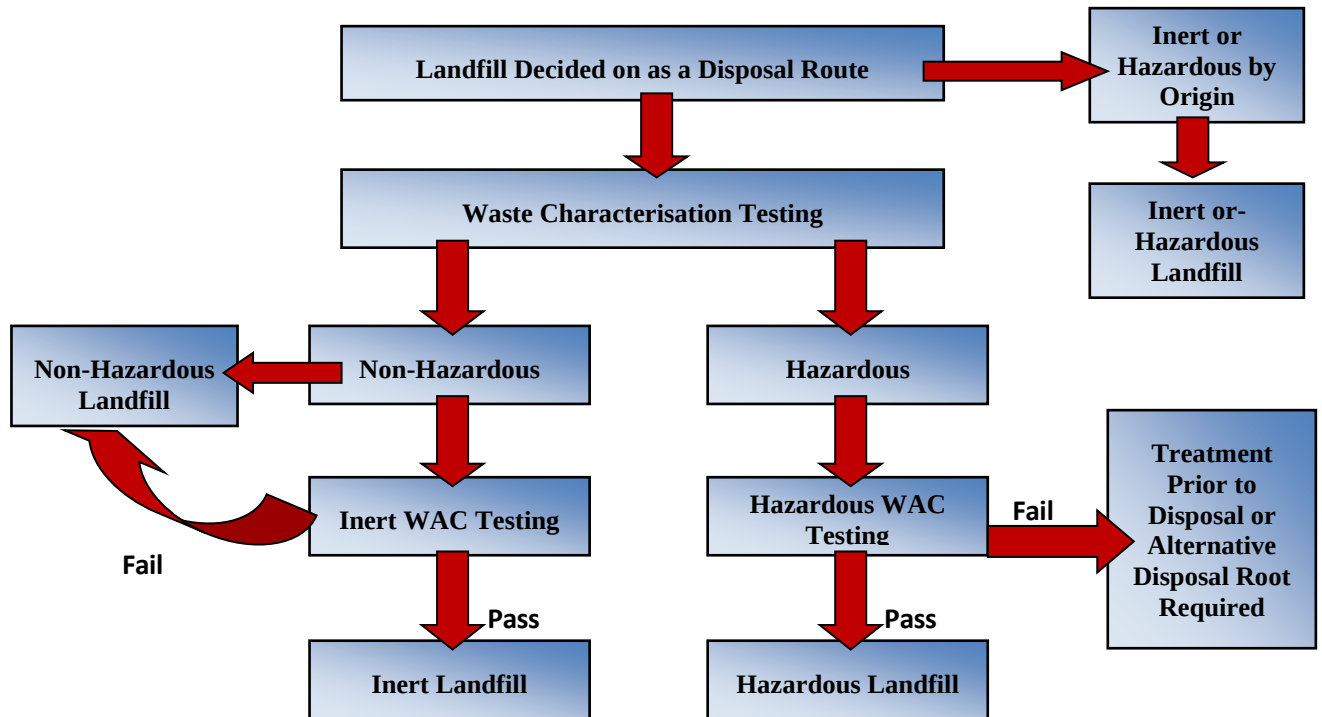
If the results of the above assessment determine that the waste is hazardous, it must then be analysed for the Waste Acceptance Criteria (WAC) analysis contained within appropriate Environmental Permitting Regulations (this comprises mainly leachate but also analysis for TOC and Loss on ignition). WAC limit values have been set for the listed determinands. If any of the determinands exceed their limit value, the waste must be pre-treated to reduce concentrations to below the limit values before the waste may be disposed of at a landfill site licensed to take hazardous waste.

For waste classified as not being hazardous, then there are two options available. Currently, waste correctly characterised as not being hazardous may be disposed of without WAC testing to a non-hazardous landfill. Alternatively, WAC testing for Inert Waste can be carried out (this is similar to the list for hazardous waste with the addition of PAH's, BTEX and Mineral Oil). If the results pass the Inert WAC criteria it can be disposed of at an Inert Waste Landfill. If any of the WAC test results exceed the Inert WAC criteria the waste has to be disposed at a non-hazardous landfill. There are WAC limits for non-hazardous waste set for pH and TOC. If these two criteria are not met then the waste must be pre-treated so that it meets the criteria before it can be disposed.

If materials fail the WAC criteria it may be possible to pre-treat the waste on-site or be taken to a soil treatment centre for pre-treatment to reduce the soil's hazardous properties (e.g., by bioremediation of hydrocarbons).

It should be noted that in order to dispose of Hazardous Waste, the site must register as a producer of Hazardous Waste with the Environment Agency. When disposing of waste materials to landfill sites the appropriate Duty of Care Waste Transfer procedures must be followed.

Landfilled Waste Decision Tree



Landfill Tax

It should be noted that HM Revenue and Customs (HMRC) classify wastes for tax purposes using a different scheme to the threefold landfill EU Landfill Directive scheme (i.e., the hazardous, non-hazardous and inert). HMRC have a two-fold system for landfill tax. The Standard Landfill Tax is currently £88.95/T and applies to all wastes unless they qualify for the reduced rate of landfill tax of £2.80/T. The wastes that qualify for the reduced rate of Landfill Tax are set out in The Landfill Tax (Qualifying Material) Order 2011 with supplementary information on the interpretation of these regulations in HMRS "Notice LFT1 – A General Guide to Landfill Tax" (May 2012) and HMRC Briefing Notes 15/12 and 18/12.

APPENDIX H – UNFORSEEN GROUND CONTAMINATION

Unforeseen Ground Contamination

There is the potential for areas of previously unexpected contamination to be present, as is the case with any “brownfield” site. Any significant quantities of asbestos, significant ashy soils, unusual, brightly coloured or significantly oily or odorous material should be considered in this category. If unexpected contamination is found the following procedures should be adhered to:

1. All site works at the position of the suspected contamination will cease.
2. A suitably trained geo-environmental specialist should assess the visual and olfactory observations of the condition of the ground and the extent of contamination, and the Client and the Local Authority should be informed of the discovery. Should the contamination be likely to affect controlled waters the Environment Agency shall also be informed.
3. The suspected contaminated material will be investigated and tested appropriately in accordance with the assessed risks. The investigation works will be carried out in the presence of a suitably qualified geo-environmental engineer. The investigation works shall commence to recover samples for testing and, using visual and olfactory observations of the condition of the ground, delineate the area over which contaminated materials are present.
4. The unexpected, contaminated material will either be left in situ or be stockpiled whilst testing is carried out and suitable assessments completed to determine whether the material can be re-used on site or requires to be disposed as appropriate.
5. Where the material is left in situ awaiting results it will be reburied or covered with plastic sheeting.
6. Where the potentially contaminated material is to be temporarily stockpiled it will either be placed either on a prepared surface of clayey Alluvium, or on 2000-gauge Visqueen sheeting (or other impermeable surface) and covered to prevent dust and odour emissions.
7. Any areas where unexpected visual or olfactory ground contamination will be surveyed, a photographic record kept, and testing results incorporated into the Verification Report.
8. A photographic recorded will be made of relevant observations.
9. The testing suite will be determined by the independent geo-environmental specialist on the basis of visual and olfactory observations.
10. Test results will be compared against current assessment criteria suitable for the future use of the area of the site affected.
11. The results of the investigation and testing of any suspect unexpected contamination will be used to determine the relevant actions. After consultation with the Local Authority and if necessary the Environment Agency, materials should either be:
 - re-used in areas where test results indicate that it meets compliance targets so it can be reused without treatment; or
 - treatment of material on site to meet compliance targets so it can be reused; or

- removal from site to a treatment centre or to a suitably licensed landfill or permitted treatment facility.

12. Verification Report will be produced for the work.

Asbestos

Asbestos cement products and asbestos fibres have not been encountered in the soils at the site but based on the age of the Made Ground material containing asbestos could be expected to be encountered. If non-notifiable asbestos (e.g., chrysotile asbestos cement board) is encountered in excavations then it will be dealt with in accordance with the Control of Asbestos Regulations 2012 (CAR 2012) and the HSE's ACoP for asbestos (2013). Finding non-notifiable asbestos is a very common occurrence on brownfield sites and is a relatively low risk activity and can be dealt with as a matter of routine. Therefore, it is not proposed that the Council will be notified but an appropriate record will be kept of confirmatory testing and disposal. This will be included in remediation verification reports.

If suspect notifiable asbestos is encountered then the Council and the HSE will be notified. An appropriate action plan will be agreed with the Council and the HSE in accordance with CAR 2012. The action plan will include the preparation of the Risk Assessment and Plan of Work in accordance with CAR and other statutory requirements including:

- Site mobilisation;
- Excavation methodology;
- Handling, movement and storage on-site of excavation arisings;
- Any processing of excavation arisings containing ACMs;
- Movement and placement of arisings to final destination;
- Placing of cover system over soils with and ACMs remaining on-site;
- Off-site disposal of ACMs;
- Licences;
- PPE & RPE; and,
- Dust and fibre monitoring.

Potential mitigation measures that would be required include:

- Ensuring works are carried out by suitably trained and experienced personnel with working with asbestos;
- Site investigation and risk assessment;
- Removal or treatment of asbestos hotspots;
- Use of PPE and RPE by construction workers; and,

- Compliance monitoring.

Unexpected Tanks

No buried underground fuel storage tanks have been encountered during the site investigation works; however, there remains a low risk that tanks are present on-site. Should an underground tank be encountered, operations should cease in the area. Additionally, there may be pipework associated with these tanks which could have oily residues. The following procedures are to be adhered to if tanks and pipework are identified:

1. All site works at the position of the tanks/pipework should stop.
2. A description of the tank should be made by the geo-environmental engineer including; condition and surround, along with visual and olfactory observations should any contents in the tank be apparent. A photographic record will also be made of relevant observations.
3. The tank's position and depth should be determined and marked on a plan of the site.
4. The independent geo-environmental engineer will inform Client and the Local Authority.
5. During the presence of the independent geo-environmental engineer, investigation works should be undertaken to obtain samples of any liquid or sludge contents and to establish dimensions of the tank.
6. Testing will be determined on the basis of visual and olfactory observations by independent geo-environmental engineer.
7. Test results will be compared against current assessment criteria and proposals for disposal of any contents determined in agreement with the appropriate Regulatory Parties.
8. Emptying the tank and disposal of contents to a suitable licenced disposal facility.
9. Degassing and removal of the tank by a suitably qualified contractor will be required, and a Naked Flame Certificate should be provided.
10. Once the tank has been emptied in accordance with the above proposals, it is to be removed for disposal to a licensed waste management facility. Copies of the relevant waste consignment notes are to be kept and included in the Verification Report.
11. Excavation and remediation of any contaminated soils around the tank will be carried out.
12. Samples of the base and sides of the resultant hole will be sampled and supervised by the independent geo-environmental engineer to confirm whether risks to human health or controlled waters.