



**BROWNFIELD
SOLUTIONS LTD**

GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

M4NCHESTER ONE LIMITED

Spear Street, Manchester

Phase II Geo-Environmental Assessment Report

JEM/C5230/11723

January 2023

EXECUTIVE SUMMARY	
Location and Brief Site Description	The site is located off Spear Street, Manchester, M1 1EJ. The site comprises an open area to the rear of the Koffee Pot café. The site has recently been used as an al fresco dining area, surfaced with limestone gravel. The outdoor furniture from this space has been removed, however the south west of the site is occupied by the bins for the café and the back door which is used for staff access as well as a fire escape.
Ground Conditions	Generalised ground conditions from the ground investigation comprise (top down): • Made ground encountered from ground level to 4.00m bgl. • Natural strata encountered from 4.00m bgl to 18.91m bgl. • Solid geology of the Chester Pebble Beds Formation was not encountered. • Groundwater was not encountered during the intrusive investigation.
Human Health - Soils Contamination	No contamination has been identified in soils in respect to human health and the intended site end use, no further action is required.
Controlled Waters – Surface and Groundwater Contamination	The risks to controlled waters are considered to be low and no further action is required.
Ground Gas	Based on the CL:AIRE RB17 approach the site has been classified as CS2 and as such precautions should be installed.
Outline Remedial Strategy	No specific remedial measures are considered necessary at the site, aside from gas protection to CS2.
Waste	Waste classification for the made ground at the site has revealed all of the samples to be non-hazardous.
Foundations and Floor Slabs	Piled foundations are considered the most suitable foundation option. Based on a circular pile with a diameter of 300mm, allowable axial loads of 120kPa are expected when constructed to a depth of 8.00m bgl, increasing to 180kPa at 12.00m bgl and 260kPa at 14.00m bgl. Based on a circular pile with a diameter of 500mm, allowable axial loads of 225kPa are expected when constructed to a depth of 8.00m bgl, increasing to 330kPa at 12.00m bgl and 480kPa at 14.00m bgl. Suspended floor slabs should be adopted.
Concrete Classification	DS2 and AC-1s prevail within the made ground, DS1 and AC-1s prevail within the natural cohesive strata onsite.
Highways Design	Made Ground CBR – 2% The above should be confirmed by in-situ testing at formation level by a specialist geotechnical engineer during construction.
Drainage	Drainage to soakaways is considered unsuitable for this site.
Retaining Walls	A masonry retaining wall approximately 2.00m high with bowing brickwork and currently supported by steel posts makes up the southwest border of the site. No drainage was visible within the wall. The age of the walls, founding depths, and the founding materials are unknown. BSL recommends inspection of the wall by a structural engineer to assess the condition and determine what, if any, specialist requirements there are in respect to demolition and removal.
Further Work	The following further works will be required to progress to the construction phase: • Detailed foundation design by a structural engineer. • Inspection of the retaining wall by a structural engineer. • Production of Ground Gas Protection Measures Verification Plan.

This executive summary should be read in conjunction with the full report, reference JEM/C5230/11723 and not as a standalone document.

PROJECT QUALITY CONTROL DATA SHEET

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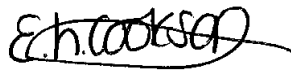
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DRAWINGS		
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P16081-FCH-BA-00-DR-A-2001	P02	Site Plan – Ground Floor Plan
C5230/01	-	Site Location Plan
C5230/02	-	Site Features Plan
C5230/03	-	Exploratory Hole Location Plan
C5230/04	-	Foundation Inspection Pit Drawings

APPENDICES	
Appendix	Title
Appendix A	BSL Methodology and Guidance
Appendix B	Exploratory Hole Logs
Appendix C	Chemical Testing Results
Appendix D	Geotechnical Testing Results
Appendix E	Correspondence with LA
Appendix F	Waste Assessment Report

1.0 INTRODUCTION

1.1 Context

This report describes a Phase II Geo-Environmental Assessment carried out by Brownfield Solutions Limited (BSL) for M4CHESTER ONE LIMITED as instructed by Marston & Grundy LLP Consulting Engineers on a site off Spear Street, Manchester and has been completed in general accordance with the following guidance:

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- Environment Agency guidance - Land Contamination: Risk Management (LCRM).
 - BS 10175:2011+A2:2017 Investigation of Potentially Contaminated Sites.
 - BS5930: 2015+A1:2020 Code of Practice for Ground Investigations.
 - BS EN 1997-1:2004+A1:2013 Eurocode 7. Geotechnical design. General rules plus UK National Annex.
 - BS EN 1997-2:2007 Eurocode 7 Geotechnical design. Ground investigation and testing plus UK National Annex.
-

Definitions of terms and acronyms used within this report is presented in Section 11.0.

1.2 Proposed Development

The proposed development is for a five storey structure containing 6 No. apartments and a ground floor commercial unit, as shown on the Site Plan- Ground Floor Plan, drawing No. P16081-FCH-BA-00-DR-A-2001 provided to BSL by the client.

1.3 Previous Reports

This report should be read in conjunction with Curtins Phase I Preliminary Site Assessment Report (Ref: B063129.003/MH/8160) issued in May 2017 and Alpha Associates Detailed Unexploded Ordnance (UXO) Threat and Risk Assessment (Ref: 10197) issued in November 2022.

1.4 Objectives and Scope

The objectives of this report are to determine the geo-environmental setting and ground conditions of the site, highlighting potential risks and areas of concern that may govern the development under the current planning regime.

This report has been produced in general accordance with the recommendations for a Tier 2 Generic Quantitative Risk Assessment as described in LCRM guidance. This assessment is also intended to fulfil the requirements of a Ground Investigation Report (GIR) as detailed in BS EN 1997-2:2007.

Following review of the Phase I Desk Study referenced above, an exploratory intrusive investigation was undertaken to confirm the findings of the preliminary CSM and risk assessment and meet any objectives that had not been satisfied. The exploratory investigation was undertaken using trial pitting, cable percussive drilling, laboratory chemical and geotechnical testing, with reporting on the findings.

1.5 Limitations

This assessment has been prepared in accordance with the relevant current legislative framework, guidance and risk assessment methodology as outlined in Appendix A. BSL is not liable for any subsequent changes in the guidance and legislation.

The findings and opinions conveyed via this report are based on information obtained from a number of sources as detailed within this report, BSL have assumed this information is correct and reliable.

Nevertheless, BSL cannot and does not guarantee the authenticity or reliability of the information it has relied upon.

BSL have used reasonable skill, care and diligence for the investigation of the site and the production of this report. There may be other conditions prevailing on the site which are outside the scope of work and have not been highlighted by this assessment and therefore have not been considered by this report. Responsibility cannot be accepted for such site conditions not revealed by the assessment.

This report has been prepared for the sole use and reliance of the Client, M4CHESTER ONE LIMITED. No other third parties may rely upon or reproduce the contents of this report without the written permission of Brownfield Solutions Ltd (BSL). If any unauthorised third party comes into possession of this report, they rely on it at their own risk and BSL do not owe them any Duty of Care.

The investigation carried out on the site has been conducted to provide the best information on the ground conditions within site access and budgetary constraints. The inherent variation of ground conditions allows only for definition of the actual conditions at the locations and depths of exploratory locations at the time of the investigation. Different ground conditions may exist that have not been identified within this investigation.

The recommendations in this report assume that ground levels will remain as existing, unless stated otherwise within the report. If there is to be any re-profiling (e.g. to create development platforms or flood defences) then the recommendations may not apply.

The groundwater results described are only representative of the dates on which they were recorded, and levels may vary seasonally (e.g. due to changes in weather).

This assessment has been based on the proposed planning layouts provided. Any subsequent change to the planning layout may have an impact on the validity of recommendations made within this report. Furthermore, new information, changed practices or new legislation may necessitate revised interpretation of the report after the date of its submission.

Although every effort has been made to position exploratory holes in the least sensitive areas of the site, exploratory hole positions were located approximately as part of this investigation and no guarantee can be given as to their accuracy. Consideration should be given to the possibility that exploratory holes excavated as part of this investigation and indeed any previous ground investigation work by others may be encountered beneath or within the influence of individual foundations. BSL cannot be held responsible for structural failures caused by the location of foundations of any form of structure within the influence of exploratory holes.

Where it has not been possible to reasonably use an EC7 compliant investigation technique, a practical alternative has been adopted to obtain indicative soil parameters and any interpretation is based upon engineering experience, local precedent where applicable and relevant published information.

The chemical testing carried out for this report was not scoped to comply with the requirements of the water supply company and further work may be required, unless otherwise stated.

Notwithstanding site observations concerning the presence or otherwise of archaeological issues, asbestos-containing materials (ACM) or invasive weeds (e.g. Japanese knotweed), this report does not constitute a formal survey of these potential issues.

The site plans enclosed in this report should not be scaled off. Any site boundary line depicted on plans does not imply legal ownership of land.

Any recommendations made in this report should be confirmed with the Regulatory Authorities prior to implementation to ensure compliance.

2.0 THE SITE

2.1 Location

The site is located off Spear Street, Manchester, M1 1EJ. It is situated within the Northern Quarter of Manchester City Centre, centred on National Grid Reference 384640, 398610 as shown on the Site Location Plan, Drawing No. C5230/01.

2.2 Site Description

The main site features and potential issues identified are detailed below and are shown on the Site Features Plan, Drawing No. C5230/02.

Feature	Description
Site Area	Approximately 0.02 hectares.
Site Access	Access to the site is gained via a locked gate off Spear Street to the northeast of the site.
Current Land Use and Site Features	The site comprises an open area to the rear of the Koffee Pot café. The site has recently been used as an al fresco dining area, surfaced with limestone gravel. The outdoor furniture from this space has been removed, however the south west of the site is occupied by the bins for the café and the back door which is used for staff access as well as a fire escape.
Potential Sources of Gross Contamination	No potential sources of gross contamination were observed during the walkover.
Vegetation	The site was generally devoid of any vegetation with the exception of some small weeds present at the boundary.
Topography	The site is generally flat however there is a retaining wall circa 2m high of masonry construction that comprises the southwestern boundary. The retaining wall appears to have bowing brickwork and is currently supported by steel posts.
Site Boundaries	The walls of the Koffee Pot Café and the Chinese health information centre make up the northwest and northeast site boundaries. The southeast boundary is comprised of wooden hoarding which was removed for the purposes of the site investigation works. The southwest boundary is comprised wooden hoarding above the aforementioned retaining wall
Surrounding Area	The site is set within a mixed commercial and residential area, bordered by office buildings and paper works to the north. The surrounding uses of the site are as follows; to the northwest of the site there is a café named the Koffee Pot, to the northeast is a Chinese health information centre, to the southeast and southwest are completed, and under construction residential apartment buildings.

3.0 SUMMARY OF PREVIOUS REPORTS

3.1 Curtins Phase I Preliminary Site Assessment Report

A summary of the relevant points from the Desk Study completed by Curtins (Ref: B063129.003/MH/8160) is presented below:

- The site was originally host to a building which appears to have been used for bedding/clothes. By 2016 this had been demolished, with the site used as a car park. The surrounding land uses through time have included a gas works (but over 650m away), canal 100m away, residential/commercial properties, tram lines, schools, mills, printing works (100m away), warehouses and a bus station south of the site.
- Geology underlying the site comprises superficial glacial Till (Secondary Aquifer – Undifferentiated) over the Chester Pebble Bed Formation (Principal Aquifer).
- BGS boreholes in the surrounding area indicate bedrock to be at circa 19.20m bgl.
- Mining is not considered to be an issue.
- The closest surface water feature is located 328m southeast of the site. This is the Rochdale Canal which is orientated northeast to southwest.
- The site is located in a Zone 1 floodplain. A small area across the eastern border.
- The overall risk to human health is considered to be moderate.
- The risk to controlled surface waters is low. The risk to groundwater is moderate,
- The risk from ground gas is moderate although no radon protection measures are required.
- The site is located in the UXO moderate risk zone; bomb strikes have been recorded in the nearby area with ruins marked on historical maps.
- Recommendations included:
 - Obtain a detailed UXO report.
 - Undertake intrusive site investigations.
 - Geotechnical testing of soils.
 - Contamination analyses of soil.
 - Undertake ground gas monitoring.
- Assessment and recommendations based on the above.

3.2 Alpha Associates Detailed Unexploded Ordnance (UXO) Threat and Risk Assessment

A summary of the relevant points from the detailed UXO Desk Study completed by Alpha Associates (Ref: 10197) is presented below:

- The most probable UXO threat is posed by WWII-era German HE bombs, whilst IBs and British AAA projectiles (which were used to defend against German bombing raids) pose a residual threat.
- Whilst there is a residual UXO risk within this Study Site, Alpha Associates do not believe that the proposed intrusive works will generate a significant risk pathway.
- The overall risk is medium.
- Site Specific Unexploded Ordnance Awareness Briefings to all personnel conducting intrusive works as well as a UXO emergency response plan and on-call EOD engineer were recommended.

4.0 METHOD OF INVESTIGATION

4.1 Objectives

To confirm the risks to the identified receptors and confirm the ground conditions in respect to the identified geotechnical and geo-environmental risks, an appropriate intrusive investigation was undertaken as per the recommendations of the Phase I Desk Study Assessment.

The aim of the fieldwork was to:

- Investigate ground conditions on the site.
- Assess the potential contamination on the site and obtain samples for contamination screening.
- Assess the potential impact of any contamination on controlled waters.
- Obtain sufficient information to undertake a ground gas risk assessment for the site.
- Obtain geotechnical information on the ground conditions at the site for preliminary foundation design and preliminary pavement design purposes.
- Give an assessment of the geo-environmental risks associated with redevelopment of the site.

4.2 Site Works

The following site works have been undertaken as part of the intrusive investigation between the dates of 30th November 2022 and 2nd December 2022.

Method	No.	Range Depths (m bgl)	Purpose
Mini excavator	5	1.50 – 2.20	To allow the made ground to be characterised and obtain samples for contamination testing. TP01 to characterise the type and depth of made ground in the centre of the site and to identify and remove significant obstructions prior to cable percussive drilling. TP02-05 to attempt to expose the foundations of the two buildings that bound the northeast and northwest of the site.
Cable percussive boreholes	1	18.91	Assess deeper ground conditions, carry out SPTs and obtain samples for contamination and geotechnical and testing.

The approximate locations of the exploratory holes are indicated on the Exploratory Hole Location Plan, Drawing No C5230/03. The exploratory hole logs are presented in Appendix B.

The exploratory holes were logged by an experienced geo-environmental engineer in general accordance with the following guidance:

- BS 5930:2015+A1:2020 Code of Practice for Site Investigations.
- BS EN 14688-1:2018 Geotechnical Investigation and Testing – Identification and classification of soil.

4.3 Sampling Strategy

Representative samples were taken from exploratory holes at regular intervals to assist in the identification of the soils and to allow subsequent laboratory testing. They were stored and transported in general accordance with BS 10175:2011+A2:2017.

The type of sample was dependent upon the stratum and the purpose of analysis in accordance with current environmental and geotechnical guidance. The distribution of samples taken across the site is recorded on the exploratory logs.

4.4 Laboratory Testing

As part of the assessment for potential contamination of the site, selected samples were taken for the purpose of chemical contamination testing.

In the absence of particularly contaminative processes on site and the lack of visual evidence of potential hydrocarbon impactation representative soil samples were screened for the following general suite of determinands at a UKAS approved laboratory:

Determinand	No of Samples
BSL Default Soil Suite: Arsenic, Cadmium, Chromium (III), Chromium (VI), Copper, Nickel, Mercury, Lead, Zinc, Selenium, speciated polycyclic hydrocarbons (PAH 16), water soluble sulphate (2:1 Extract), soil organic matter (SOM) and pH.	4
Asbestos Screen.	4
Total Organic Carbon (TOC).	4
Waste Acceptance Criteria (WAC).	1

The Chemical Laboratory Testing Results are presented in Appendix C.

Representative disturbed samples were obtained for all soil types encountered. Selected samples were scheduled for testing at an approved laboratory in accordance with BS 1377 'Method of Test for Soils for Civil Engineering Purposes' and BS EN ISO 17892- Parts 1-12:2018 'Geotechnical investigation and testing. Laboratory testing of soil'.

The following tests were scheduled for geotechnical purposes:

Description	No of Samples
Natural Water Content.	2
Plasticity Index Analysis.	2
pH Value.	2
Water Soluble Sulphate Contents.	2
SD1 BRE Full Suite.	1
Determination of Undrained Shear Strength in Triaxial Compression.	3

The Geotechnical Laboratory Testing Results are presented in Appendix D.

4.5 Ground Gas

The Phase I report indicates that the site should be subjected to ground gas monitoring to allow for a ground gas risk assessment to be undertaken, primarily due to the likely presence of made ground at the site. However, the size of the site makes installation of multiple monitoring wells prohibitive. With that in mind, consultations were made with Sue Jones, Environmental Protection Officer at Manchester City Council. Copies of the correspondence is presented in Appendix E.

It was agreed that it would be more suitable to assess the ground gas situation and the requirement for ground gas precautionary measures at the site utilising guidance taken from CL:AIRE Research Bulletin RB17: A Pragmatic Approach to Ground Gas Risk Assessment.

Adopting the approach of RB17 is considered particularly suitable for sites with limited or no made ground; on such sites limited meaningful assessment is possible adopting traditional ground gas monitoring as it would not be practically possible to install monitoring well response zones targeting any made ground in such a scenario. In addition, the absence of significant off-site sources would preclude the need to install monitoring wells within natural strata as there is not considered to be any off-site source which could produce significant ground gases to result in large scale migration onto the subject site, which is the case at the Spear Street application site. Adopting the RB17 approach also reduces the required timescales which would have been required for gas monitoring, which on such a site would have been at least three months.

5.0 GROUND CONDITIONS

5.1 Summary

A brief summary of the ground conditions encountered is presented in the table below:

Stratum	Range Depths - Top (m bgl)	Range Depths - Base (m bgl)	Range Thickness' (m)	Brief Description
Made Ground	0.00	1.50 – 4.00	1.50 – 4.00	Slightly clayey gravelly SAND with cobbles.
Natural Superficial Strata	4.00	18.91	14.91	Slightly sandy slightly gravelly CLAY.

Details are provided in the logs in Appendix B and the individual strata are described in the sections below.

5.2 Made Ground

Made Ground – General

Made ground was encountered within all the exploratory holes across the site and was observed from ground level to depths between 1.50m and 4.00m bgl. The base of the made ground was only proven at 4.00m bgl within the cable percussive borehole.

Gravel surfacing of cream fine to coarse limestone was present across the site recorded to be 0.10m thick, directly underlain by a blue plastic membrane.

The composition of the made ground beneath the blue plastic membrane was fairly consistent across the site and represented demolition material comprising gravelly sand with varying amounts of ash as a minor constituent. Cobbles and boulders of asphalt, brick and concrete ranged from low to medium content.

Existing Foundations

Four foundation inspection pits (TP02 – TP05) were excavated to a maximum depth of 1.50m bgl as to prevent causing any instability to the existing buildings. Only within TP04 was a foundation like feature identified; however, a metal pipe was beneath this feature as well as continued masonry wall. The results of these inspections indicate the buildings enclosing the northeast and northwest of the site are likely to have basements, which is consistent with the building styles and anecdotal information received regarding the structures.

A newbuild apartment building was in the final stages of construction bordering the site to the south. It was requested that BSL take measurements of the newer apartment building's foundation which was exposed offsite in an alleyway between the site boundary retaining wall and the new building.

For full details of the excavated pits and features encountered see Foundation Drawings reference C5230/04.

5.3 Natural Superficial Strata

The natural strata underlying the site was generally firm to hard clay with varying amounts of sand and gravel as minor constituents. This is interpreted to represent glacial Till and was proven to 18.91m bgl.

An isolated band of slightly gravelly sand was encountered from 17.40-18.00m bgl, below very stiff slightly gravelly sandy clay, and above hard slightly gravelly sandy clay.

5.4 Solid Geology

The solid geology of the Chester Pebble Beds Formation was not encountered in this investigation.

5.5 Groundwater

Groundwater was not encountered within any of the exploratory hole locations during this investigation.

5.6 Observations

Contamination

During the works undertaken by BSL, observations for both visual and olfactory evidence of contamination were undertaken.

With the exception of slag and clinker observed as a minor constituent in the made ground soils, no other evidence of contamination was observed at the site.

Stability of Excavations/Boreholes

The sides of the trial pits were generally unstable due to the presence of deep granular made ground across the site.

Casing was required to prevent collapse with the granular materials during drilling of the cable percussive boreholes.

6.0 TEST RESULTS

6.1 Geotechnical Laboratory Testing

Plasticity Index Analysis

Plasticity index results in the two samples tested were 27% and 28%. Associated water contents were 20.3% and 21.1%.

After modification of particle size in accordance with BRE 240 the modified plasticity indices are 24.8% and 27.1% indicating the cohesive soils to be of medium volume change potential.

Undrained Shear Strength

The results of the tests are shown in the table below:

Location	Depth (m)	Shear Strength (kPa)	Undrained Shear Strength to EC7
BH01	5.00	125	High
BH01	9.50	105	High
BH01	15.50	328	Extremely High

6.2 Aggressive Ground Conditions – Geotechnical Chemical Testing

The test results for the assessment of aggressive ground conditions are presented in Appendix D. The results are summarised and assessed within Section 8.0 of this report.

6.3 In Situ Geotechnical Testing

In Situ Standard Penetration Tests

Standard Penetration Tests (SPTs) were carried out within the cable percussive borehole at regular 1.0m to 1.5m intervals. The results of the individual blows and the N-values are recorded on the Exploratory Hole Log in Appendix B.

All SPT N values are uncorrected. Density and strength descriptors are reported in accordance with the guidelines stated in BS 5930:2015+A1:2020, incorporating requirements of BS EN ISO 14688-1:2002, BS EN ISO 14688-2:2004 and BS EN ISO 14689-1:2003.

6.4 Geo-Environmental Testing

Chemical Laboratory Testing

The chemical test results for soils are presented in Appendix C. The results are summarised and assessed within Section 8.0 of this report.

7.0 GEOTECHNICAL ASSESSMENT

7.1 Ground Model Summary

The site is currently derelict, only being used as a fire escape and for bin storage by the abutting Koffee Pot Café. The southwest of the site is currently supported by a circa 2.00m retaining wall that appears to be bowing and is supported by metal rods.

The ground conditions can be summarised as below (top down):

- Made ground generally comprising slightly clayey gravelly sand, interpreted to be demolition waste, from ground level proven to a maximum depth of 4.00m bgl.
- Natural superficial deposits comprising firm to hard clay with varying amounts of sand and gravel proven to a maximum depth of 18.91m bgl.
- Solid geology of the Chester Pebble Beds Formation was not encountered during site works.
- Groundwater was not encountered during site works.

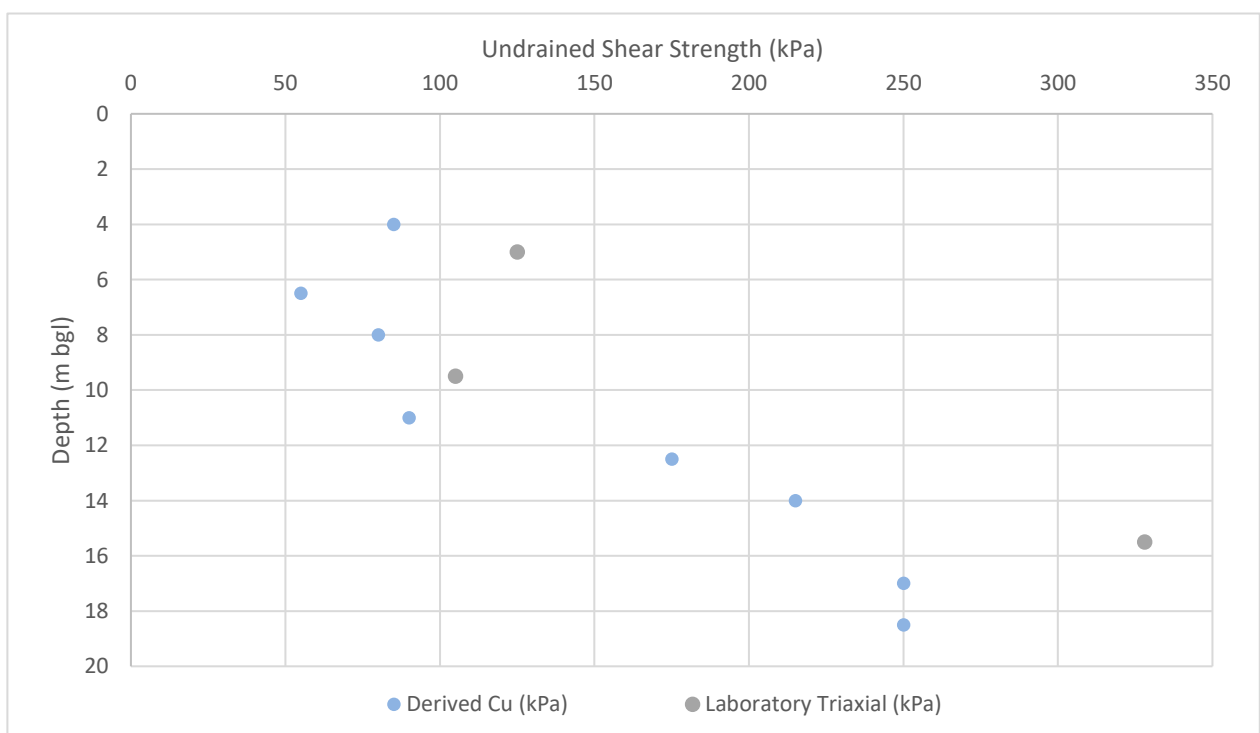
A moderate UXO risk zone spans across the site.

The eastern border of site lies within a Zone 1 floodplain. Specialist flood risk advice should be sought and this will require consideration when setting the finished levels for the site.

7.2 Design Soil Parameters

The relevant test results from the prior section have been evaluated to derive geotechnical soil parameters for the site.

For cohesive (fine) soils, the equivalent approximate undrained shear strengths (C_u) have been calculated from the recorded SPT N values, adopting f_1 values based on the correlation of Stroud (1975) and the 'average' plasticity.



A depth (m bgl) vs derived shear strength (Cu) graph is provided above to provide a profile of the cohesive soils underlying the site. The graph portrays a clear increase of soils strengths as depth increases. Derived parameters have been used directly within preliminary foundation calculations as detailed below.

7.3 Foundations

The development will comprise five storey structure containing 6 No. apartments and a ground floor commercial unit and is considered to be classed as Geotechnical Category 2 in accordance with Eurocode 7.

Preliminary design by calculation has been undertaken to determine the design resistance of the bearing strata in the following section. Note that the made ground, the depth of which was proven at 4.00m bgl, is not considered to be a suitable bearing stratum.

No proposed structural loads were available at the time of writing; therefore, the following recommendations are provisional and should be reviewed at the detailed design stage

This assessment is based on the existing ground levels and does not take into consideration any cut/fill exercise, which should be considered at the detailed design stage.

Piles

In view of the made ground thickness over the building footprint and the likely magnitude of the column loads expected to be imposed by the proposed development, shallow foundations will be unsuitable, and it is considered that piled foundations will be required.

Piles should be extended through the made ground and into the superficial deposits. Depending on the structural loadings and design requirements, piles will likely utilise a combination of skin friction and end-bearing resistance, transferring the majority of the loads to the surrounding glacial Till deposits through skin friction.

Displacement piles such as driven pre-cast concrete or tubular steel piles, or replacement techniques such as bored piles with the use of casing or continuous flight auger (CFA) piles are all considered potentially suitable piling solutions for this site. However, due to the proximity to the residential buildings CFA piles are likely the best to minimise disturbance to existing structures and residents. Driven piles are likely to cause significant disturbance, although modern bottom driven methods are designed to reduce vibrations.

The choice of piling system and the detailed design of piles are beyond the scope of this report and should be undertaken by a piling specialist. However, as a guide, preliminary calculations were undertaken for a single circular concrete pile, taking into account shaft resistance, end bearing resistance and the effects of negative skin friction. The preliminary allowable loads for various pile diameters and lengths are shown in the table below.

Profile	Pile Diameter (mm)	Pile Length (m)	Allowable Load (kN)
BH01	300	8.00	120
		12.00	180
		14.00	260
	500	8.00	225
		12.00	330
		14.00	480

As stated above, these calculations are preliminary, should be used only as a guide and reviewed at the detailed design stage. Information gained from this ground investigation should be assessed by

experienced piling contractors and suitably qualified structural engineers such that appropriate piles are selected and designed given the site conditions that have been encountered.

Whilst detailed design is beyond the scope of this report, the following should be taken into consideration during the detailed design stage by a suitably competent contractor/engineer:

- Piles should extend a minimum of five pile diameters into the bearing stratum to fully mobilise end-bearing resistance and shaft resistance.
- Higher allowable loads than those listed in the table above could be achieved by increasing the diameter of the piles or by using pile groups.
- Obstructions in the ground (e.g. relict foundations) could cause piles to stop shallower than their anticipated design depth, or deviate from the vertical, therefore reducing their capacity.
- Bored piles through coarse soils will likely result in loosening, with resultant reduced shaft friction.
- potential effects of negative skin friction on piles due to recently placed made ground deposits should be considered.
- Discussions should be made with the piling contractor regarding the suitability of driven piles due to the levels of disruption to the adjacent residential and commercial properties.
- CFA piles are likely to be a suitable alternative to driven piles to reduce noise levels, although there will be additional costs associated with disposal of excess soils.
- The piling work should be undertaken in accordance with BS EN 12699:2015 'Execution of Special Geotechnical Work - Displacement piles', and also relevant standards associated with manufacturing the piles.
- In accordance with Eurocode 7 it would be prudent to verify the compressive resistance of the strata and the pile design should be by static load testing on working piles 1.5 times the characteristic load on more than 1% of working piles. This will provide an accurate strength of the end bearing stratum.

In addition to the above, careful consideration should be given to the design of foundations and groundworks in respect to the adjacent properties and any offsite existing basement structures to avoid negative destabilising effects.

Working Platform

Prior to the commencement of penetrative works (piling), a working platform will be required for tracked plant. This should be designed and installed in accordance with BR470 (BRE 2004) based on the plant requirements, data and rig loadings.

UXO

Based on the available information to date, specialist UXO advice and/or supervision will be required for all groundworks, including piling.

Piling Risk Assessment

A risk assessment is likely to be necessary for piling, as there is a possibility that this could lead to creation of new pathways for migration of contamination.

7.4 Building Near Trees

The clay soils on site are of medium volume change potential. Where piles encounter cohesive strata in the vicinity of existing, proposed or recently removed trees, foundations should be adjusted in full accordance with BRE 298. All foundations should be deepened below roots of greater than 5mm diameter during excavations for footings.

Due to the location of the site and its surrounding land use, BSL has assumed that there are no trees within an influencing distance of the site and no evidence of current or former trees was observed during the site investigation.

7.5 Floor Slabs

A suspended floor slab should be adopted at the site supported by piles. Given the presence of granular made ground soils with a proven thickness of 4.00m, a minimum ventilation void of 150mm should be provided beneath floor slabs on this site in accordance with LABC/NHBC standards.

7.6 Site Preparation and Construction

The stability of the existing retaining wall will require consideration and relict infrastructure grubbed out, as required.

Instability of excavations through natural soils is not anticipated provided they are not exposed to adverse weather conditions for any substantial period of time. Instability of the made ground should be allowed for. All excavations should be carried out in accordance with CIRIA Report 97 'Trenching Practice'.

Collapsing of the trial pit sides was observed in the granular made ground strata and temporary shoring maybe required. Otherwise, the foundation excavations will be significantly wider than anticipated and costs will be incurred for additional volumes of concrete.

Excavation depths should generally be readily achieved using conventional plant (JCB or similar) although high specification plant (tracked 360° or similar) is recommended to maintain the build programme. Whilst none were encountered during the intrusive investigation, breaking equipment may also be required locally to penetrate any old foundations associated with former construction.

The presence of substantial depths of made ground across the site may result in settlement of newly installed drainage. This should be taken into consideration during the design of drainage, which may include flexible joints to allow for some differential settlement.

7.7 Concrete Classification

The soluble sulphate and pH test results have been assessed in accordance with BRE Special Digest 1 "Concrete in aggressive ground" 2005. The Design Sulphate (DS) classification and the Aggressive Chemical Environment for Concrete (ACEC) classification are presented in the table below.

For the purposes of this assessment, the groundwater has been classified as static given the site is underlain by low permeability deposits and groundwater was not encountered during the intrusive investigation works.

Stratum	No. Samples	Characteristic SO ₄ (g/l)	Characteristic pH	DS Class	ACEC Class
Made Ground	5	0.98	7.95	DS2	AC-1s
Natural Superficial Strata	2	0.11	8.60	DS1	AC-1s

Based on the above, the results of laboratory pH and sulphate content, indicate that sulphate class DS2 and ACEC Class AC-1s conditions prevail within the made ground, and sulphate class DS1 and ACEC Class AC-1s conditions prevail in the natural clay underlying the site in accordance with BRE Special Digest 1 "Concrete in aggressive ground" 2005.

The specific concrete mixes (the Design Concrete Class) to be used on site will be determined by the site-specific concrete requirements in terms of the durability and structural performance. These are assessed in terms of the Structural Performance Level (SPL) and any need for Additional Protective Measures (APM) detailed in Part D of BRE Special Digest 1 with further guidance in Pt E and F.

7.8 Highways

Based on Table 5.1 from DMRB IAN 73/06 Rev 1 equilibrium CBR values of 2% are likely to be achieved in undisturbed natural clays soils for pavement design purposes, unless proven otherwise by in-situ testing at formation level by a specialist geotechnical engineer. Equilibrium CBR values are likely to be 2% within the made ground.

Where the CBR is found to be less than 2%, the sub-grade is unlikely to be suitable for both the trafficking of site plant and as a permanent highway foundation without improvement of the soils.

7.9 Site Drainage

The use of sustainable drainage systems, such as traditional soakaways within the natural ground, is not likely to be feasible due to the presence of low permeability cohesive strata underlying the site.

Additionally, the use of soakaways is not recommended due to the presence of variable made ground proven to a depth of 4.00m bgl.

7.10 Retaining Walls and Existing Basements

A masonry retaining wall approximately 2.00m high with damaged, bowing brickwork and currently supported by steel posts makes up the southwest border of the site. No drainage was visible within the wall. The age of the walls, founding depths, and the founding materials are unknown. Existing basements are also known to be abutting the site.

It was outside the scope of this investigation to undertake a detailed inspection of the construction or a structural inspection of the walls and BSL recommends inspection of the wall by a structural engineer to assess the condition and determine what, if any, specialist requirements there are in respect to demolition and removal. Inadequate demolition may result in the instability of soils behind the wall, potentially resulting in dangerous collapse.

If the existing retaining wall is to be retained, care should be taken in the design of the proposed development to ensure that the safety and stability of retaining walls/any existing basement walls are not compromised. This work should be undertaken by a suitably competent engineer, particularly where they form, or could influence, site boundaries.

8.0 GEO-ENVIRONMENTAL RISK ASSESSMENT

8.1 Introduction

The samples were tested for an assessment of the chemical contamination that may pose a risk to human health. The results were examined with reference to a selection of guidance documents as detailed in Appendix A. In this case the LQM/CIEH S4ULs and DEFRA C4SLs for a commercial end use have been adopted as Tier 1 generic screening values as the ground floor of this development is to be used as a commercial unit. No viable pathways are considered to exist to the residents on the first floor from soils contamination.

The apparent exceedance of the relevant screening value is taken as indicating further detailed assessment or remedial action is required.

A summary assessment sheet is presented in Appendix C alongside the chemical test results. Results are discussed in detail in the sections below.

8.2 Soils Test Results and Risk Assessment – Human Health

Metals

No metals have been detected above the adopted screening criteria.

Asbestos

No asbestos fibres have been detected in any of the 4 No. samples screened.

Poly Aromatic Hydrocarbons (PAHs)

No PAHs have been detected above the adopted screening criteria.

8.3 Summary – Human Health Risk Assessment

Based on the testing and assessment undertaken, there are no determinands above the relevant assessment criteria and mitigation measures will not be required in respect to soils.

8.4 Controlled Waters Risk Assessment

Groundwater/surface water testing has not been carried out based on the preliminary CSM risk assessment and the site is not considered to pose a significant risk to controlled water for the following reasons:

-
- No significant gross or mobile contamination has been identified on site in soils based on the results obtained as a potential indicator of groundwater contamination.
 - There is no indication under present conditions of significant pollution of controlled waters and conditions following development of the site will not be any worse, indeed they may improve with increased hard cover and water retaining imported soft landscaping soils.
 - For the made ground, the preparation of samples for leachability analysis has not been undertaken as this is an aggressive methodology and provides theoretical values which are unlikely to be representative of existing site conditions, real site leaching concentrations will be reduced significantly from that indicated by the laboratory testing, furthermore this would not be representative of post-construction conditions, which will significantly reduce infiltration.
 - The concentrations of leachable substances that could emanate from the site will be subject to dilution and dispersal during transport and so the risks will reduce with distance from the site and into the identified surrounding water bodies.
 - The nearest watercourse is over 300m away, which provides considerable distance for attenuation and contaminant degradation.
-

- The site is underlain by low permeability clays which will inhibit lateral and vertical contaminant migration.
- Groundwater was not encountered within any of the exploratory hole locations during the intrusive investigation works.
- The site does not lie within a SPZ.
- There are no groundwater abstractions within 800m.
- There are no potable (sensitive) water abstractions within 1000m.
- Evidence indicates the nearby wells are historical and related to low sensitivity commercial use.

8.5 Ground Gas Risk Assessment

Rationale

In accordance with CIRIA C665 and as set out in Appendix A of this report, the ground gas generation potential is considered to be **very low to low** (made ground). The sensitivity of the development is **low** on account of the proposed ground floor commercial unit. Based on this, and in agreement with the Manchester City Council as discussed in Section 4.5, the CL:AIRE RB17 approach has been used to assess the risk of ground gas onsite.

Summary of Potential On-Site Sources and Pathways

The ground investigation carried out on site demonstrated the presence of made ground overlying natural cohesive soils across the site. This made ground is inferred to be a result of the infilling of a previous basement structure and was proven to a maximum depth of 4.00m bgl.

No other viable on-site potential ground gas sources have been identified.

Assessment of Data

The made ground on site generally comprised inert demolition material with anthropogenic constituents comprising predominantly brick, concrete and sandstone, with minimal degradable or organic matter. Chemical testing indicates that the made ground soils have total organic carbon (TOC) contents ranging from 1.3% to a maximum of 1.8%.

The proposed development requires a piled foundation solution due to the depth of made ground onsite, and the construction of this building may require the excavation of some of this material which would therefore reduce the thicknesses of the made ground present. Additionally, there is a requirement for a suspended floor slab with a minimum ventilation void of 150mm which also provides a degree of ground gas protection within the building.

Taking into consideration the above, based on Table 1 in RB17, this indicates that where sites have a maximum 5.00m thickness of made ground, with materials in place for more than 20 years with TOC contents of up to 3%, that a Characteristic Situation of CS2 should be considered appropriate.

Assessment Summary

Based on the thickness and TOC content of made ground soils present at the site, ground gas protection measures are required in line with CS2 conditions.

8.6 Qualitative Risk Assessment

The CSM has been revised based on the findings of the site investigation and laboratory testing results and these are presented overleaf. Unless stated otherwise, in respect to off-site sources, only risks that are assessed as moderate and above within the preliminary CSM have been carried forward to this section, or where a previously unidentified potential source, pathway and / or receptor has been identified from the recent site works.

Human Health						
Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk	Justification
On site Made Ground Metals, PAH's, asbestos	Direct contact, inhalation of dusts	End-users	Unlikely	Medium	Low	Although areas of made ground appear to be up to circa 4.00m deep, the fill material comprises clay with demolition materials and no visual or olfactory evidence of contamination was identified. Laboratory chemical testing has not identified any contamination of soils which would affect end users at the site. In addition, the presence of hardstanding across the commercial development will break the pathway to site end users. The overall risk is therefore considered to be low.
On site Made Ground Metals and organic contamination	Migration into/chemical attack of water supply pipelines	Water Pipelines / End users	Unlikely	Mild/Minor	Very low	Contaminants within the soil/groundwater could potentially attack the clean potable water supply pipe, contaminants should be assessed in accordance with the relevant guidance to determine the correct pipe material and level of precautions required.
Made Ground Ground Gas (carbon dioxide and methane)	Migration into confined spaces, inhalation and asphyxiation/explosion	End-users / property / structures	Low likelihood	Medium to Severe	Moderate	Based on the CL:AIRE RB17 approach the site has been classified as CS2 and precautions should be installed.

Controlled Waters						
Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk	Justification
Made Ground PAH's, Metals	Overland flow, / migration through saturated zone	Rochdale Canal (328m away)	Unlikely	Medium	Low	Contamination has not been identified within the made ground soils. However, if present it is considered contaminants associated with the made ground and other past industrial uses are unlikely to impact the Rochdale Canal. This is due to the low permeability of the clays underlying the area, which will inhibit lateral migration, and the potential for contaminants to attenuate and degrade over this distance. Therefore, a low risk is posed to the river from the made ground.
	Leaching through unsaturated zone / Migration through saturated zone	Secondary Aquifer Un-differentiated (Ground-water)	Unlikely	Medium	Low	No significant contamination has been identified on site in soils based on the results obtained as a potential indicator of groundwater contamination. As discussed above, presence of cohesive Till would limit the migration potential of any contamination present, and the non-sensitive nature of the Secondary Undifferentiated aquifer means that risks are low. Additionally, the site is currently surfaced in hardstanding and will remain so, with a new surface water drainage system installed which will further reduce the risk to controlled waters. By virtue of the development taking place, this should contribute to an overall "betterment" of groundwater quality.
	Migration through saturated zone	Principal Aquifer (Ground-water)	Unlikely	Medium	Low	No significant contamination has been identified on site in soils based on the results obtained as a potential indicator of groundwater contamination. There are no groundwater abstraction licences within 800m of the site, and no potable water abstractions within 1km of the site. Additionally, the site is underlain by cohesive Till soils which would help break the pathway between any contaminants and the Principal Aquifer.

8.7 Outline Remedial Measures

No sources of contamination have been identified on site, therefore no specific remedial measures are required for soils in respect to human health for the proposed end use.

Utilities

The level of protection for the clean potable water supply pipes should be determined using the local water company risk assessment criteria in accordance with UKWIR.

As the site is brownfield, there is the assumption that barrier pipe would be utilised, although requirements should be confirmed by risk assessment and with the water supply company.

Ground Gas Protection Systems

Based on the CL:AIRE RB17 approach the site has been classified as CS2 and as such precautions should be installed.

The design of a gas protection system according to BS8485:2015+A1:2019 requires the proposed structures to be categorised into one of four building types (Type A to D).

For CS2 in accordance with BS 8485 for a Type B building placed within CS2, a minimum of 3.5 points is required to be obtained from gas protection measures. The gas protection system should consist of at least two separate elements including a structural barrier, ventilation measures and/or a gas resistant membrane.

The required level of protection should be obtained from a combination at least two or more different elements from the following options in line with BS8485:

-
- a) Structural barrier of the floor slab– i.e. *A reinforced cast in situ suspended floor slab with minimal penetrations* [1 or 1.5 point score dependant on construction quality].
 - b) Ventilation measures–i. e. *A pressure relief pathway* [0.5 point score] (Required as a minimum in all systems) or *passive sub-floor dispersal layer* [1.5 point score - good performance or 2.5 point score - very good performance].
 - c) Gas resistant Membrane- i.e. *a gas resistant membrane which is suitably impervious to carbon dioxide and methane* [2 point score].
-

Note that If the installation of the membrane is not verified by a suitably qualified independent engineer in accordance with CIRIA C735, then this will score 0 points and the criteria will not be met. This may have serious implications in terms of achieving regulatory sign off, potentially causing costly delays and potentially placing end users of the site and the structure at risk.

All installations should be subject to verification. The verifier should be independent, competent and suitably trained; BSL can provide this service. We recommend validation requirements should be discussed with the Local Authority prior to installation.

General

It is recommended that the approval of the Regulator (Local Authority) is obtained in regard to the above prior to any irrevocable action is taken at the site.

Once the above body has approved the above outline remedial proposals, a Verification Plan for Ground Gas Protection Measures will need to be produced to meet planning requirements and submitted to the regulatory authorities for approval. This will also give guidance to enable a suitably qualified contractor to carry out the works.

A watching brief is recommended during groundworks for any unidentified sources of contamination. If any gross contaminated material is encountered works should cease in that area and BSL consulted.

Once remediation is complete, verification reports will need to be produced by a suitably qualified independent geo-environmental engineer, such as BSL, in order to achieve regulatory sign off.

8.8 Health and Safety Issues

During the reclamation and construction phases of the site development it will be necessary to protect the health and safety of site personnel. The risk to construction and ground workers is assessed in the table below:

Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk
Made Ground (heavy metals, PAHs)	Ingestion, direct contact, inhalation of dusts.	Construction Workers	Likely	Mild	Moderate/low
Ground gas	Inhalation in confined spaces/trenches	Construction Workers	Low likelihood	Severe	Moderate

The risk from made ground will be mitigated by standard PPE including gloves. Welfare facilities should be made available to wash before hand to mouth activities.

Soil gas concentrations are not necessarily reflected by those in the breathing zone, all contractors and maintenance workers should be made aware of the possible presence of carbon dioxide and should take all necessary health and safety precautions when working in trenches or confined spaces.

General guidance on these matters is given in the Health and Safety Executive (HSE) document “Protection of Workers and the General Public during the Redevelopment of Contaminated Land”. In summary, the following measures are suggested to provide a minimum level of protection:

- All ground workers should be issued with the relevant protective clothing, footwear and gloves. These protective items should not be removed from the site and personnel should be instructed as to why and how they are to be used.
- Hand-washing and boot-washing facilities should be provided.
- Care should be taken to minimise the potential for off-site migration of contamination by the provision of dust suppression control and wheel cleaning equipment during the construction works.
- Good practices relating to personal hygiene should be adopted on the site.
- The contractor shall satisfy the Health and Safety Executive with regard to any other matters concerning the health, safety and welfare of persons on the site.

9.0 WASTE SOIL CLASSIFICATION & ASSESSMENT

9.1 Summary

BSL have undertaken a preliminary assessment of potential excavation waste to arise from the site during redevelopment to:

- Classify the excavation waste to arise as either hazardous or non-hazardous.
- Identify the most sustainable options for the wastes to arise in accordance with the waste hierarchy.
- Provide a written description of the waste required as part of the Duty of Care.
- Provide details of “hazardous properties” to complete hazardous waste consignment note (where applicable).
- Be able to provide a basic classification report to a landfill operator (where waste is destined for landfill disposal).

9.2 Waste Classification Procedure

As described in the ‘Waste Duty of Care Code of Practice (2016)’ any substance or object that the holder discards, intends to discard or is required to discard is a waste. It is the responsibility of the waste producer to classify this waste. The classification process is described in the ‘Guidance on the classification and assessment of waste’ WM3 and aims to determine whether the waste is Hazardous or Non-Hazardous to human health and the environment.

Hazardous wastes are signified by entries where the code is followed by an asterisk, where some wastes are deemed hazardous without further assessment, which are termed “Absolute Entries” e.g. most waste oils. Alternatively, waste entries are termed “Mirror” entries that require further assessment of hazardous properties, in order to determine whether they are hazardous waste or not (e.g. soil and stones). The EWC codes relevant to excavation wastes are:

- 17 05 03* - soil and stones containing dangerous substances.
- 17 05 04 – soil and stones other than those mentioned in 17 05 03.

The Landfill Directive (Directive 1999/31/EC on the landfilling of waste, Decision 2003/33/EC and Landfill Regulations 2005) led to the establishment of a methodology for classifying wastes.

Wastes first need to be classified based on their total concentrations and classified as either hazardous or non-hazardous waste. WAC testing is only required if the end disposal route is a landfill and WAC analysis must not be used for waste classification.

Wastes can only be accepted at a landfill if they meet the relevant Waste Acceptance Criteria (WAC) for that type of landfill. A waste must comply with the WAC limits for the relevant landfill, otherwise the soil will need to be pre-treated. There are three different WAC criteria, these are:

- Inert waste.
- Stable Non-Reactive Hazardous Waste (SNRHW).
- Hazardous waste.

There are no standard set of WAC limits for non-hazardous landfill sites and each non-hazardous landfill will have its own set of criteria under which it is licenced to accept non-hazardous waste. These will need to be determined through the selected waste receiver prior to disposal.

A non-hazardous waste should not be compared with WAC limits for hazardous or SNRHW waste sites and the WAC test should only be used to determine if the waste is suitable for disposal at an inert waste landfill site. Likewise, wastes classified as hazardous based on their total concentrations should not be compared with WAC limits for inert waste landfill sites, as these will not be accepted.

Details of how material should be classified for waste disposal are presented in the BSL Methodology and Guidance in Appendix A and are summarised in the table below:

Classification based on Total Concentrations ¹	PRIOR TO LEAVING SITE			
	Non-Hazardous Waste		Hazardous Waste	
	IF SOILS CANNOT BE RE-USED ELSEWHERE AND MUST GO TO LANDFILL			
WAC testing	Below inert WAC limit values	Above inert WAC limit values	Below hazardous WAC limit values ⁴	> WAC limit values
Landfill requirements	INERT landfill	NON-HAZARDOUS landfill ²	HAZARDOUS landfill	PRE-TREATMENT ³

1 Total concentrations are defined as tests results on solids as opposed to leachate (i.e. a liquid).

2 Individual sites may have certain limit values pre-determined in their licence.

3 After pre-treatment the material characteristics may have changed to an extent that allow the soil to be re-classified.

4 Possibility that wastes could be classified as stable Nonreactive HAZARDOUS waste in non-hazardous Landfill (e.g. soils containing low concentrations of asbestos, gypsum or sulphate bearing soils).

Waste classified as non-hazardous can be accepted into a non-hazardous landfill without having to pass any numerical WAC.

Soils above hazardous WAC limit values require pre-treatment prior to disposal. The effective pre-treatment, typically involving separation, sorting and screening, can offer cost savings through reducing the hazardous nature and volumes of soil. Costs for disposal of non-hazardous/hazardous soils are significant compared to the disposal of inert material.

Inert Waste

The possibility of automatic inert classification of the naturally occurring “clean” soils should be explored in accordance with Section 4.3 of the EA guidance document. The Council Decision includes a list of wastes in Section 2.1.1 of the document that are assumed to be inert and therefore acceptable at a landfill for inert waste without testing. This is the case if:

- They are single stream waste of a single waste type (although different waste types from the list may be accepted together if they are from a single source); and
- There is no suspicion of material or substances such as metals, asbestos, plastics, chemicals, etc to an extent which increases the risk associated with the waste sufficiently to justify contamination and they do not contain other classes of landfill.

9.3 Waste Classification and Waste Acceptance Criteria (WAC)

We have reviewed the testing results and assessed them through a waste classification database which allows users to code and classify waste as defined in the EWC (European Waste Catalogue) based on EC Regulation 1272/2008 on the Classification, Labelling and Packaging of Substances and Mixtures (CLP) and latest Environment Agency guidance (WM3 “Guidance on the classification and assessment of waste - Technical Guidance”).

The samples tested were screened against assessment criteria within WM3 using the HazWasteOnline tool to assess whether they contained any contaminants in the hazardous range.

The Waste Classification Report and WAC testing results are/is presented in Appendix F. The results of the waste assessment based on total concentrations are presented in the table below, alongside the WAC analysis test results.

Location	Depth (m)	Stratum	Waste Classification	WAC Analysis	Landfill	Comments
TP01	0.10- 0.50	MADE GROUND	Non-hazardous	NON- HAZARDOUS landfill	NON- HAZARDOUS landfill	PAH and pH
TP02	0.50 – 1.00	MADE GROUND	Non-hazardous	-	-	-
TP04	0.10 – 0.90	MADE GROUND	Non-hazardous	-	-	-
TP05	0.50 – 1.50	MADE GROUND	Non-hazardous	-	-	-

Based on the waste classification database assessment, all samples of the made ground soils have been classified as **non-hazardous**.

Note that further testing of the soils (WAC testing) may be required on the actual arisings in order to satisfactorily categorise the soil for its suitability for disposal to landfill.

9.4 Options Assessment

Following the classification of waste materials, the options available for the waste can be considered in the context of the waste hierarchy as below:

- Onsite re-use (with or without prior treatment) under suitable exceptions/permits.
- Offsite processing for recycling or recovery e.g. screening.
- Offsite disposal (with or without prior treatment) i.e. landfill.

Where feasible, efforts should be made to retain soils for onsite re-use to minimise costs and maximise the sustainability of projects.

Based on the above, the possible options for the generation of waste soils at the site are described in the table below:

Waste Generation Source	Comments
Made Ground from site levelling/foundations excavations/services excavations	Samples of made ground from across the site have been classified as non-hazardous for off-site disposal purposes, although should be suitable for re-use on site if required under suitable exemptions/permits.

General

If any gross hydrocarbon contaminated material is encountered during the construction phase, it is possible that this may be classified as hazardous and testing should be undertaken at that time.

Where it is necessary to dispose material off site it is recommended that materials are segregated and sufficient time is allowed to further classify the actual soil arisings that constitute the waste, including discussion with landfill sites and waste transfer stations to find the best disposal route. It is illegal to dilute and mix soils without a suitable permit.

9.5 Re-use of Soils

By definition in law, any material excavated from the ground becomes waste at the moment of excavation. If that soil (now a “waste”) is then placed on another part of the development site (or used on another development site) without an appropriate materials management plan, permit or exemption being in place, by law this material is defined as “illegally deposited waste”.

Landfill tax rules allow HM Revenue & Customs (HMRC) to recover landfill tax on illegally deposited waste on construction sites. This could lead to excessive costs without the correct documentation in place. In addition, a person who makes, knowingly causes or knowingly facilitates a disposal to be made at an unauthorised site is also liable to pay Landfill Tax.

In order to comply with UK legislation and avoid excessive costs, if the re-use of soils is proposed on site, this should be done in accordance with the relevant exemptions or permits in place.

Soils Re-use Under DoWCoP

One of the main industry mechanisms for allowing the re-use of soils in construction is the CL:AIRE “Development Industry Code of Practice for the Definition of Waste” (CL:AIRE DoWCoP) also known as a Materials Management Plan (MMP). Further guidance is provided in the BSL Methodology and Guidance in Appendix A.

To implement the DoWCoP (for Route A), there is a requirement to notify the Environment Agency and Local Authority of the intention to use the code of practice in principal, after which there is a 21-day notice period for their response.

In order to re-use soils under the DoWCoP, there are four key criteria that need to be met:

-
- The aims and objectives of the project meet the requirements of the Waste Framework Directive (does not harm human health or the environment).
 - The soils can be demonstrated to be suitable for use (backed up by chemical/geotechnical testing and assessment).
 - There is certainty of use (planning consents are in place alongside materials tracking, which should be in place as part of good site practice in any case).
 - Quantity (the quantity of materials used should be known).
-

Information on existing site levels, proposed levels, volumes generated (e.g. foundation / drainage excavation arisings) would need to be known in order to complete the MMP.

If the DoWCoP is the chosen route, the MMP should be in place and declared by a Qualified Persons (QP) before works commence, otherwise excavated soils could constitute an illegal deposit of waste and enforcement action could be taken by the EA and HMRC.

The declared MMP should be amended as new import sources are added.

Once the project is complete, a verification report detailing soils re-use/import will need to be produced and submitted to CL:AIRE, which may be subject to a random audit process. Sites found to be non-compliant with the CoP can be referred to the EA for further investigation.

Regardless of implementing re-use under the code of practice or not, all sites should have some form of materials tracking in place in compliance with current legislation. Any re-use scheme should also be designed to minimise disposal costs.

Re-use of soils containing asbestos should comply with the CL:AIRE publication 'Interpretation for Managing and working with Asbestos in Soil and Construction and Demolition Materials' (CAR-SOIL™) and CAR 2012.

In terms of the re-use of brick/concrete crush materials, the DoWCoP does cover aggregates, but only on the site of origin, and the EA WRAP aggregate Quality Protocol might best apply to ensure quality standards, which are discussed further below.

Soils Re-use under Exemptions and Permits

Other potentially suitable options to allow the re-use and/or import of soils and aggregates on site are provided in the table below:

Re-use Mechanism	Description
U1 Exemption	Can be applied to re-use/import of soils and stones, but only up to 1000 tonnes or for brick and concrete up to 5000 tonnes. This is usually an efficient way to re-use small volumes of waste materials. However, only one U1 can be filled in per site in any 3-year period. Quick and free via online registration.
WRAP Quality Protocols	Describes how processed demolition arisings can be removed from regulatory waste regime. Requires a demonstration of appropriateness by: • Factory Production Control Manual. • Facility Permit (or Exemption). • Grading Analysis.
Waste Framework Directive (WFD) exclusion	In regard to "clean" naturally occurring soils only that are to be re-used on their site of origin, these are covered by a Waste Framework Directive (WFD) exclusion which is an EA regulatory position statement. So long as the project can prove the four criteria listed above for the DoWCoP, then permits or the DoWCoP are not required. However, many projects still use the CoP to ensure compliance.
T5 Screening and blending of waste	The T5 exemption allows you to temporarily treat waste on a small scale to produce aggregate or soil at a particular location, such as a construction or demolition site. The limit is 5,000 tonnes. This applies to: • Screening soil on a demolition site to remove wood and rubble. • Blending soil and compost that has been produced under an exemption on a construction site to produce better soil for landscaping on that site (e.g. peaty deposits). • Crushing waste (except bricks, tiles and concrete) before screening or blending • Grading waste concrete after it has been crushed to produce a certain type of aggregate.
T7 Exemption	The T7 allows treatment of waste bricks, tiles and concrete by crushing, grinding or reducing in size. This needs to be registered with the Local Authority.
Other Permitting Routes	Other options include use under an Environmental Permit (Standard or Bespoke Rules), however these may be a time consuming and costly route, where use of the other above options (if applicable) are likely to be more feasible in construction.

10.0 CONCLUSIONS

10.1 Geo-Environmental

Geo-Environmental – Human Health

Testing of the made ground at the site did not reveal any exceedances of heavy metals, PAHs or asbestos. Based on the testing and assessment undertaken, there are no determinands above the relevant assessment criteria and mitigation measures will not be required in respect to soils.

Geo-Environmental – Ground Gas

Based on the CL:AIRE RB17 approach the site has been classified as CS2 and as such precautions should be installed.

Geo-Environmental – Controlled Waters

The overall risk to controlled waters is considered to be low and no further action is required.

Waste

Waste classification for the made ground at the site has revealed all of the samples to be non-hazardous.

10.2 Geotechnical

Foundations

Due to the ground conditions beneath the site, piles have been recommended as a suitable foundation type. Based on a circular pile with a diameter of 300mm, allowable axial loads of 120kPa are expected when constructed to a depth of 8.00m bgl, increasing to 180kPa at 12.00m bgl and 260kPa at 14.00m bgl. Based on a circular pile with a diameter of 500mm, allowable axial loads of 225kPa are expected when constructed to a depth of 8.00m bgl, increasing to 330kPa at 12.00m bgl and 480kPa at 14.00m bgl.

Floor slabs

Suspended floor slabs should be adopted.

Concrete classification

DS2 and AC-1s prevail within the made ground, DS1 and AC-1s prevail within the natural cohesive strata onsite.

Highways

Equilibrium CBR values of 2% are likely to be achieved within the made ground.

Drainage (SuDS)

The use of sustainable drainage systems, such as traditional soakaways within the natural ground, is not likely to be feasible due to the presence of thick made ground deposits and low permeability cohesive strata underlying the site.

Retaining Structures

A masonry retaining wall approximately 2.00m high with bowing brickwork and currently supported by steel posts makes up the southwest border of the site. No drainage was visible within the wall. The age of the walls, founding depths, and the founding materials are unknown. BSL recommends inspection of the wall by a structural engineer to assess the condition and determine what, if any, specialist requirements there are in respect to demolition and removal.

10.3 Further Work

The following further work is considered necessary to progress the site to construction phase:

-
- Detailed foundation design by a structural engineer.
 - Inspection of the retaining wall by a structural engineer.
 - Production of Ground Gas Protection Measures Verification Plan.
-

11.0 ABBREVIATIONS AND DEFINITIONS

GLOSSARY	
Term / Abbreviation	Definition
AST	Above Ground Storage Tank.
B(a)P	Benzo (a) Pyrene.
BGS	British Geological Survey.
BRE	Building Research Establishment.
BS	British Standard.
BSL	Brownfield Solutions Ltd.
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes.
CBR	California Bearing Ratio (used in pavement/highways design).
CAR 2012	Control of Asbestos Regulations (2012).
CBCB	Cheshire Brine Compensation Board.
CBCD	Cheshire Brine Compensation District.
CBR	California Bearing Ratio.
CIEH	Chartered Institute of Environmental Health.
CIRIA	Construction Industry Research Association.
CL:AIRE	Contaminated Land: Applications in Real Environments.
CLEA	Contaminated Land Exposure Assessment.
CLO	Contaminated Land Officer.
COMAH	Control of Major Accident Hazards.
Contamination	Presence of a substance which is in, on or under land, and which has the potential to cause significant harm or to cause significant pollution of controlled water. There is no assumption in this definition that harm results from the presence of the contamination. Naturally enhanced concentrations of harmful substances can fall within this definition of contamination. Contamination may relate to soils, surface water, groundwater or ground gas.
Controlled Waters	Inland freshwater (any lake, pond or watercourse above the freshwater limit), water contained in underground strata and any coastal water between the limit of highest tide or the freshwater line to the three-mile limit of territorial waters.
CPT	Cone Penetration Test.
CSM	Conceptual Site Model. A schematic hypothesis of the nature and sources of contamination, potential migration pathways (including description of the ground and groundwater) and potential receptors, developed on the basis of the information from the preliminary investigation and refined during subsequent phases of investigation and which is an essential part of the risk assessment process. The conceptual site model is initially derived from the information obtained by the preliminary investigation (i.e. the Phase I Desk Study). This conceptual model is used to focus subsequent investigations, where these are considered to be necessary, in order to meet the objectives of the investigations and the risk assessment. The results of intrusive investigations can provide additional data that can be used to further refine the conceptual site model.
DCP	Dynamic Cone Penetrometer.
DNAPL	Dense Non-Aqueous Phase Liquid.
DoWCoP	Definition of Waste Code of Practice.
DWS	Drinking Water Standard.
EA	Environment Agency.
EHO	Environmental health Officer.
EQS	Environmental Quality Standard.
GAC	Generic Assessment Criteria.

GLOSSARY	
Term / Abbreviation	Definition
GDR	Geotechnical Design Report.
GFR	Geotechnical Feedback Report.
GIR	Ground Investigation Report.
GSV	Gas Screening Value.
Harm	Adverse effect on the health of living organisms, or other interference with ecological systems of which they form part, and, in the case of human health, including property/structures and water supply pipelines.
Hazard	Inherently dangerous quality of a substance, procedure or event.
HDPE	High Density Polyethylene.
HSV	Hand Shear Vane.
K	Modulus of Subgrade Reaction.
LCRM	Land Contamination: Risk Management (EA guidance).
LNAPL	Light Non-Aqueous Phase Liquid (petrol, diesel, kerosene).
LOD	Limit of Detection (for particular method adopted).
MMP	Materials Management Plan.
Mv	Modulus of Volume of Compressibility.
ND	Not Detected.
NHBC	National House Building Council.
NR	Not Recorded.
OS	Ordnance Survey.
PAH	Polycyclic Aromatic Hydrocarbon.
Pathway	Mechanism or route by which a contaminant comes into contact with, or otherwise affects, a receptor.
PCB	Poly-Chlorinated Biphenyl.
PCSM	Preliminary Conceptual Site Model.
pH	Scale used to specify how acidic or basic a water-based solution is.
PHC	Petroleum Hydrocarbons.
PID	Photo Ionisation Detector.
PNEC	Predicted No-Effect Concentration.
Precision	Level of agreement within a series of measurements of a parameter.
PSD	Particle Size Distribution.
PVC	Polyvinyl Chloride.
Receptor	Human health, living organisms, ecological systems, controlled waters (surface waters and groundwater within aquifers), atmosphere, structures and utilities that could potentially be adversely affected by contaminant(s).
Risk	Probability of the occurrence, magnitude and consequences of an unwanted adverse effect on a receptor.
Risk Assessment	Process of establishing, to the extent possible, the existence, nature and significance of risk.
Sampling	Methods and techniques used to obtain a representative sample of the material under investigation.
SOM	Soil Organic Matter.
Source	Location from which contamination is, or was, derived. This could possibly be the location of the highest soil, groundwater or gas concentration of the contaminant(s).
SPT	Standard Penetration Test.
SVOCs	Semi Volatile Organic Compounds.
TOC	Total Organic Carbon.
TPH CWG	Total Petroleum Hydrocarbon (Criteria Working Group).

GLOSSARY	
Term / Abbreviation	Definition
TVOCs	Total volatile organic compounds.
UCS	Unconfined Compressive Strength.
Uncertainty	Parameter, associated with the result of a measurement that characterises the dispersion of the values that could reasonably be attributed to the measurement.
UST	Underground Storage Tank.
UXO	Unexploded Ordnance.
VCCs	Vibro Concrete Columns.
VSCs	Vibro Stone Columns
VOCs	Volatile Organic Compounds.
WAC	Waste Assessment Criteria.
WFD (in waste context)	Waste Framework Directive.
WFD (in water context)	Water Framework Directive.
Units	Definition
°	Degrees
Φ	Phi angle (in degrees)
g/l	Grams per Litre
Km	Kilometres
kPa	Kilo Pascal (Equivalent to kN/m ²)
KN/m ² /mm	Kilo Newton per metered squared per millimeter
kN/m ²	Kilo Newtons per metre squared
kPa	Kilo Pascal (Equivalent to kN/m ²)
l/hr	Litres per hour
MJ/kg	Mega joule per kilogram
MN	Mega Newton
M ² /MN	Mega Newton per metre squared
M	Metres
m bgl	Metres Below Ground Level
m OD	Metres Ordnance Datum (sea level)
µg/l	Micrograms per Litre (parts per billion)
µm	Micrometre
mb	Millibars (atmospheric pressure)
mg/kg	Milligrams per kilogram (parts per million)
mg/m ³	Milligram per metre cubed
mm	Millimetre
ppb	Parts Per Billion
Ppm	Parts Per Million

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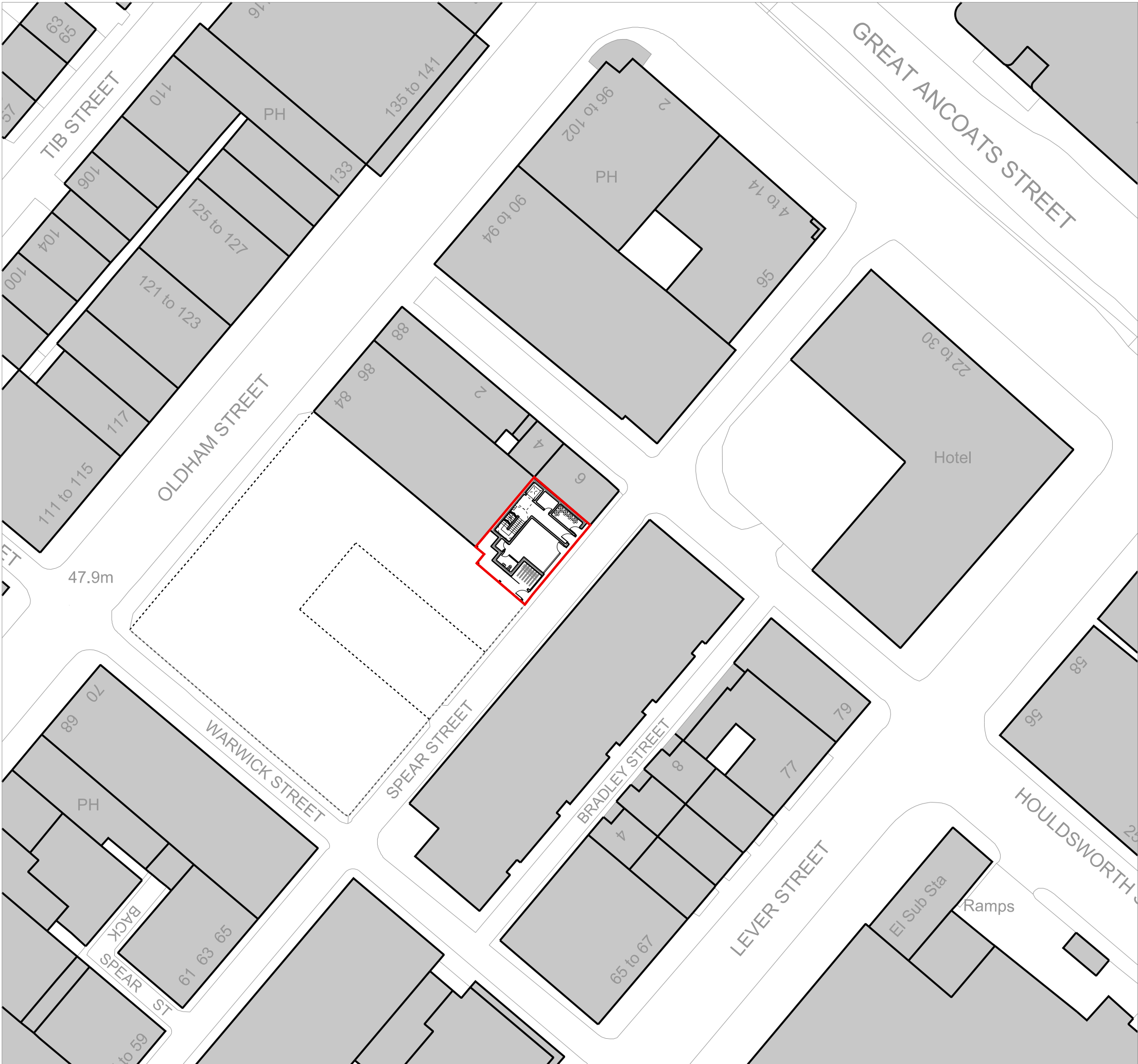
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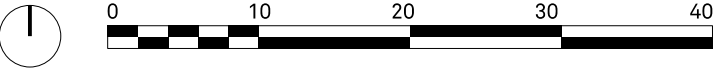
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DRAWINGS



Notes

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P02	24.10.22	AM	MS	General updates.
P01	28.07.22	RD	GJ	First issue.
Rev:	Date:	By:	Chk By:	Rev Note:

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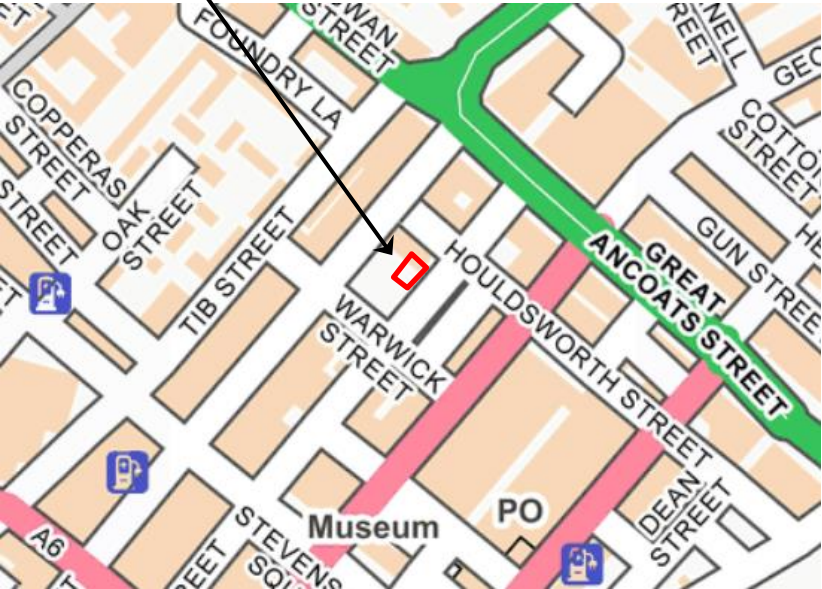
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Northern Group				
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Status	Issue suitable for:	Date		Scale
S2	Information	28.07.22		
Job No.	Drawing Stage	Scale		1:500 @ A3
P16-081	Planning			



SITE LOCATION

NEAREST POSTCODE: M1 1EJ

SITE ENTRANCE WHAT3WORDS:
///BUZZ.CYCLE.TRICKS



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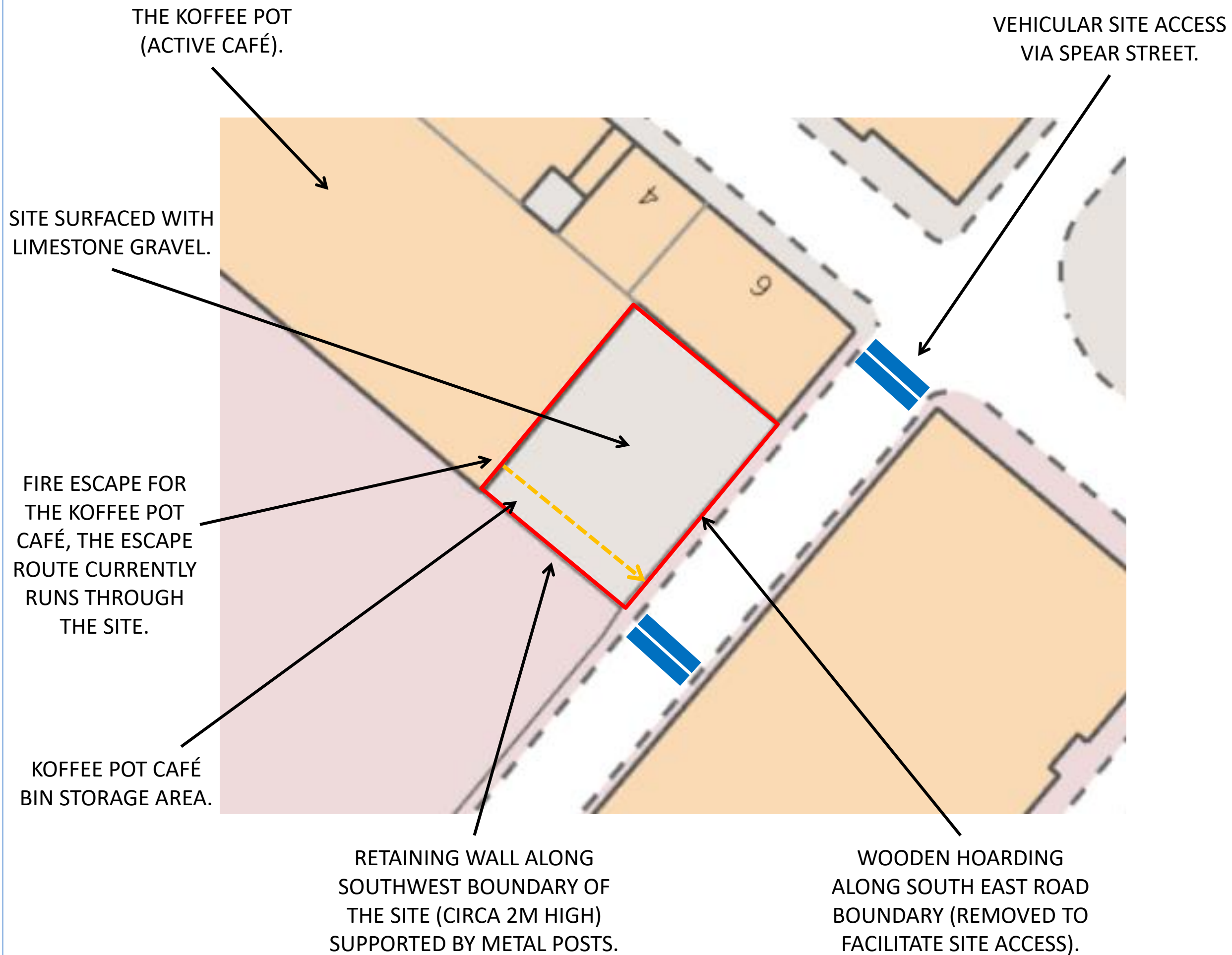
PROJECT TITLE

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DRAWING TITLE

SITE LOCATION PLAN

DRAWING No. C5230/01	REVISION -	SCALE NTS	DATE 04/01/23
DRAWN BY SD		CHECKED BY JEM	



KEY

- APPROXIMATE SITE BOUNDARY
- LOCKED GATE
- KOFFEE POT CAFÉ FIRE ESCAPE ROUTE

- NOTES
- ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE COMMENCING WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ARCHITECT & ENGINEER FOR VERIFICATION. FIGURED DIMENSIONS ONLY ARE TO BE TAKEN FROM THIS DRAWING.
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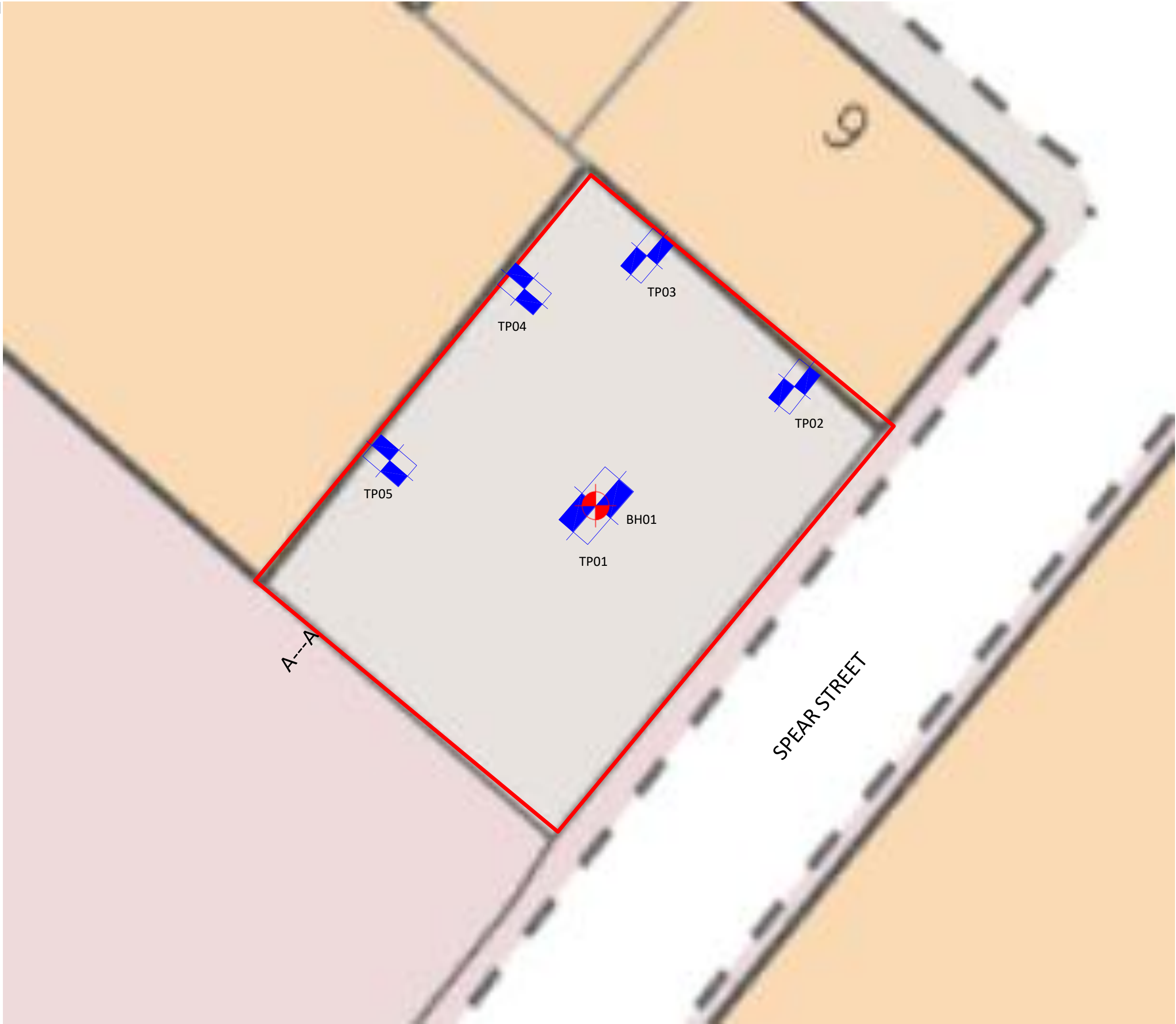


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SITE FEATURES PLAN

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KEY

- APPROXIMATE SITE BOUNDARY
- MECHANICALLY EXCAVATED TPXX TRIAL PIT
- BHXX CABLE PERCUSSIVE BOREHOLE
- A---A CROSS SECTION OF EXPOSED FOUNDATION OF NEWLY BUILT NEIGHBOURING APARTMENT BUILDING

- NOTES
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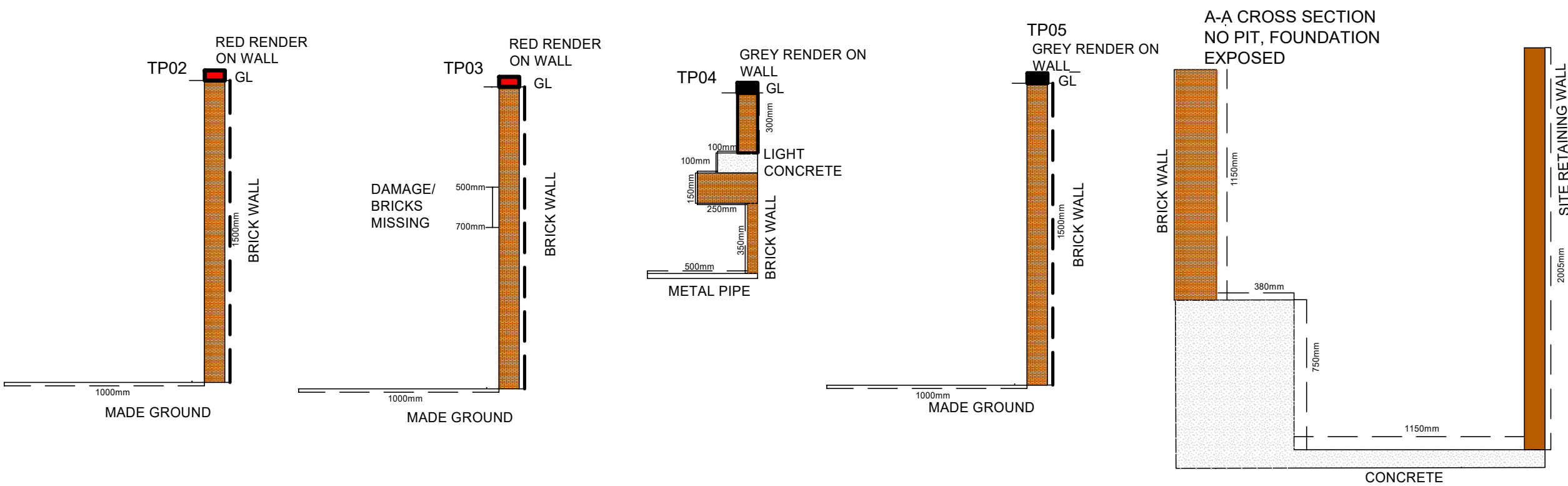
DRAWING TITLE
EXPLORATORY HOLE PLAN

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SECTION VIEW



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CLIENT
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PROJECT TITLE
SPEAR STREET, MANCHESTER

DRAWING TITLE
EXISTING FOUNDATION DETAILS

DRAWING No. C5230/04	REVISION	SCALE NTS	DATE 09/12/22
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APPENDIX A

BSL Methodology and Guidance

BSL Phase I & II Geo-Environmental Assessment Reports - Methodology and Guidance

This Appendix provides information on the approaches, methods and guidance used by Brownfield Solutions Ltd in the preparation of this report.

The term 'geo-environmental' is used to describe aspects relating to ground-related environmental issues (such as potential soils and groundwater contamination). The term 'geotechnical' is used to describe aspects relating to the physical nature of the site (such as foundation requirements). It should be noted that this is an integrated investigation and these two main aspects are related, unless otherwise specified within the report.

Phase I reports are written in general accordance with the description of a Preliminary Investigation as defined in BS10175:2011+A2:2017 and are also produced in general accordance with the recommendations for a Tier 1 Preliminary Risk Assessment as described in LCRM guidance

The first stage of the investigation and assessment of a site is the Preliminary Investigation/Tier 1 Preliminary Risk Assessment, often referred to as a Phase 1 Desk Study, comprising a desk study and walk-over survey and collation of desk-based searches, which culminates in the Preliminary Risk Assessment and the development of a preliminary/initial Conceptual Site Model (CSM). From this are identified any potential geotechnical and geo-environmental hazards and the qualitative degree of risk associated with them.

From the geo-environmental perspective, the hazard Identification process uses professional judgement to evaluate all the hazards in terms of possible contaminant linkages (of source-pathway-receptor). Possible contaminant linkages are potentially unacceptable risks in terms of the current contaminated land regime legal framework and require either remediation or further assessment. These are normally addressed via intrusive ground investigation and generic risk assessment as part of Phase II investigations and reports.

The second stage is the Ground Investigation, Generic Risk Assessment and Geotechnical Interpretation. This represents the further assessment mentioned above. The Ground Investigation comprises field work and laboratory testing based on the findings of the Preliminary Risk Assessment, to reduce uncertainty in the geotechnical and geo-environmental hazard identification. This may include an exploratory, a detailed or/and supplementary Investigations as described in BS 10175:2011+A2:2017. Phase II Assessments are produced in general accordance with the recommendations for a Tier 2 Generic Quantitative Risk Assessment as described in LCRM guidance and are also intended to fulfil the requirements of a Ground Investigation Report (GIR) as detailed in BS EN 1997-2:2007.

Contaminated Land - Legislative Background

Land contamination can be addressed in several ways, e.g. during planning, under Part 2A, following an incident, during an investigation into environmental damages, or during the application of an environmental permit, or its surrender.

For the planning process the key test is **as a minimum the site cannot be determined as contaminated land**, e.g. there is not significant harm, significant possibility of significant harm to human health or that there is not significant harm to, or the significant possibility that the pollution of controlled waters will occur.

Environmental liabilities and risks have been evaluated in terms of a source -pathway - target relationship in accordance with the approach set out in:

- The 1995 Environment Act.
- The Contaminated Land Statutory Guidance, DEFRA – April 2012.
- The Contaminated Land (England) Regulations 2006.
- The Contaminated Land (England) Amendment Regulations 2012.
- Water Resources Act.
- Water Framework Directive.
- Environmental Damage Regulations.
- Environment Agency (EA) - Land Contamination Risk Management (LCRM) 2019.

Contaminated land is defined within the legislative framework as land which is in such condition by reason of substances in, on or under the land that:

- 1) Significant harm is being caused or there is a significant possibility of such harm being caused.
- 2) Significant pollution of controlled waters is being or is likely to be caused.

The potential for harm is based on the presence of three factors:

Source - substances that are potential contaminants or pollutants that may cause harm.

Pathway - a potential route by which contaminants can move from the source to the receptor, and the impact of that migration on the source e.g. ;attenuation.

Receptor - a receptor that may be harmed, for example the water environment, humans and water, considering the sensitivity of the receptor

Where a source, pathway and target are all present a pollutant linkage exists and there is potential for harm to be caused. The presence of a source does not automatically imply that a contamination problem exists, since contamination must be defined in terms of pollutant linkages and unacceptable risk of harm. The nature and importance of both pathways and receptors are site specific and will vary according to the intended end use of the site, its characteristics and its surroundings.

The key principle which supports the S-P-R approach is 'suitable for use' criteria. This requires remedial action only where contamination is considered to pose unacceptable actual or potential risks to health or the environment and, taking into account the proposed use of the site.

Relevant Guidance Documents

This report has been prepared in accordance with the list of guidance below, however the list is not exhaustive:

- DETR: Circular 02/2000: Environmental Protection Act 1990: Part IIA: Contaminated land. 2012.
 - Environment Agency technical advice to third parties on Pollution of Controlled Waters for Part IIA of the EPA1990, May 2002.
 - BS 10175:2011+A2:2017.
 - Environment Agency (EA) - Land Contamination Risk Management (LCRM). 2019.
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- Groundwater Protection - <https://www.gov.uk/government/collections/groundwater-protection>.
- UK Technical Advisory Group (UKTAG) - - Water Framework Directive
- Incidents and their classification: the Common Incident Classification Scheme (CICS) – Used by the Environment Agency to classify pollution incidents.

Relevant Legislative Documents

The following is a non-exhaustive list of legislative framework documents that has been considered in the production of this report:

- The Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance (2012).
- The Environment Protection Act (1990).
- The Water Resources Act (1991).
- The Environment Act (1995).
- The Contaminated Land (England) Act (2000).
- The Pollution Prevention and Control (England and Wales) Regulations (2000).
- The Landfill Regulations (England and Wales) Regulations (2002).
- The Landfill (England and Wales) (Amendment) Regulations (2004).
- Contaminated Land (England) Regulations (2012).
- The Environmental Damage (Prevention and Remediation) Regulations (2009).
- Environmental Permitting Regulations (England and Wales) Regulations (2010).
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017
- Health and Safety at Work Act.
- National Planning Policy Framework (NPPF)(2021).

Contaminated Land Risk Assessment Approach

Contaminated Land Risk Assessment is a technique that identifies and considers the associated risk, determines whether the risks are significant and whether action needs to be taken. The four main stages of risk assessment are:

Hazard Identification ➡ Hazard Assessment ➡ Risk Estimation ➡ Risk Evaluation.

LCRM outlines the framework to be followed for risk assessment in the UK. The framework is designed to be consistent with UK legislation and policies including planning. The starting point of the risk assessment is to identify the context of the problem and the objectives of the process. Under LCRM, three tiers of risk assessment exist – Stage/Tier Preliminary Risk Assessment, Stage 2 Generic Quantitative and Stage 3 Detailed Quantitative.

Further information can be found at the below site:

<https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>

Formulating and developing a conceptual model for the site is an important requirement of risk assessment, this supports the identification and assessment of pollutant linkages. Development of the conceptual model forms the main part of preliminary risk assessment, and the model is subsequently refined or revised as more information and understanding is obtained through the risk assessment process.

Risk is a combination of the likelihood of an event occurring and the magnitude of its consequences. Therefore, both the likelihood and the consequences of an event must be taken into account when assessing risk.

The risk assessment process needs to take into account the degree of confidence required in decisions. Identification of uncertainties is an essential step in risk assessment.

The likelihood of an event is classified on a four-point system using the following terms and definitions from CIRIA C552, with reference to Incidents and their classification: the Common Incident Classification Scheme

(CICS), Environmental Protection Act 1990: Part 2A – Contaminated Land Statutory Guidance 2012 and other guidance as appropriate which will be detailed within the main body of the report if applied.

The likelihood of a given receptor being impacted is related to a number of factors, e.g. the geology which could inhibit contaminant migration. For example, a site with a significant thickness of clay between it and a receptor may reduce migration of contamination via the subsurface, which will reduce the likelihood of a given receptor being impacted. The geology or drainage for example could offer a preferential pathway e.g. mines shafts/faults increasing the likelihood and potential magnitude of an impact. The depth of contamination will also affect the exposure pathway, for example petroleum hydrocarbons at depth are unlikely to reach a receptor via dermal contact but could via vapour pathways which will influence the likelihood of an impact being felt e.g. if there are no buildings on site.

The terms and definitions used for the assessment of the likelihood are provided below:

High likelihood: There is a pollution linkage and an event appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.

Examples - Extensive areas with concentrations above saturation limits for mobile contamination e.g. petroleum hydrocarbons within the water table.

Likely: There is a pollution linkage and all the elements are present and in the right place, which means it is probable that an event will occur. Circumstances are such that the event is not inevitable, but possible in the short term and likely over the long term.

Examples – Localised areas of contaminants with concentrations above saturation limits for mobile contamination e.g. localised petroleum hydrocarbons within the water table; shallow contamination above relevant human health generic assessment criteria is present with little or no hardstanding,

Low likelihood: There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain even over a longer period such event would take place, and is less likely in the short term.

Examples - A thickness/distance of low permeability deposits preventing contaminant migration to a receptor is present; a site is mostly covered hard standing preventing exposure to soil contamination.

Unlikely: There is a pollution linkage but circumstances are such that it is improbable the event would occur even in the long term.

Examples – A site is underlain by a substantial thickness of low permeability clays, between the source and potential receptors which will inhibit significantly, but not completely rule out migration to sensitive receptors.

The severity is also classified using a system based on CIRIA C552, with reference to Incidents and their classification: the Common Incident Classification Scheme (CICS), Environmental Protection Act 1990: Part 2A – Contaminated Land Statutory Guidance 2012 and other guidance as appropriate which will be detailed within the main body of the report, if applied. The terms and definitions are:

Severe: Short term (acute) risk to human health likely to result in ‘significant harm’ as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution of sensitive water resources. Catastrophic damage to buildings or property. A short-term risk to a particular ecosystem or organism forming part of that ecosystem (note definition of ecosystem in ‘Draft Circular on Contaminated Land’, DETR 2000);

Examples – High concentrations of contaminant on surface of recreation area, major spillage of contaminants from site into controlled waters, explosion causing building to collapse.

Medium: Chronic damage to human health (‘significant harm’ as defined in DETR 2000). Pollution of sensitive water resources. A significant change in a particular ecosystem or organism forming part of that ecosystem (note definition of ecosystem in ‘Draft Circular on Contaminated Land’, DETR 2000);

Examples - Concentrations of contaminants exceed the generic assessment criteria, leaching of contaminants from a site to a Principal or Secondary Aquifer, death of species within a designated nature reserve.

Mild: Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ('significant harm' as defined in 'Draft Circular on Contaminated Land', DETR 2000). Damage to sensitive buildings, structures, services or the environment.

Examples – Pollution of non-classified groundwater or damage to buildings rendering it unsafe to occupy.

Minor: harm, not necessarily significant harm, which may result in financial loss or expenditure to resolve. Non-permanent health effects to human health (easily prevented by use of personal protective clothing etc). Easily repairable effects of damage to buildings, structures and services.

Examples – Presence of contaminants at such concentrations PPE is required during site work, loss of plants in landscaping scheme or discolouration of concrete.

Once the likelihood and severity have been determined, a risk category can be assigned using the table below.

		Consequences			
		Severe	Medium	Mild	Minor
Probability	Highly likely	Very high	High	Moderate	Moderate/low
	Likely	High	Moderate	Moderate/low	Low
	Low likelihood	Moderate	Moderate/low	Low	Very low
	Unlikely	Moderate/low	Low	Very Low	Very low
	No Linkage	Negligible			

Definitions of the risk categories obtained from the above table are as follows together with an assessment of the further work that might be required:

Very high: There is a high probability that severe harm could arise to a designated receptor from an identified hazard or there is evidence that severe harm is currently happening. This risk, if realised, could result in substantial liability. Urgent investigation and remediation are likely to be required.

High: Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation is required and remedial works may be necessary in the short term and are likely over the longer term.

Moderate: It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it would be more likely to be relatively mild. Investigation is normally required to clarify the risk and determine the liability. Some remedial works may be required in the longer term.

Low: It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.

Very Low: There is a low possibility that harm could arise to a receptor. In the event of such harm being realised, it is not likely to be severe.

Some linkages may be identified which constitutes a theoretical connection between a source and a receptor, but professional judgement shows them not to be possible for some reason. These are labelled 'no linkage' in the summary table, which give rise to a **negligible** risk category and no further action is required.

Ground Gas Risk Assessment Guidance

BS8485:2015+A1:2019, BS 8576:2013, CIRIA C665 and CL:AIRE RB17 are the current guidance which gives up-to-date advice on all aspects of ground gas. They outline good practice in investigation, the collection of relevant data and monitoring programmes in a risk-based approach to ground gas contamination.

Within BS8485:2015+A1:2019, BS 8576:2013 and CIRIA C665, two semi-quantitative methods are set out for the assessment of risk:

- 1 For low rise housing with a ventilated under floor void at minimum 150 mm (Boyle and Witherington).
- 2 For all other development types (Wilson and Card).

Both methods use the concept of Gas Screening Values (GSVs) to identify levels of risk. The mitigation and management of potentially unacceptable risk is described with reference to both passive and active systems of gas. Source removal is also discussed as an option. A separate approach is discussed under the RB17 header further below.

The aim of the guidance is for a consistent approach to decision making, particularly relating to the scope of protective design measures on a site-specific basis.

Legislative Framework

BS8485:2015+A1:2019, BS 8576:2013 and CIRIA C665 provides technical guidance, however they also recognise the context into which the guidance has to be employed. Government policy is based upon a “suitable for use approach”, which is relevant to both the current and proposed future use of land. When considering the current use of land, Part IIA of the Environment Protection Act 1990 provides the regulatory regime. The presence of hazardous ground gases could provide the “source” in a “pollutant linkage” which could lead the regulator to determine that considerable harm or there is a significant possibility of such harm being caused. Under such circumstances, the regulator would determine the land to be “contaminated land” under the provisions of the Act, setting out the process of remediation as described in the DETR Circular 02/2000 *Statutory guidance on contaminated land*.

Generation Potential of Sources

BS 8576:2013 Figure 6 provides a basis for assessing the generation potential from sources identified as part of the Phase I Assessment. These are summarised below:

Generation Potential	Typical Sources
Very Low	- Natural carbonate soil and strata, e.g. chalk and limestone. - Natural soil strata with a low degradable organic content, e.g. alluvium, peat. - In-filled pond less than 15 m diameter, in-filled before 1930s to 1940s. - Made ground with low degradable organic content (e.g. up to 5% organic material such as pieces of wood, pieces of paper, rags, etc. with a high proportion of ash and no food or other easily degradable waste). - Mine workings shallow or shaft (where there is clear evidence that they are flooded). - Inert landfill sites.
Low	- Natural soil strata with a high degradable organic content (DOC). - Made ground with total organic carbon (TOC) up to 6% (e.g. dock silt, no food or other easily degradable waste). - Foundry sand (includes phenolic binders, rags and wood that decay, albeit at low rates). - Landfill 1945 to mid 1960s (see also Moderate below).
Moderate	- Sewage sludge. - Mine workings – unflooded, more than 50 years since last worked (gas is liberated from coal when mine workings are excavated; this continues for up to about 50 years). - Landfill 1945 to mid 1960s (this could also be “low” or, if disturbed, “high”).

Generation Potential	Typical Sources
High	- Landfill mid 1960s to early 1990s. - Mine workings – unflooded – less than 50 years since last worked.
Very High	- Municipal landfill sites. - Landfill early 1990s onward.

Frequency and Duration of Monitoring

The monitoring period for a specific site covers the “worst case” scenario. A “worst case” scenario will typically occur during falling atmospheric pressure and, in particular, weather conditions such as rainfall, frost and dry weather.

The benefits of the additional information and whether it is likely to change the scope of gas protection should be considered, as are the consequences of failing to characterise adequately pollutant linkages. Investigations concerned with soil gas are required to provide monitoring data sufficient to allow prediction of worst case conditions enabling the confident assessment of risk and subsequent design of appropriate gas protection schemes. Monitoring programmes should not be an academic exercise in data collection. CL:AIRE publication TB17 “Ground Gas Monitoring and ‘Worst-Case’ Conditions” provides further guidance.

Below are matrices that will aid in determining an appropriate number of gas monitoring visits and the length of monitoring period.

Typical/idealised periods of monitoring

		Generation of Potential Source				
		Very Low	Low	Moderate	High	Very High
Sensitivity of Development	Low (Commercial)	1 month	2 months	3 months	6 months	12 months
	Moderate (Apartments)	2 months	3 months	6 months	12 months	24 months
	High (Low rise Residential)	3 months	6 months	6 months	12 months	24 months

Typical/idealised frequency of monitoring/Number of Visits Required

		Gas Generation of Potential Source				
		Very Low	Low	Moderate	High	Very High
Sensitivity of Development	Low (Commercial)	4	6	6	12	12
	Moderate (Apartments)	6	6	9	12	24
	High (Low rise Residential)	6	9	12	24	24

Note

- NHBC guidance also recommends this period of monitoring (Boyle and Witherington, 2007).
- Generation potential of sources based on descriptions within BS 8576:2013.
- At least two sets of readings should be at low and falling atmospheric pressure (but not restricted to periods below <1000 mb) known as worst case conditions. Historical data can be used as part of the data set (Table 5.5b).

It is recommended that newly installed monitoring wells are left for 24 hours to allow the soil gas to reach equilibrium. It should be recognised, however, that some soil gas regimes could take considerably longer (up to seven days). Interpretation of any initial readings should take this equilibrium process into account.

RB17 Approach

CL:AIRE RB17 (Card et al 2012) is a pragmatic approach to ground gas risk assessment and was developed because gas concentration, pressure and flow rate measured in a well headspace may not be representative of the conditions in the surrounding formation.

In these low-risk situations, the approach is to use the conceptual site model and the estimation of the likely gas generation from a source to identify where or if gas monitoring is required to better define the risks.

Under this approach, for sites with natural soils only with no credible methane source, then no action is required (no monitoring or gas protection measures) as this represents Characteristic Situation 1 (CS1).

Unexploded Ordnance (UXO) Guidance

Clients have a legal duty under the CDM 2015 Regulations to provide designers and contractors with project-specific health and safety information needed to identify hazards and risks. This includes the possibility of unexploded ordnance (UXO) being encountered on the site. Further details are given in CIRIA report C681.

BSL carry out non-specialist UXO screening exercises by considering any evidence of UK defence activities on or near the site evident from gathered desk study information and the unexploded aerial delivered bomb (UXB) online risk maps produced by Zetica. Other data sources are available, but as a first stage screening exercise the freely available online Zetica maps have been used. The level of risk stated is that determined by Zetica, a company experienced and considered competent in the assessment of UXO.

Contaminated Land Screening Values

In assessing the potential for contamination Brownfield Solutions Limited (BSL) follows UK guidance and current best practice.

General

The current recommended method for assessing contamination is on the basis of:

Source-Pathway-Receptor

Where any one of these “pollution linkages” is absent there is deemed to be no risk.

Fundamentally, receptors can be considered as humans (human health) and controlled waters (surface and ground waters).

The purpose of using generic Tier 1 screening levels is to have a simple means of assessing the potential contamination of a site and to inform decisions on whether further investigation is warranted or whether an option to undertake clean up based on the data to hand is cost effective.

Human Health

Current UK guidance is provided by DEFRA and the Environment Agency (EA). Publications forming part of the guidance include the CLEA Model and toxicological reports collectively referred to as the CLEA Guidance. The CLEA Guidance has included a number of publications which have provided initial screening values for soil contamination based on standard land uses and soil assumptions.

CLEA guidance has gone through a number of revisions over time. Tier 1 generic S4UL values have been published using the CLEA 1.06 Model by CIEH/LQM. These are the third set of generic assessment criteria generated by CIEH and replace the previous two sets of GACs (Generic Assessment Criteria). The revised S4UL values are based on greater knowledge of relevant toxicology and further consideration of exposure frequencies.

C4SL values for six determinands including lead was published by DEFRA/CL:AIRE in December 2014 and they represent a low risk as opposed to minimal risk. These screening values were published by DEFRA for Part 2A use, although with the dual purpose for use under planning. However, S4ULs remain the first reference due to the broader range of end uses and soil organic content.

The preference from the EA is that site specific screening levels are used wherever possible. Due to numerous factors it is not always possible to utilise site specific values. In these instances the following data sources are used in the order of preference given below:

- CIEH S4UL values (derived by CIEH/LQM).
- DEFRA/CL:AIRE C4SL's.
- CL:AIRE GAC values.
- Guidance from other European countries.
- Guidance from the outside Europe.

Controlled Waters

The European Water Framework Directive (WFD) became UK law in December 2003. It was created to ensure that European countries manage their rivers, groundwater and lakes so that they stay healthy for people and for wildlife.

This is achieved by the use of chemical standards for surface waters and groundwater. These values describe concentrations of chemicals that are not expected to cause harm to environmental organisms or human health, provided they are not exceeded. The same chemical may have several standards for different environmental regimes, and for different protection objectives.

Statutory Standards are set in legislation and if exceeded, this constitutes non-compliance with statutory obligations. European Directives are implemented in England and Wales by corresponding statutory instruments (i.e. regulations). The statutory instruments can be the exact same standards as they appear in the Directive or be more stringent.

A number of non-statutory standards also exist, these are set by various organisations (including the EA) for chemicals that are considered to be of concern, but are not covered by any specific legislation.

The chemical standards used in the UK to control impaction of contamination on controlled waters are Environmental Quality Standards (EQS). The EQS's cover a large number of compounds.

Where certain compounds are not covered by the EQS these are commonly compared to the UK Drinking Water Standards (DWS).

Further Assessment

When screening values are exceeded then further consideration is required. This could include the use of simple measures to break the pollution pathway and mitigate the risk, further additional detailed investigation, including the deriving of site-specific values to better define the risk, and to design appropriate remedial measures.

Re-Use Of Waste - Guidance Note

Definition of Waste

The Environment Agency considers waste to be “...any material that is discarded, or intended to be discarded...” This includes any soil from trenches, footing, site strip etc. It is no longer required in its original location, therefore it is considered to be waste.

CL:AIRE: Code of Practice

Where materials are excavated for construction purposes, wherever possible these should be retained on site for engineering purposes if they are suitable for use. This can be implemented under the CL:AIRE “Development Industry Code of Practice for the Definition of Waste” (CL:AIRE DoWCoP), also commonly referred to as a “Materials Management Plan”.

The developer/contractor is advised to complete all works under the DoWCoP.

Potential scenarios where soils may be able to be re-used:

- Material capable of being used in another place on the same site without treatment.
- Material capable of being used in another place on the same site following ex-situ treatment on site.
- Material capable of being used in another development site without treatment (Direct Transfer).
- Material capable of being used in another development site following ex-situ treatment on another site eg Hub site.

The Code of Practice requires 4 No. Factors to be addressed:

- 1) Protection of human health and protection of the environment.
- 2) Suitability of use, without further treatment.
- 3) Certainty of use.
- 4) Quantity of material.

In order to satisfy these requirements the following are required:

- i) Consultation/approval with Local Authority & Environment Agency to confirm they have no objections to the proposed re-use of waste soils, or the risk assessments for the site.
- ii) Risk Assessments to demonstrate that the site does not present an Environmental Hazard.
- iii) Remediation Strategy for contaminated sites (or Design Statement for non-contaminated sites).
- iv) Materials Management Plan (MMP) which details material generated stockpiles and the end use.
- v) Volume calculations.
- vi) Planning permission for the development.
- vii) Contractual details to be clear, regarding who steps in if a contractor goes into administration/liquidation.

The use of the CoP is effectively industry regulated, there is a requirement to appoint an independent Qualified Person (QP) who checks all the requirements have been met and registers the documentation with the Environment Agency. This person must not have had any involvement with the preparing of the risk assessments or remedial strategy on the site.

Soils which require treatment on site (eg bioremediation, stabilisation) will require an Environmental Permit for treatment, together with justification and validation to prove, once treated, this material is suitable for use. Site management procedures need to be in place to ensure that material is tracked through from excavation stockpiling, treatment and remediation processes. Should the process of material tracking be considered non-robust, or not adhered to, this may fail the test whether excavated materials may be considered non-waste.

Waste Classification for Soils

Introduction

Waste producers have a duty of care to classify the waste they are producing:

- Before it is collected, disposed of or recovered.
- To identify the controls that apply to the movement of the waste.
- To complete waste documents and records.
- To identify suitably authorised waste management options.
- To prevent harm to people and the environment.

The most sustainable and economic method of dealing with waste soil is usually the retention and re-use on site. Where this is not possible there are three main options for the disposal of soils:

1. Disposal to a permitted waste recycling facility.
2. Re-use on another site (subject to the suitability).
3. Disposal to a landfill site.

The disposal to a permitted facility will be subject to the **specific conditions of the permits for each individual facility** and will vary dependent on location and environmental sensitivity of the receiving site. Re-use on another site will also be subject to the acceptability criteria of that site.

The guidance below relates to disposal to **landfill sites only**.

Background for Landfill Disposal

In July 2005 the United Kingdom implemented the European Directive 1999/31/EC (The Landfill Directive), this introduced the current regime for waste and waste disposal to landfill. The Landfill Directive places controls on waste disposal. These controls include requirements to follow the waste acceptance procedures and criteria that have been agreed by the Council of the European Union and are laid out in Council Decision 2003/33/EC.

Before a waste can be accepted at a landfill site, the landfill **operator** must be satisfied that the waste meets his permit conditions, the waste acceptance procedures (WAP) and waste acceptance criteria (WAC).

If disposal to landfill is the best management option for the waste soils, these procedures **must** be followed or the operator may refuse to accept the waste.

Key Points:

- Not all waste can be landfilled
- Landfills are classified according to whether they can accept hazardous, non-hazardous or inert wastes.
- Wastes can only be accepted at a landfill if they meet the waste acceptance criteria (WAC) for that class of landfill.
- Most wastes must be treated before you can send them to landfill.
- There are formal processes for identifying and checking wastes that must be followed before wastes can be accepted at a landfill site.

Classification

Wastes are listed in the European Waste Catalogue (EWC 2002) and grouped according to generic industry, process or waste types. Wastes within the EWC are either hazardous or non-hazardous. Some of these wastes are hazardous without further assessment (absolute entries) or are 'mirror' entries that require further assessment of their hazardous properties in order to determine whether they are hazardous waste.

Waste soil has mirror entries on the EWC and as such the first phase of the waste classification process is that of determining if the waste is hazardous or not i.e the hazard assessment. The most common EWC waste codes related to soil are:

17 05	soil (including excavated soil from contaminated sites), stones and dredging spoil
17 05 03*	soil and stones containing dangerous substances
17 05 04	soil and stones other than those mentioned in 17 05 03

Soils may contain certain contaminants (eg asbestos, oil,) which have prescribed concentration thresholds, that if breached will render the material hazardous waste. These are based on specific “hazardous properties” which include hazards such as carcinogenicity, flammability and toxicity.

In the first instance the concentrations of plausible contaminants within the soil should be identified and wastes should be **classified based on their total concentrations**.

Waste Definitions

Inert	- Will not undergo any significant physical, chemical or biological transformations. - Will not dissolve. - Will not burn. - Will not physically or chemically react. - Will not biodegrade. - Will not adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm to human health. - Has insignificant total leachability and pollutant content. - Produces a leachate with an ecotoxicity that is insignificant (if it produces leachate).
Non-Hazardous	Is not inert (see above) Is not hazardous (see below)
Hazardous	Soil has hazardous properties as defined in WM3 (Guidance on the classification and assessment of waste (1st edition 2015)- Technical Guidance)
Stable Non-reactive hazardous waste#	Hazardous waste, the leaching behaviour of which will not change adversely in the long-term, under landfill design conditions or foreseeable accidents either: in the waste alone (for example, by biodegradation), under the impact of long-term ambient conditions (for example, water, air, temperature or mechanical constraints) or by the impact of other wastes (including waste products such as leachate and gas).

This option allows hazardous waste that is stable and thus has a low leaching potential to be deposited in cells with a standard of containment consistent with non-hazardous wastes.

WAC Testing

The purpose of WAC analysis is to confirm that the waste complies with the relevant WAC for the receiving landfill. If the waste has any disposal route other than a landfill site (e.g. recycling facility, incineration etc) the WAC is not relevant. Furthermore, the WAC limits **cannot** be used to make an assessment of whether a waste is hazardous. WAC testing does however define if a non-hazardous waste is suitable for an inert landfill.

Classification based on Total Concentrations ¹	Non-Hazardous Waste		Hazardous Waste	
	Below inert WAC limit values:	Above inert WAC limit values:	Below hazardous WAC limit values	Above hazardous WAC limit values
WAC testing				
Landfill requirements	INERT landfill	NON-HAZARDOUS landfill ²	HAZARDOUS landfill	PRE-TREATMENT ³

1 Total concentrations are defined as tests results on solids as opposed to leachate (i.e. a liquid).

2 Individual sites may have certain limit values pre-determined in their licence.

3 After pre-treatment the material characteristics may have changed to an extent that allow the soil to be re-classified.

Hydrocarbons in Soils

WM3 uses the term Oil or Waste Oil to cover hydrocarbons products such as fuel oil, petrol or diesel. These are defined by WM3 as hazardous under an absolute entry in the List of Wastes. However, hydrocarbons in soils are a mixture rather than a pure product and are therefore not absolute entries.

Known Oils

The simplest scenario is where the identity of the contaminating oil is known or can be identified. If the oil is known the manufacturer's or supplier's REACH compliant safety data sheet for the specific oil can be obtained and the hazard statement codes on that Safety Data Sheet can be used for the hazardous waste assessment.

Where the identity of the oil can only be identified down to a petroleum group level (i.e. the contaminating oil is known to be diesel, but the specific type/brand is unknown), then the classification of that petroleum group should be used in the assessment. The marker compounds associated with that petroleum group may be used to confirm carcinogenicity.

Oils may contain a range of hydrocarbons, so the presence of for instance Diesel Range Organics (DRO) does not enable the assessor to conclude that diesel is present. These hydrocarbons may have arisen from other oils, the laboratory needs to provide an interpretation of the chromatograph to determine if it is consistent with diesel or weathered diesel as a whole.

The concentration of known oils should be determined using a method that as a minimum spans the range in which the carbon numbers for that known oil fall.

Unknown Oils

Where hydrocarbons are contaminating soils, it is likely that the oil will be unknown or cannot be determined.

WM3 states that:

For contaminated land specific consideration must be given to the following before proceeding;

- The presence of other organic contaminants, for example solvents or coal tar that could be detected as hydrocarbons. Coal Tar is not an oil and is considered separately in WM3 example 2. Where the site history or investigation indicates the presence of hydrocarbons from oil and other sources (e.g. coal tar), and the origin of the hydrocarbons cannot reliably be assigned to either, then a worst case approach of considering the hydrocarbons both as waste oil (in accordance with this example) and from other sources, for example coal tar should be taken.
- The presence of diesel, or weathered diesel, should be specifically considered by the laboratory and where this is confirmed by the hydrocarbon profile the oil should be assessed as a known or identified oil (diesel).

The use of marker compounds is optional; however, it is recommended that where possible the marker compounds should be used. WM3 states:

If the identity of the oil is unknown, and the petroleum group cannot be established, then the oil contaminating the waste can be classified as non-carcinogenic/mutagenic due to the presence of oil if all three of the following criteria are met:

- The waste contains benzo[a]pyrene (BaP) at a concentration of less than 0.01% (1/10,000th) of the TPH concentration (This is the carcinogenic limit specified in table 3.1 of the CLP for BaP)
- This has been determined by an appropriate and representative sampling approach in accordance with the principles set out in Appendix D of WM3, and
- The analysis clearly demonstrates, for example by carbon bands or chromatograph, and the laboratory has reasonably concluded that the hydrocarbons present have not arisen from petrol or diesel.

For example:

TPH Concentration (mg/kg)	Petrol or Diesel	BaP (mg/kg)	Classification
10,000	No	0.9	Non- Hazardous
1,000	No	Not available	Hazardous
1,000	Yes	Not relevant	Hazardous

References

1. Environmental Permitting (England and Wales) Regulations 2010 (as amended) (EP Regulations), the Landfill Directive (1999/31/EC) and the subsequent Council Decisions.
2. Environment Agency Environmental Permitting Regulations: "Inert Waste Guidance- Standards and Measures for the Deposit of Inert Waste on Land" 2009.
3. Environment Agency "Waste acceptance at landfills - Guidance on waste acceptance procedures and criteria" Nov 2010.
4. Environment Agency "Guidance on the classification and assessment of waste (Technical Guidance WM3)".
5. Classification, Labelling and Packaging of Substances Regulation (EC 1272/2008) (CLP).
6. Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives
7. 2014/955/EU: Commission Decision of 18 December 2014 amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament
8. Environmental Permitting Guidance The Landfill Directive For the Environmental Permitting (England and Wales) Regulations 2010 Updated March 2010 Version 3.1
9. Classification, Labelling and Packaging of Substances Regulation (EC 1272/2008) (CLP).

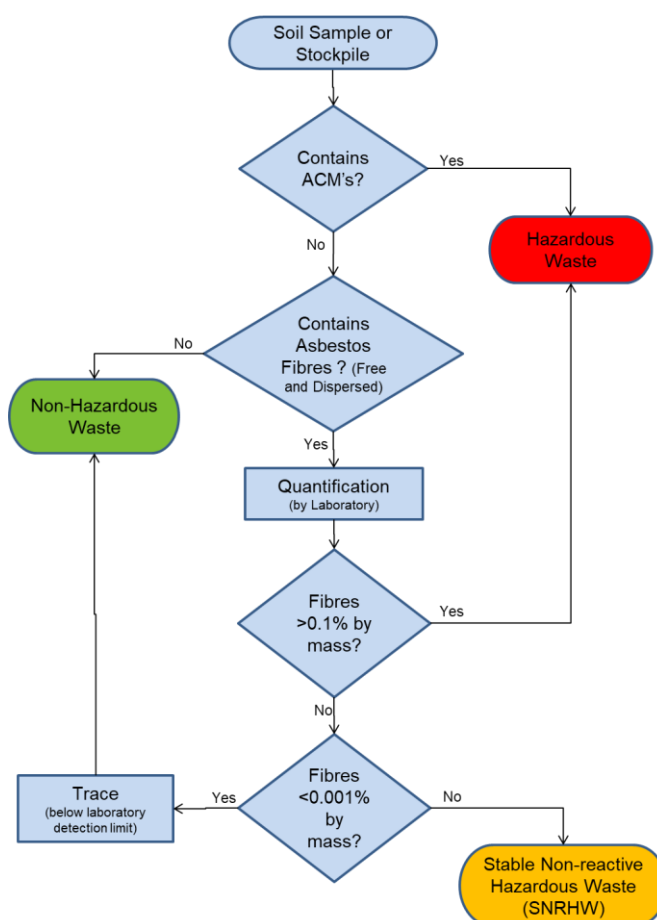
Additional Asbestos Guidance Notes

Disposal

The 1st Edition of WM3 "Guidance on the classification and assessment of waste", details the way in which Asbestos is assessed within soils.

The assessment of asbestos containing waste is dependent on whether the asbestos is present as:

- Fibres that are free and dispersed, or
- Identifiable pieces of asbestos containing materials (ACM's)



Identifiable pieces of asbestos are any particle of a size that can be identified as potentially being asbestos by a competent person if examined by the naked eye. The result is that commonly soils with visible ACM's are sorted and the ACM's removed by hand picking and separate disposal.

Asbestos concentrations below 0.001% by mass are below standard laboratory detection limits and are not currently regarded as containing asbestos for the purposes of disposal and may be disposed of to an inert landfill site¹. These levels are often termed "trace" by laboratories.

Asbestos concentrations between 0.001% and 0.1% are stable non-reactive hazardous waste (SNRHW)¹. Waste transfer stations where soil recycling takes place may be able to take SNRHW, but are unlikely to take soils containing asbestos above trace concentrations.

The following codes should be assigned to the asbestos waste as appropriate:

17 06	Insulation materials and asbestos-containing construction materials
17 06 01	Insulation materials containing asbestos
17 06 03	Other insulation materials consisting of or containing hazardous substances
17 06 04	Insulation materials other than those mentioned in 17 06 01 and 17 06 03
17 06 05	Construction material containing asbestos

WM3 indicates that 17 06 05 would normally be used in preference to 17 06 01 for the asbestos in asbestos contaminated soil and stones.

Construction materials containing asbestos and "*other suitable materials*" may be landfilled at landfills for non-hazardous waste in accordance with the Landfill Directive without testing.

This means that wastes that are only hazardous because of their asbestos content can be disposed of at landfills for non-hazardous waste in separate landfill cells that only accept asbestos wastes and other suitable materials. The Landfill Directive requires that stable non-reactive hazardous waste shall not be deposited with biodegradable waste (for example organic material, household waste, paper etc..) and must meet the waste acceptance criteria set out in accordance with Annex II.

Construction

Health and Safety Executive (HSE) guidance on asbestos is not directly related to soil and much of the guidance focuses on the removal of asbestos from buildings. The overarching legislation is the Control of Asbestos Regulation (CAR 2012). However, where work involves (or is likely to involve) contact with asbestos then CAR 2012 requires a risk assessment including whether or not the work is licensed or notifiable non-licensed work and may require an Asbestos Management Plan. Work becomes notifiable if it is considered that the control limit could be exceeded.

Brownfield sites frequently have soils that contain asbestos and the presence of asbestos needs to be considered within the context of construction, particularly in relation to groundworks. The exposure of soils and the use of excavators and plant to move soil around increases the possibility of fibres becoming airborne. However, it is good site practice to not generate dusts and to employ dust suppression on all sites regardless of the presence of asbestos.

The legal control limit for asbestos is 0.1f/ml over a continuous four-hour period. The control limit is not a 'safe' level and exposure from work activities involving asbestos must be reduced to as far below the control limit as possible.

Clearly the higher the concentrations in the soil the greater potential there is for fibres to be released, however IOM publication TM/88/14 "the release of dispersed asbestos fibres from soil" 1988 concludes that:

- Mixtures of asbestos in dry soils with asbestos content as low as 0.001% can produce airborne respirable asbestos concentrations greater than 0.1f/ml in dust clouds where the respirable dust concentrations are less than 5mg/m³.
- An action limit is recommended of no higher than 0.001% asbestos in soils above which steps should be taken to minimise exposure to airborne fibres (e.g. by wetting).
- The addition of relatively small quantities (10%) of water can reduce the airborne fibre concentrations by an order of magnitude.

Where asbestos has been identified at concentrations above 0.001% as free and dispersed fibres in the soil precautions need to be adopted. Concentrations below this are considered to be normal background, although good site practice dictates that the generation of dusts should be avoided and therefore any fugitive fibre release from minor concentrations should be kept to a practical minimum.

End Use

The use of materials containing asbestos and material containing asbestos is prohibited under EU legislation. There is currently a Joint Industry Working Group (JIWG) tasked with producing a Code of Practice for Asbestos in Soil, Made Ground and Construction & Demolition Material that will clarify in due course the position of the various government agencies.

Asbestos containing materials can remain in situ under a suitable cover system which may be hardsurfacing or soft landscaping (with or without hard dig layers and markers).

There is a risk that future maintenance may compromise such systems and details of the presence of asbestos should be kept in the Health and Safety File.

Preliminary publications from JIWG (April 2015) provide guides for decision making in relation to construction.

The re-use of waste soils should be undertaken in accordance with the CL:AIRE Code of Practice and is subject to suitable risk assessments demonstrating low risk. There is nothing that specifically excludes the re-use of soils containing asbestos as fill to raise levels. However, the movement of materials increases the risk of fibres becoming airborne and suitable precautions will be required.

The re-use of soils containing asbestos at concentrations above hazardous waste levels is likely to meet with regulatory opposition. Assuming a suitable strategy could be agreed this would take a considerable amount of time and is only likely to be feasible where there is a long program for implementation.

Asbestos in Soil as Free Fibres

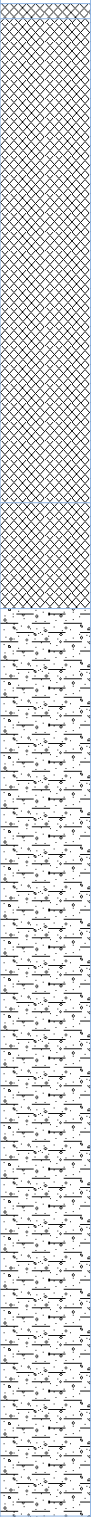
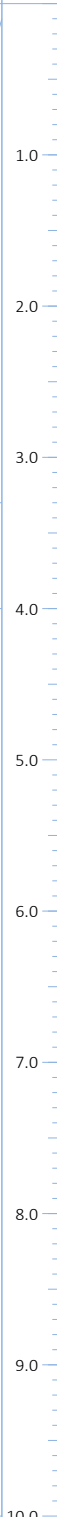
Concentration (by weight)	Waste Disposal				Construction Issues	End Use	
	Recyc	Inert	SNR	Hazardo		Suitable for re-use on site	Precautions
Not detected	√	√			No precautions necessary, however on a brownfield site asbestos not previously identified may be found during works and a statement within the contractors method statement for how they will deal with this unforeseen asbestos would be good practice to ensure compliance with CAR2012.	Yes	None
Trace (<0.001%)		√ ²			Precautions are unlikely to be required, however a detailed method statement may be required to ensure compliance with CAR2012. Basic asbestos management good practice will be required. Typically precautions would include: - Ensuring soils do not dry out to become dusty. - Site personnel have the risk communicated at induction stage.	Yes Soils can be re-used under CL:AIRE CoP with the correct precautions in place.	Generally clean cover or hardstanding cover required.
0.001% – 0.099%			√		Contractor needs to produce an Asbestos Management Plan in accordance with CAR2012 as part of their method statement. Typical precautions would include: - Site personnel have the risk communicated at induction stage. - Ensuring personnel have suitable training. - Task monitoring to inform PPE requirements. - Ensuring soils do not dry out to become dusty and that misting is available during groundworks. - Separate stockpiling. - Clean haulage routes.	Possibly Soils may be able to be re-used under CL:AIRE CoP, subject to a satisfactory Risk Assessment and regulatory agreement with the correct precautions in place.	Clean cover or hardstanding cover required.
0.1+%				√	Contractor needs to produce an Asbestos Management Plan in accordance with CAR2012 as part of their method statement. Typical precautions would include: - Site personnel have the risk communicated at induction stage. - Ensuring personnel have suitable training. - Task monitoring to inform PPE requirements. - Site wide and or perimeter monitoring. - Ensuring soils do not dry out to become dusty and that misting is available during groundworks. - Separate stockpiling. - Clean haulage routes. - Decontamination unit	Unlikely ³ Re-use of soils containing asbestos within an earthworks scheme will involve significant engineering and the Risk for generating dusts will be significantly increased with	Clean cover and a hard dig layer. A plan should be in place for future excavations as part of the Health and Safety File.

Concentration (by weight)	Waste Disposal				Construction Issues	End Use	
	Recyc	Inert	SNR	Hazardo		Suitable for re-use on site	Precautions
						repeated handling and compaction.	

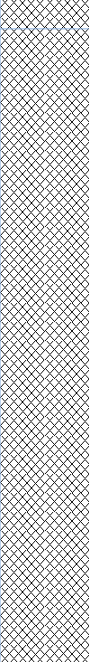
1. The standard laboratory detection limit is normally 0.001%. Below 0.001% is trace and currently regarded as not containing asbestos for the purposes of disposal off site. However the waste producer has a duty to fully classify the waste and the presence of trace asbestos should be declared. Consequently it is unlikely that a waste treatment site will take this soil and an inert landfill may make a commercial decision to only take it under some circumstances.
2. The re-use of soils containing asbestos at concentrations above hazardous waste is likely to meet with regulatory opposition. Assuming a suitable strategy could be agreed this would take a considerable amount of time and is only likely to be warranted where there a long program for implementation.

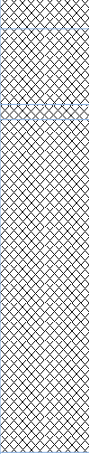
APPENDIX B

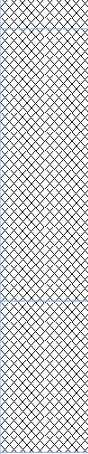
Exploratory Hole Logs

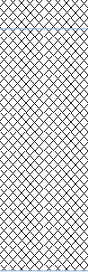
BROWNFIELD SOLUTIONS LTD						Borehole Log		Borehole No.	
PROJECT NO: C5230						CO-ORDS:		BH01	
								Sheet 1 of 2	
PROJECT NAME: SPEAR STREET, MANCHESTER						LEVEL:		Hole Type	
								CP	
CLIENT: M4NCHESrER ONE LTD						DATES: 01/12/22 - 02/12/22		Scale	
								1:50	
								Logged	Checked
								JEM	LC
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	D		0.10			MADE GROUND: Cream subangular to subrounded fine to coarse gravel of limestone over a blue plastic membrane. MADE GROUND: Brown slightly clayey gravelly fine to coarse sand with medium cobble content. Gravel is angular to subrounded fine to coarse of brick, concrete, glass, asphalt, metal, timber, ceramic, sandstone and rare slag and clinker. Cobbles are subangular to subrounded up to 200mm in diameter of asphalt, brick and concrete.	
		1.00	D						
		1.20	SPT	N=18 (10,9/7,4,4,3)					
		2.00	D						
			SPT	N=12 (5,4/4,3,3,2)					
		2.50-3.30	ES						
		3.00	D						
			SPT	N=9 (2,2/2,2,2,3)					
		3.30-3.50	ES		3.30				
		4.00	D						
			SPT	N=17 (8,5/3,4,5,5)	4.00				
		5.00-5.45	U						
		5.50	D						
		6.50-6.95	D						
		6.50	SPT	N=11 (2,2/2,3,3,3)					
		7.00	D						
		8.00	D						
	SPT	N=16 (2,3/3,4,4,5)							
9.00	D								
9.50-9.95	U								
10.00	D								
Remarks		1. Hole commenced above backfilled TP01. 2. No groundwater encountered. 3. Hole backfilled with arisings upon completion.						ES = Environmental Sample D = Disturbed Sample B = Bulk Sample LB = Large Bulk Sample U = Undisturbed Sample UT = Undisturbed Thin Wall Sample SPT = Standard Penetration Test PID = Photoionization Detector (ppm) PPM = Part Per Million HSV = Hand Shear Vane	

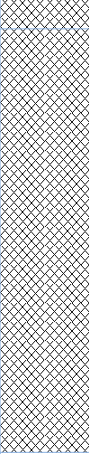
 BROWNFIELD SOLUTIONS LTD							Borehole Log		Borehole No.
									BH01
									Sheet 2 of 2
PROJECT NO: C5230							CO-ORDS:		Hole Type
									CP
PROJECT NAME: SPEAR STREET, MANCHESTER							LEVEL:		Scale
									1:50
CLIENT: M4NCHESrER ONE LTD							DATES: 01/12/22 - 02/12/22		Logged
									Checked
									JEM
									LC
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description	
Depth (m)	Type	Results							
11.00	D SPT	N=18 (2,2/2,4,6,6)							11.0
12.00	D								12.0
12.50-12.95	S SPT	N=35 (6,5/6,8,10,11)							
12.50									
13.00	D								13.0
14.00-14.45	S SPT	N=43 (4,5/7,7,11,18)							14.0
14.00									
14.80	D				14.80				
15.50-15.95	U							Very stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mudstone and sandstone.	15.0
16.00	D								16.0
17.00-17.36	S SPT	N≥50 (6,6/50 for 210mm)							17.0
17.00					17.40			Reddish brown slightly gravelly fine to coarse SAND. Gravel is subrounded to rounded fine to medium of sandstone and mudstone.	
18.00	D				18.00				18.0
18.50-18.91	S SPT	N≥50 (6,7/50 for 265mm)						Hard brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mudstone and sandstone.	
18.50					18.91				
								End of Borehole at 18.91m	19.0
									20.0
Remarks		1. Hole commenced above backfilled TP01. 2. No groundwater encountered. 3. Hole backfilled with arisings upon completion.						ES = Environmental Sample D = Disturbed Sample B = Bulk Sample LB = Large Bulk Sample U = Undisturbed Sample UT = Undisturbed Thin Wall Sample SPT = Standard Penetration Test PID = Photoionization Detector (ppm) PPM = Part Per Million HSV = Hand Shear Vane	

 BROWNFIELD SOLUTIONS LTD						Trial Pit Log		No. TP01 Sheet 1 of 1	
PROJECT NO: C5230						CO-ORDS:		Hole Type TP	
PROJECT NAME: SPEAR STREET, MANCHESTER						LEVEL:		Scale 1:25	
CLIENT: M4NCHESTER ONE LTD						DATES: 30/11/22		Logged JEM	Checked LC
Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description		
	Depth (m)	Type	Results						
	0.10-0.50	ES		0.10			MADE GROUND: Cream subangular to subrounded fine to coarse gravel of limestone over a blue plastic membrane. MADE GROUND: Brown slightly clayey gravelly fine to coarse sand with medium cobble content. Gravel is angular to subrounded fine to coarse of brick, concrete, glass, asphalt, metal, timber, ceramic, sandstone and rare slag and clinker. Cobbles are subangular to subrounded up to 200mm in diameter of asphalt, brick and concrete.	1.0	
	1.00-1.50	ES		2.20			Medium content of subrounded boulders up to 950mm in diameter of concrete and masonry wall from 1.80m bgl.	2.0	
							End of Trial Pit at 2.20m	3.0	
								4.0	
								5.0	
Remarks		1. No groundwater encountered. 2. Sides unstable with constant collapsing of granular made ground. 3. Hole backfilled with arisings upon completion.						ES = Environmental Sample D = Disturbed Sample B = Bulk Sample LB = Large Bulk Sample U = Undisturbed Sample UT = Undisturbed Thin Wall Sample SPT = Standard Penetration Test PID = Photoionization Detector (ppm) PPM = Part Per Million HSV = Hand Shear Vane	

 BROWNFIELD SOLUTIONS LTD					Trial Pit Log		No. TP02 Sheet 1 of 1		
PROJECT NO: C5230					CO-ORDS:		Hole Type TP		
PROJECT NAME: SPEAR STREET, MANCHESTER					LEVEL:		Scale 1:25		
CLIENT: M4NCHESrER ONE LTD					DATES: 30/11/22		Logged JEM	Checked LC	
Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description		
	Depth (m)	Type	Results						
	0.50-1.00	ES		0.10			MADE GROUND: Cream subangular to subrounded fine to coarse gravel of limestone over a blue plastic membrane. MADE GROUND: Brown slightly clayey gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse of brick, concrete and sandstone. MADE GROUND: Paving slabs. MADE GROUND: Brown slightly clayey gravelly fine to coarse sand with medium cobble content. Gravel is subangular to subrounded fine to coarse of brick, concrete and sandstone. Cobbles are subangular to subrounded up to 190mm in diameter of brick.	1.0	
					0.35 0.40				
				1.50			End of Trial Pit at 1.50m	2.0	
								3.0	
								4.0	
								5.0	
Remarks		1. Machine excavated foundation inspection pit. 2. No groundwater encountered. 3. Sides unstable with constant collapsing of granular made ground. 4. Hole backfilled with arisings upon completion.						ES = Environmental Sample D = Disturbed Sample B = Bulk Sample LB = Large Bulk Sample U = Undisturbed Sample UT = Undisturbed Thin Wall Sample SPT = Standard Penetration Test PID = Photoionization Detector (ppm) PPM = Part Per Million HSV = Hand Shear Vane	

 BROWNFIELD SOLUTIONS LTD						Trial Pit Log		No. TP03 Sheet 1 of 1	
PROJECT NO: C5230						CO-ORDS:		Hole Type TP	
PROJECT NAME: SPEAR STREET, MANCHESTER						LEVEL:		Scale 1:25	
CLIENT: M4NCHESrER ONE LTD						DATES: 30/11/22		Logged JEM	Checked LC
Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description		
	Depth (m)	Type	Results						
	0.10-1.00	ES		0.10			MADE GROUND: Cream subangular to subrounded fine to coarse gravel of limestone over a blue plastic membrane. MADE GROUND: Brown slightly clayey gravelly fine to coarse sand with low cobble content. Gravel is subangular to subrounded fine to coarse of brick, concrete and sandstone. Cobbles are subangular to subrounded up to 190mm in diameter of brick.		
	1.00-1.50	ES		1.00			MADE GROUND: Greyish brown slightly clayey gravelly fine to coarse sand with low cobble content. Gravel is subangular to subrounded fine to coarse of brick, concrete, sandstone and rare coal and clinker. Cobbles are subangular to subrounded up to 190mm in diameter of brick.	1.0	
				1.50			End of Trial Pit at 1.50m		
								2.0	
								3.0	
								4.0	
								5.0	
Remarks		1. Machine excavated foundation inspection pit. 2. No groundwater encountered. 3. Sides unstable with constant collapsing of granular made ground. 4. Hole backfilled with arisings upon completion.						ES = Environmental Sample D = Disturbed Sample B = Bulk Sample LB = Large Bulk Sample U = Undisturbed Sample UT = Undisturbed Thin Wall Sample SPT = Standard Penetration Test PID = Photoionization Detector (ppm) PPM = Part Per Million HSV = Hand Shear Vane	

 BROWNFIELD SOLUTIONS LTD					Trial Pit Log		No.		
TP04									
Sheet 1 of 1									
PROJECT NO: C5230					CO-ORDS:		Hole Type		
PROJECT NAME: SPEAR STREET, MANCHESTER					LEVEL:		TP		
CLIENT: M4NCHESTER ONE LTD					DATES: 30/11/22		Scale		
							1:25		
							Logged		
							Checked		
							JEM		
							LC		
Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description		
	Depth (m)	Type	Results						
	0.10-0.90	ES		0.10			MADE GROUND: Cream subangular to subrounded fine to coarse gravel of limestone over a blue plastic membrane. MADE GROUND: Brown slightly clayey gravelly fine to coarse sand with low cobble content. Gravel is subangular to subrounded fine to coarse of brick, concrete and sandstone. Cobbles are subangular to subrounded up to 190mm in diameter of brick.	1.0	
				0.90			End of Trial Pit at 1.50m	2.0	
								3.0	
								4.0	
								5.0	
Remarks		1. Machine excavated foundation inspection pit. 2. No groundwater encountered. 3. Sides unstable with constant collapsing of granular made ground. 4. Hole backfilled with arisings upon completion.						ES = Environmental Sample D = Disturbed Sample B = Bulk Sample LB = Large Bulk Sample U = Undisturbed Sample UT = Undisturbed Thin Wall Sample SPT = Standard Penetration Test PID = Photoionization Detector (ppm) PPM = Part Per Million HSV = Hand Shear Vane	

 BROWNFIELD SOLUTIONS LTD					Trial Pit Log		No. TP05 Sheet 1 of 1	
PROJECT NO: C5230					CO-ORDS:		Hole Type TP	
PROJECT NAME: SPEAR STREET, MANCHESTER					LEVEL:		Scale 1:25	
CLIENT: M4NCHESTER ONE LTD					DATES: 30/11/22		Logged JEM	Checked LC
Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description	
	Depth (m)	Type	Results					
	0.50-1.50	ES		0.10			MADE GROUND: Cream subangular to subrounded fine to coarse gravel of limestone over a blue plastic membrane. MADE GROUND: Brown slightly clayey gravelly fine to coarse sand with medium cobble content. Gravel is angular to subrounded fine to coarse of brick, concrete, glass, asphalt, metal, timber, ceramic, sandstone and rare slag and clinker. Cobbles are subangular to subrounded up to 200mm in diameter of asphalt, brick and concrete.	1.0
				1.50			End of Trial Pit at 1.50m	2.0
								3.0
								4.0
								5.0
Remarks		1. Machine excavated foundation inspection pit. 2. No groundwater encountered. 3. Sides unstable with constant collapsing of granular made ground. 4. Hole backfilled with arisings upon completion.						ES = Environmental Sample D = Disturbed Sample B = Bulk Sample LB = Large Bulk Sample U = Undisturbed Sample UT = Undisturbed Thin Wall Sample SPT = Standard Penetration Test PID = Photoionization Detector (ppm) PPM = Part Per Million HSV = Hand Shear Vane

APPENDIX C

Chemical Testing Results

Joel Massey
Brownfield Solutions Ltd
William Smith House
173 - 183 Witton Street
Northwich
Cheshire
CW9 5LP

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

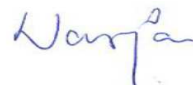
t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

e: j.massey@brownfield-solutions.co.uk

Analytical Report Number : 22-12545

Project / Site name:	Spear Street, Manchester	Samples received on:	09/12/2022
Your job number:	C5230	Samples instructed on/ Analysis started on:	09/12/2022
Your order number:	3779	Analysis completed by:	19/12/2022
Report Issue Number:	1	Report issued on:	19/12/2022
Samples Analysed:	4 soil samples		

Signed:



Dominika Warjan
Junior Reporting Specialist
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

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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: 22-12545

Project / Site name: Spear Street, Manchester

Your Order No: 3779

Lab Sample Number				2528670	2528671	2528672	2528673
Sample Reference				TP01	TP02	TP04	TP05
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10-0.50	0.50-1.00	0.10-0.90	0.50-1.50
Date Sampled				30/11/2022	30/11/2022	30/11/2022	30/11/2022
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	47
Moisture Content	%	0.01	NONE	9.9	19	15	11
Total mass of sample received	kg	0.001	NONE	1	1.1	1.1	1.1

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	JSW	JSW	JSW	JSW

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	10.7	8.1	7.8	8.5
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	320	830	2500	230
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.16	0.42	1.2	0.11
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	158	417	1240	113
Organic Matter (automated)	%	0.1	MCERTS	2.9	2.2	3.1	2.7
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	1.7	1.3	1.8	1.5

Speciated PAHs*

Naphthalene	mg/kg	0.05	NONE	2.2	< 0.05	0.1	1.2
Acenaphthylene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05	0.25
Acenaphthene	mg/kg	0.05	NONE	6.1	< 0.05	0.12	1.5
Fluorene	mg/kg	0.05	NONE	4.4	< 0.05	0.08	1.3
Phenanthrene	mg/kg	0.05	NONE	32	0.22	0.84	10
Anthracene	mg/kg	0.05	NONE	7.5	0.05	0.18	2.4
Fluoranthene	mg/kg	0.05	NONE	36	0.25	0.97	14
Pyrene	mg/kg	0.05	NONE	32	0.26	0.98	14
Benzo(a)anthracene	mg/kg	0.05	NONE	14	0.16	0.45	6.4
Chrysene	mg/kg	0.05	NONE	14	0.15	0.49	6.4
Benzo(b)fluoranthene	mg/kg	0.05	NONE	17	0.17	0.44	8
Benzo(k)fluoranthene	mg/kg	0.05	NONE	4.7	0.06	0.25	2.2
Benzo(a)pyrene	mg/kg	0.05	NONE	14	0.18	0.42	6.8
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	6	0.1	0.2	3.1
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	1.4	< 0.05	0.06	0.75
Benzo(ghi)perylene	mg/kg	0.05	NONE	6.5	0.13	0.26	3.4

Total PAH*

Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	196	1.73	5.84	81.4
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Analytical Report Number: 22-12545

Project / Site name: Spear Street, Manchester

Your Order No: 3779

Lab Sample Number				2528670	2528671	2528672	2528673
Sample Reference				TP01	TP02	TP04	TP05
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10-0.50	0.50-1.00	0.10-0.90	0.50-1.50
Date Sampled				30/11/2022	30/11/2022	30/11/2022	30/11/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)				Units	Limit of detection	Accreditation Status	

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	9	27	27	12
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.6	< 0.2	< 0.2	0.5
Chromium (hexavalent)	mg/kg	1.2	NONE	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	14	9.4	17	15
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	14	9.4	17	15
Copper (aqua regia extractable)	mg/kg	1	MCERTS	30	74	83	39
Lead (aqua regia extractable)	mg/kg	1	MCERTS	120	520	720	240
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.5	2.1	2.1	0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	14	15	17	14
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	120	52	66	110

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

*Data reported unaccredited due to quality control parameter failure associated with this result; other checks applied prior to reporting the data have been accepted and the failure justified as having no significant impact on sample data reported.

Analytical Report Number : 22-12545

Project / Site name: Spear Street, Manchester

* 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 *
2528670	TP01	None Supplied	0.10-0.50	Brown clay and sand with gravel and brick.
2528671	TP02	None Supplied	0.50-1.00	Brown sand with gravel.
2528672	TP04	None Supplied	0.10-0.90	Brown loam and sand with gravel and brick.
2528673	TP05	None Supplied	0.50-1.50	Brown gravelly clay with stones.

Analytical Report Number : 22-12545

Project / Site name: Spear Street, Manchester

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

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 dispersion 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
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	NONE
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
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 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
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Organic matter (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
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	NONE
Sulphate, water soluble, in soil	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

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL or B' 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. Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Joel Massey

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t: 01923 225404
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e: reception@i2analytical.com

Analytical Report Number : 22-12550

Project / Site name:	Spear Street, Manchester	Samples received on:	09/12/2022
Your job number:	C5230	Samples instructed on/ Analysis started on:	09/12/2022
Your order number:	3779	Analysis completed by:	21/12/2022
Report Issue Number:	1	Report issued on:	21/12/2022
Samples Analysed:	10:1 WAC sample		

Izabela Wójcik
Signed:

Izabela Wójcik
Reporting Specialist
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

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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.



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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number : 22-12550

Project / Site name: Spear Street, Manchester

* 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 *
2528700	TP01	None Supplied	0.10-0.50	Brown clay and sand with gravel and brick.

Analytical Report Number : 22-12550

Project / Site name: Spear Street, Manchester

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance""	L046-PL	W	NONE
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Mineral Oil (Soil) C10 - C40	Determination of mineral oil fraction extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Speciated WAC-17 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
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH at 20oC in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In house method.	L005-PL	W	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 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
BTEX in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Total BTEX in soil (Poland)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073-PL	W	MCERTS
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Sulphate 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025

Analytical Report Number : 22-12550

Project / Site name: Spear Street, Manchester

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by EC probe using a factor of 0.6.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L031	W	ISO 17025
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic carbon in leachate by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL or B' 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.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
-	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

APPENDIX D

Geotechnical Testing Results

4041

Client: Brownfield Solutions Ltd
 Client Address: William Smith House, 173 - 183 Witton Street,
 Northwich, Cheshire,
 CW9 5LP
 Contact: Joel Massey
 Site Address: Spear Street Manchester

Client Reference: C5230
 Job Number: 22-12318
 Date Sampled: 02/12/2022
 Date Received: 09/12/2022
 Date Tested: 19/12/2022
 Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

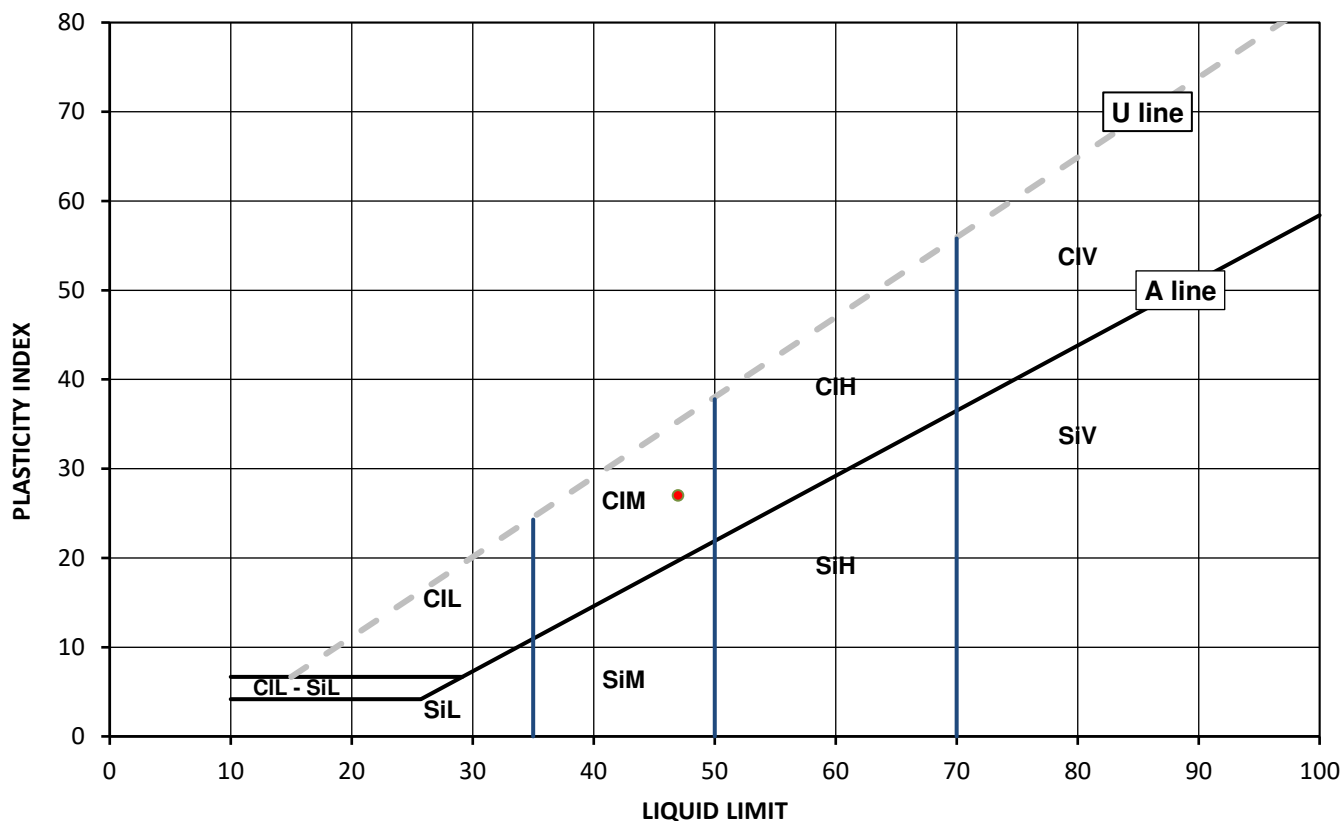
Test Results:

Laboratory Reference: 2527399
 Hole No.: BH01
 Sample Reference: Not Given
 Sample Description: Brown slightly gravelly slightly sandy CLAY

Depth Top [m]: 3.30
 Depth Base [m]: 3.50
 Sample Type: D

Sample Preparation: Tested after washing to remove >0.425mm;
 Cone Type: 80g/30deg

As Received Water Content [W] %	Corrected Liquid Limit [WL] %	Correlation Factor	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
20.3	47	1.058	20	27	92



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
Cl	Clay	below 35
Si	Silt	35 to 50
	L	Low
	M	Medium
	H	High
	V	Very high
	O	Organic
		append to classification for organic material (eg CIHO)

Note: Water Content by BS EN 17892-1: 2014; Correlation Factor by Clayton C.R.I and Jukes A.W (1978)

Remarks:

Signed:



Monika Siewior
 Reporting Specialist
 for and on behalf of i2 Analytical Ltd

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

4041

Client: Brownfield Solutions Ltd
 Client Address: William Smith House, 173 - 183 Witton Street,
 Northwich, Cheshire,
 CW9 5LP
 Contact: Joel Massey
 Site Address: Spear Street Manchester

Client Reference: C5230
 Job Number: 22-12318
 Date Sampled: 02/12/2022
 Date Received: 09/12/2022
 Date Tested: 19/12/2022
 Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

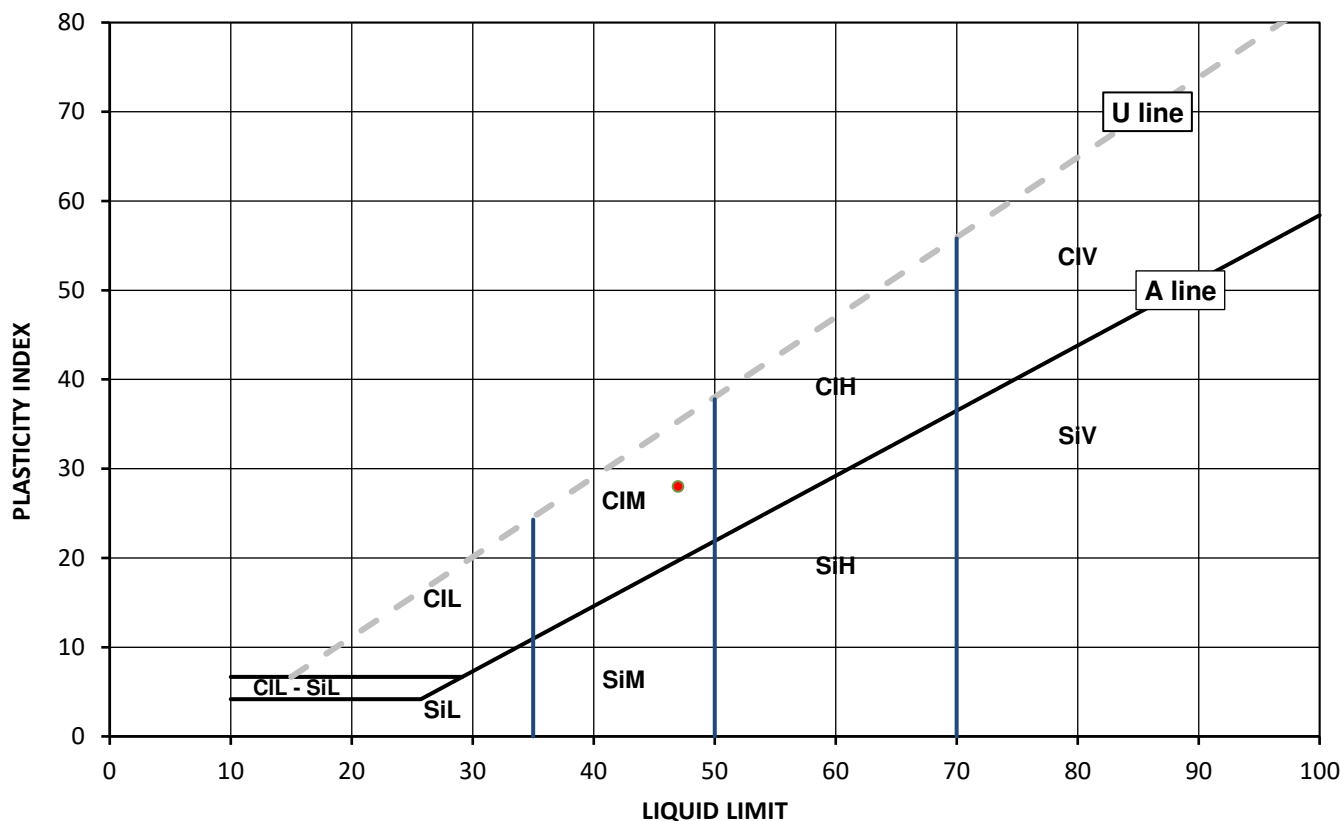
Test Results:

Laboratory Reference: 2527400
 Hole No.: BH01
 Sample Reference: Not Given
 Sample Description: Brown slightly gravelly slightly sandy CLAY

Depth Top [m]: 4.00
 Depth Base [m]: 4.00
 Sample Type: D

Sample Preparation: Tested after washing to remove >0.425mm;
 Cone Type: 60g/60deg

As Received Water Content [W] %	Corrected Liquid Limit [WL] %	Correlation Factor	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
21.1	47	1.039	19	28	97



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
Cl	Clay	below 35
Si	Silt	35 to 50
	L	Low
	M	Medium
	H	High
	V	Very high
	O	Organic
		append to classification for organic material (eg CIHO)

Note: Water Content by BS EN 17892-1: 2014; Correlation Factor by Clayton C.R.I and Jukes A.W (1978)

Remarks:

Signed:

Monika Siewior

Monika Siewior
 Reporting Specialist
 for and on behalf of i2 Analytical Ltd

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SUMMARY REPORT

SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with:

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB



Environmental Science

4041

Client: Brownfield Solutions Ltd
Client Address: William Smith House, 173 - 183 Witton Street,
Northwich, Cheshire,
CW9 5LP
Contact: Joel Massey
Site Address: Spear Street Manchester

W by BS EN 17892-1: 2014; Liquid and Plastic Limit by BS EN ISO 17892-12:2018+A1:2021: Clause 5.3 (4 Point Test), Clause 5.3.14 (1 Point Test) and 5.5; Correlation Factor by Clayton C.R.I and Jukes A.W (1978); PD by BS 1377-2: 1990: Clause 8.2

Client Reference: C5230
Job Number: 22-12318
Date Sampled: 02/12/2022
Date Received: 09/12/2022
Date Tested: 19/12/2022
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	W	Liquid & Plastic Limit								Density		
		Reference	Depth Top	Depth Base	Type				% Passing 425um	WL*	Correlation Factor	Wp	Ip	Cone type	Sample Preparation	bulk	dry	PD	
			m	m															Mg/m3
2527399	BH01	Not Given	3.30	3.50	D	Brown slightly gravelly slightly sandy CLAY	Atterberg 1 Point	20.3	92	47	1.058	20	27	80g/30 deg	N/A				
2527400	BH01	Not Given	4.00	4.00	D	Brown slightly gravelly slightly sandy CLAY	Atterberg 1 Point	21.1	97	47	1.039	19	28	60g/60 deg	N/A				

Note: # Non accredited; NP - Non plastic; I - The water content in the sample was increased , D - The water content in the sample was decreased; * - One point liquid limit corrected as per the report Correlation Factor by Clayton C.R.I and Jukes A.W (1978)

Comments:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed:

Monika Siewior

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

TEST CERTIFICATE

DETERMINATION OF THE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client: Brownfield Solutions Ltd
Client Address: William Smith House, 173 - 183 Witton Street,
Northwich, Cheshire,
CW9 5LP

Contact: Joel Massey
Site Address: Spear Street Manchester

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: C5230
Job Number: 22-12318
Date Sampled: 01/12/2022
Date Received: 09/12/2022
Date Tested: 19/12/2022
Sampled By: Not Given

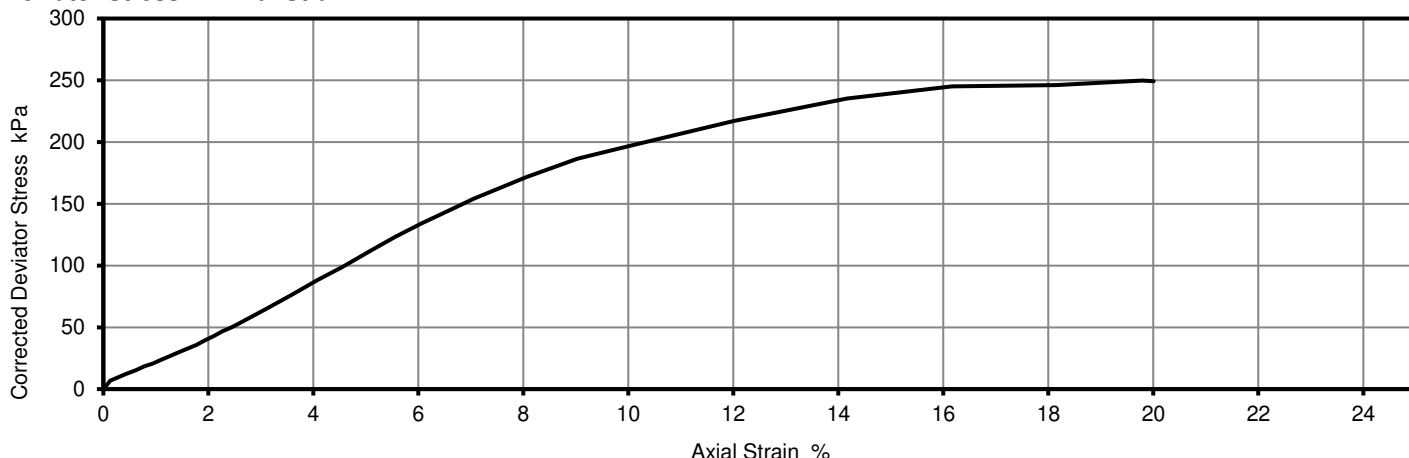
Test Results:

Laboratory Reference: 2527401
Hole No.: BH01
Sample Reference: Not Given
Sample Description: Brown very silty CLAY
Sample Preparation: Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.

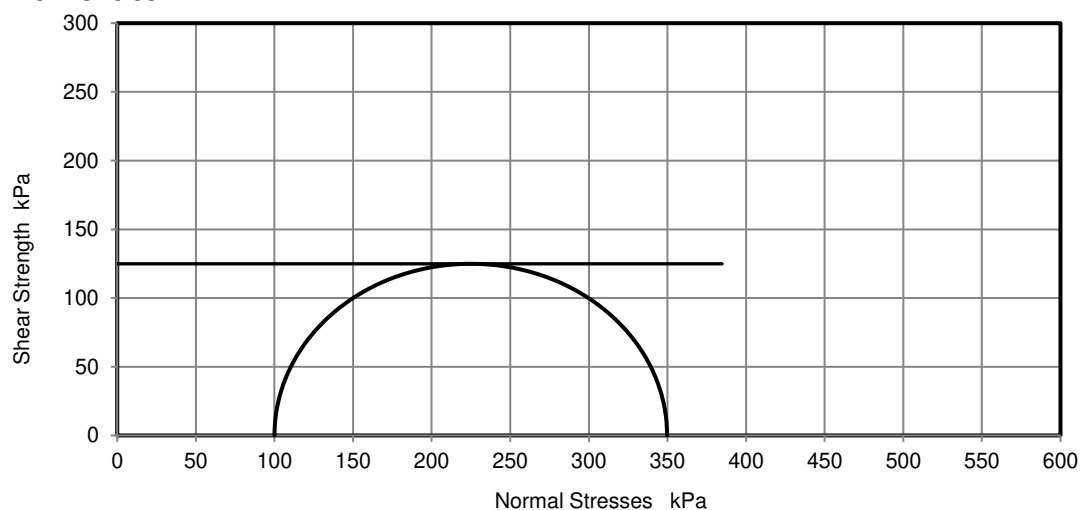
Depth Top [m]: 5.00
Depth Base [m]: 5.45
Sample Type: U

Test Number	1	Rate of Strain	1.99	%/min
Length	200.80	Cell Pressure	100	kPa
Diameter	99.84	Axial Strain at failure	19.8	%
Bulk Density	2.13	Deviator Stress, ($\sigma_1 - \sigma_3$) _f	250	kPa
Moisture Content	23	Undrained Shear Strength, c_u	125	kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Dry Density	1.73	Mode of Failure	Compound	
Membrane Correction	1.11	Membrane thickness	0.29	mm

Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377.
This is provided for information only.

Remarks:

Signed:

Monika Siewior

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

DETERMINATION OF THE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client: Brownfield Solutions Ltd
Client Address: William Smith House, 173 - 183 Witton Street,
Northwich, Cheshire,
CW9 5LP
Contact: Joel Massey
Site Address: Spear Street Manchester

Client Reference: C5230
Job Number: 22-12318
Date Sampled: 01/12/2022
Date Received: 09/12/2022
Date Tested: 19/12/2022
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference: 2527402

Hole No.: BH01

Sample Reference: Not Given

Sample Description: Brown slightly gravelly silty CLAY

Sample Preparation: Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.

Depth Top [m]: 9.50

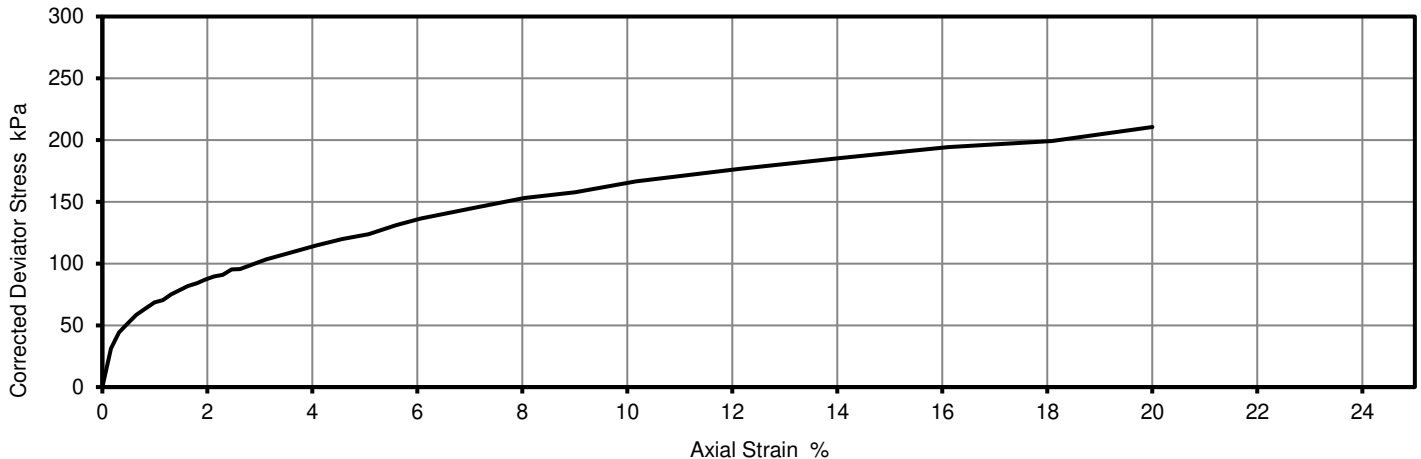
Depth Base [m]: 9.95

Sample Type: U

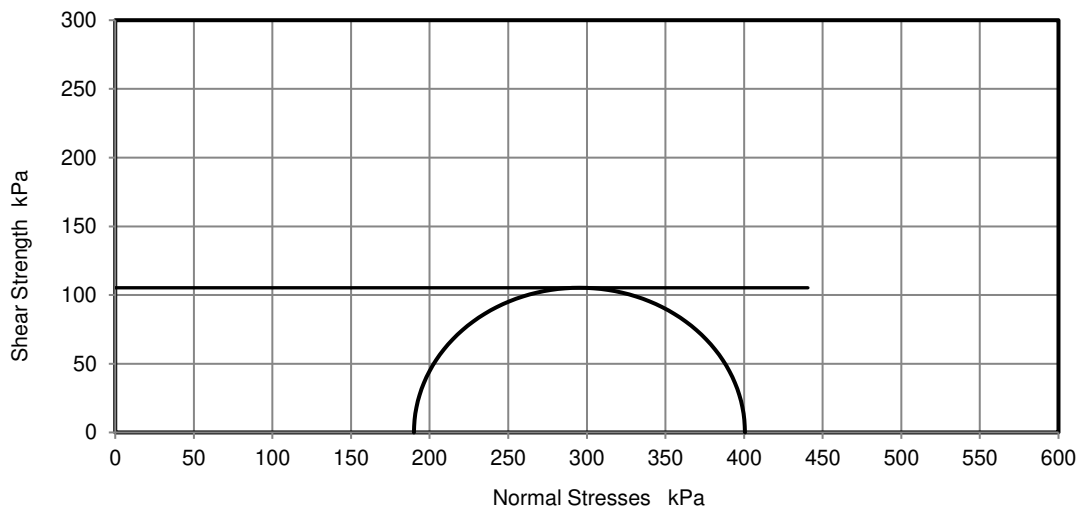
Test Number	1
Length	139.59 mm
Diameter	69.01 mm
Bulk Density	2.20 Mg/m3
Moisture Content	16 %
Dry Density	1.90 Mg/m3
Membrane Correction	1.17 kPa

Rate of Strain	2.00 %/min
Cell Pressure	190 kPa
Axial Strain at failure	20.0 %
Deviator Stress, ($\sigma_1 - \sigma_3$) _f	211 kPa
Undrained Shear Strength, c_u	105 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Mode of Failure	Compound
Membrane thickness	0.21 mm

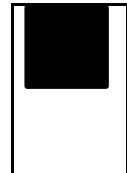
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377.
This is provided for information only.

Remarks:

Signed:

Monika Siewior

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

DETERMINATION OF THE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client: Brownfield Solutions Ltd
Client Address: William Smith House, 173 - 183 Witton Street,
Northwich, Cheshire,
CW9 5LP
Contact: Joel Massey
Site Address: Spear Street Manchester

Client Reference: C5230
Job Number: 22-12318
Date Sampled: 02/12/2022
Date Received: 09/12/2022
Date Tested: 19/12/2022
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

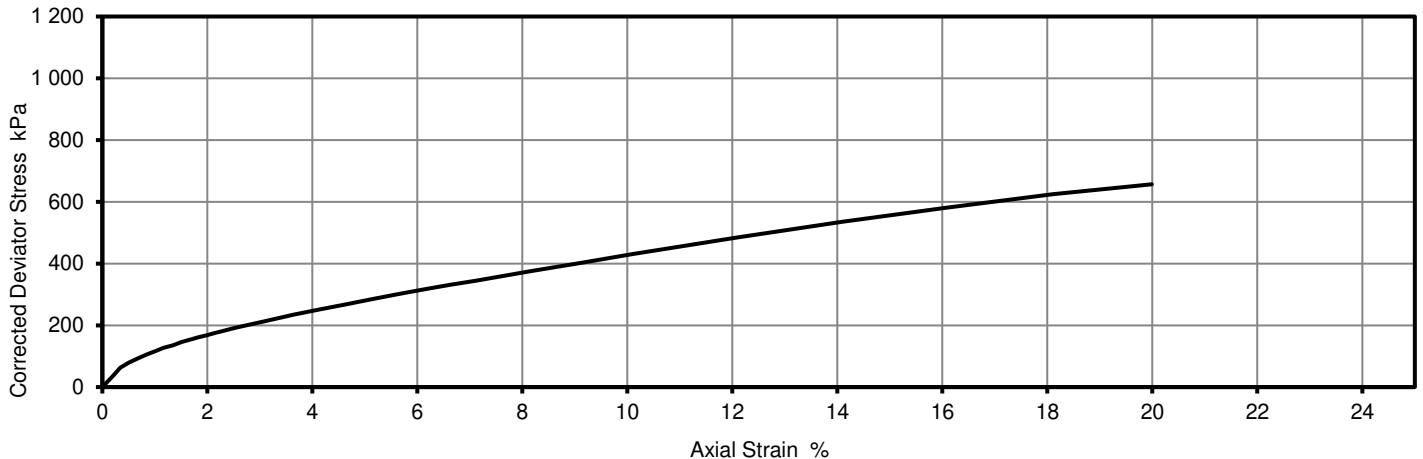
Test Results:

Laboratory Reference: 2527403
Hole No.: BH01
Sample Reference: Not Given
Sample Description: Brown slightly gravelly slightly silty CLAY
Sample Preparation: Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.

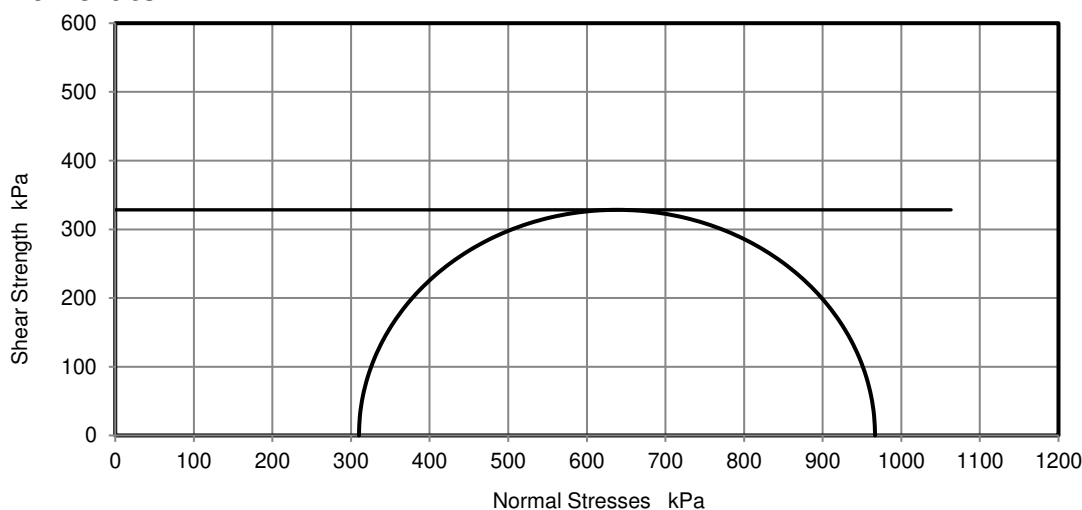
Depth Top [m]: 15.50
Depth Base [m]: 15.95
Sample Type: U

Test Number	1	Rate of Strain		%/min
Length	139.87 mm	Cell Pressure	310	kPa
Diameter	69.62 mm	Axial Strain at failure	20.0	%
Bulk Density	2.25 Mg/m ³	Deviator Stress, ($\sigma_1 - \sigma_3$) _f	657	kPa
Moisture Content	10 %	Undrained Shear Strength, c_u	328	kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Dry Density	2.04 Mg/m ³	Mode of Failure	Compound	
Membrane Correction	1.33 kPa	Membrane thickness	0.24	mm

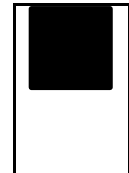
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377.
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Signed:

Monika Siewior

Page 1 of 1

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 29/12/2022

GF 184.12

**Joel Massey**

Brownfield Solutions Ltd
William Smith House
173 - 183 Witton Street
Northwich
Cheshire
CW9 5LP

e: j.massey@brownfield-solutions.co.uk

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 : 22-12320

Project / Site name:	Spear Street Manchester	Samples received on:	09/12/2022
Your job number:	C5230	Samples instructed on/ Analysis started on:	09/12/2022
Your order number:	3781	Analysis completed by:	21/12/2022
Report Issue Number:	1	Report issued on:	22/12/2022
Samples Analysed:	3 soil samples		

Signed:

Anna Goc
Junior Reporting Specialist
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: 22-12320
Project / Site name: Spear Street Manchester
Your Order No: 3781

Lab Sample Number				2527414	2527415	2527416
Sample Reference				BH01	BH01	BH01
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				7.00-7.00	16.00-16.00	3.00-3.00
Date Sampled				01/12/2022	02/12/2022	01/12/2022
Time Taken				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	53
Moisture Content	%	0.01	NONE	23	7.9	10
Total mass of sample received	kg	0.001	NONE	0.6	0.6	0.6

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.6	9	11.5
Total Sulphate as SO ₄	%	0.005	MCERTS	-	-	0.941
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.11	0.045	0.75
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	-	37
Total Sulphur	%	0.005	MCERTS	-	-	0.357
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	-	-	< 2.0

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	-	-	< 5.0
Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	-	< 2.5

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number : 22-12320

Project / Site name: Spear Street Manchester

* 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 *
2527414	BH01	None Supplied	7.00-7.00	Brown clay.
2527415	BH01	None Supplied	16.00-16.00	Brown clay and sand with gravel.
2527416	BH01	None Supplied	3.00-3.00	Brown clay and sand with gravel and stones.

Analytical Report Number : 22-12320

Project / Site name: Spear Street Manchester

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
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
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 Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL or B' 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.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

APPENDIX E

Correspondence with LA

Lisa Cookson

From: Aaron Stokoe
Sent: 28 November 2022 07:56
To: Sue Jones
Cc: Lisa Cookson
Subject: RE: Spear Street, Manchester - Ground Gas Risk Assessment

Morning Sue, that's great, many thanks for the response.

Best Regards

Aaron

Aaron Stokoe BSc (Hons) CSci MEnvSc FGS
Associate | CL:AIRE QP

Brownfield Solutions Limited

William Smith House | 173 – 183 Witton Street | Northwich | Cheshire | CW9 5LP | UK

T: 01606 334 844 **M:** 07988889225

E: a.stokoe@brownfield-solutions.co.uk **W:** www.brownfield-solutions.com



**BROWNFIELD
SOLUTIONS LTD**



Also at:

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T: 0121 572 9014

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From: Sue Jones <sue.jones@manchester.gov.uk>
Sent: 25 November 2022 14:09
To: Aaron Stokoe <a.stokoe@brownfield-solutions.co.uk>
Subject: RE: Spear Street, Manchester - Ground Gas Risk Assessment

Hi Aaron,

I hope you are well, I have reviewed the information and I am happy for you to use the RB17 approach to assess the gas risks.

Kind regards

Sue

Sue Jones
Environmental Protection Officer
Environmental Protection
Environmental Health
The Neighbourhoods Directorate

Manchester City Council

email: sue.jones@manchester.gov.uk

website: www.manchester.gov.uk

Telephone 0161 234 1389

Internal: 31389

We are now on Twitter, for latest news and updates follow us [@EnvHealthMcr](https://twitter.com/EnvHealthMcr)

From: Aaron Stokoe <a.stokoe@brownfield-solutions.co.uk>

Sent: 22 November 2022 09:20

To: Laura Miller <laura.miller@manchester.gov.uk>

Cc: Lisa Cookson <L.Cookson@brownfield-solutions.co.uk>; Sue Jones <sue.jones@manchester.gov.uk>

Subject: RE: Spear Street, Manchester - Ground Gas Risk Assessment

You don't often get email from a.stokoe@brownfield-solutions.co.uk. [Learn why this is important](#)

Best Regards

Aaron

Aaron Stokoe BSc (Hons) CSci MEnvSc FGS

Associate | CL:AIRE QP

Brownfield Solutions Limited

William Smith House | 173 – 183 Witton Street | Northwich | Cheshire | CW9 5LP | UK

T: 01606 334 844 **M:** 07988889225

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From: Laura Miller <laura.miller@manchester.gov.uk>

Sent: 22 November 2022 08:51

To: Aaron Stokoe <a.stokoe@brownfield-solutions.co.uk>

Cc: Lisa Cookson <L.Cookson@brownfield-solutions.co.uk>; Sue Jones <sue.jones@manchester.gov.uk>

Subject: Re: Spear Street, Manchester - Ground Gas Risk Assessment

Good morning, Aaron,

Thank you for your email.

I have copied in Sue Jones who is the district officer for this site and she will response within 5 days.

Kind Regards

Laura

Laura Miller (MRes, MA, BSc(Hons))

Please note that due to working compressed hours Wednesdays are a non-working day for me, I will respond to your email when I return to the office

Environmental Protection Officer
Environmental Protection Section
Environmental Health
Neighbourhoods Directorate
Manchester City Council

email: laura.miller@manchester.gov.uk

website: www.manchester.gov.uk

Telephone: 0161 234 1742

Internal: 31742

We are now on Twitter, for latest news and updates follow us [@EnvHealthMcr](https://twitter.com/EnvHealthMcr)

Please consider the environment before printing an e-mail

From: Aaron Stokoe <a.stokoe@brownfield-solutions.co.uk>
Sent: 21 November 2022 15:15
To: Laura Miller <laura.miller@manchester.gov.uk>
Cc: Lisa Cookson <L.Cookson@brownfield-solutions.co.uk>
Subject: Spear Street, Manchester - Ground Gas Risk Assessment

You don't often get email from a.stokoe@brownfield-solutions.co.uk. [Learn why this is important](#)

Hope you don't mind the direct contact, if you are not the best person to advise on the below then please let me know who to approach.

We are contacting the authority in regards to a potential development at the above site and an existing Phase I Preliminary Site Assessment (Desk Study) carried out by Curtins (Report Ref: B063129.003/MH/8160 issued in May 2017).

The report can be accessed here:  [PHASE 1 DESK STUDY-775656.pdf](#) The site location is as attached.

From what we can see on the planning portal, the most recent application lodged is associated with café use, although the developer intends to build on the largely derelict small plot with a 5 storey residential building, with a commercial ground floor. The reference for use as the café is 133866/FO/2022.

The site is very small and highly constrained, barely large enough to get a single cable percussive borehole in. We have reviewed the information available in the Phase I Preliminary Site Assessment undertaken by Curtins, as summarised below:

- The site was originally host to a building which appears to have been used for bedding/clothes. By 2016 this had been demolished. Land uses through time have included a gas works (but over 650m away), canal 100m away, residential/commercial warehouses and a bus station south of the site.
- Geology comprises superficial glacial Till (Secondary Aquifer – Undifferentiated) over the Chester Pebble Bed Formation.
- BGS boreholes in the surrounding area indicate bedrock to be at circa 19.20m bgl.
- Mining is not considered to be an issue.

- The closest surface water feature is located 328m southeast of the site. This is the Rochdale Canal which is orientated northeast to southwest.
- The site is located in a Zone 1 floodplain. A small area across the eastern border.
- The overall risk to human health is considered to be moderate.
- The risk to controlled surface waters is low. The risk to groundwater is moderate,
- The risk from ground gas is moderate although no radon protection measures are required.
- The site is located in the UXO moderate risk zone; bomb strikes have been recorded in the nearby area with ruins m
- Recommendations included:
 - Obtain a detailed UXO report.
 - Undertake intrusive site investigations.
 - Geotechnical testing of soils.
 - Contamination analyses of soil.
 - Undertake ground gas monitoring.
- Assessment and recommendations based on the above.

For ground gas they state the below (Page 25 of the PDF)

On and off-site soils with the potential to generate ground gases • Suspected Made Ground deposits encountered on site, composition, depth and extent of which is currently unknown. • Potential infilled land, on and off site, which could give rise to the generation and migration of ground gases.	Vertical and horizontal migration through existing service corridors and the underlying superficial deposits	Human Health End user of site (Residential property) Residents, visitors and general public	Medium Acute health risk, e.g. asphyxiation or risk from explosion	Given li furth fully as No spe \ inve v consi
---	---	--	--	--

However, BSL note that no significant potential infilled features (pits, ponds or landfills) have been identified that could be a potential gas source. There are no mining issues at the site and radon is also not an issue. Made ground is flagged a potential source of ground gas, however this is unlikely to be of any significant thickness below the immediate area and BSL are of the opinion that this risk should be re-assessed to negate the requirement for ground gas monitoring by adopting the CL:AIRE RB17 approach – subject to the agreement of Manchester City Council Environmental Protection.

We note a site investigation for an adjacent piece of land (by e3p) also indicates stiff clays down to circa 17.95m bgl, which would inhibit gas migration from wider area sources and as a proxy indication of potential gassing issues the much larger adjacent site was classified as CS1.  [11-344-r1 - Phase II Residential Site Investigation - Oldham Street Manchester \(1\).pdf](#)

Based on the above, as part of a Phase II intrusive investigation that we will be conducting, can the authority advise if they would accept the re-assessment of the ground gas risk for this site and agree to the adoption of the CL:AIRE RB17 approach please? This would negate the requirement for installed boreholes on this highly constrained site and the need for longer term gas monitoring. Obviously if we encounter anything untoward on site that would warrant installation of gas monitoring standpipes (e.g. in the unlikely event of significant putrescible matter) then we would revise this stance at that stage. If you need any further clarification on the above, then please let me know.

Many thanks in advance

Aaron

Aaron Stokoe BSc (Hons) CSci MEnvSc FGS
Associate | CL:AIRE QP

Brownfield Solutions Limited

William Smith House | 173 – 183 Witton Street | Northwich | Cheshire | CW9 5LP | UK

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APPENDIX F

Waste Assessment Report

Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

- understand the origin of the waste
- select the correct List of Waste code(s)
- confirm that the list of determinands, results and sampling plan are fit for purpose
- select and justify the chosen metal species (Appendix B)
- correctly apply moisture correction and other available corrections
- add the meta data for their user-defined substances (Appendix A)
- check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)



O28JW-HP4WJ-NOXOR

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in pale yellow.

Job name

Spear Street, Manchester

Description/Comments

Project

C5230

Site

Classified by

Name: **Jake Wheaton**
 Date: **16 Jan 2023 16:03 GMT**
 Telephone: **01606334844**
 Company: **Brownfield Solutions Limited**
Brownfield Solutions Ltd
173-183 Witton Street
Northwich
CW9 5LP

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

HazWasteOnline™ Certification:

CERTIFIED

Course

Hazardous Waste Classification

Date

07 Oct 2021

Next 3 year Refresher due by Oct 2024

Purpose of classification

2 - Material Characterisation

Address of the waste

Land off Spear Street, Manchester

Post Code M1 1EJ

SIC for the process giving rise to the waste

41100 Development of building projects

Description of industry/producer giving rise to the waste

Redeveloping a brownfield site, currently used as outdoor seating for a café, into 5-storey residential building with commercial ground floor.

Description of the specific process, sub-process and/or activity that created the waste

Waste created during the excavation of soils for the development of the site.

Description of the waste

Made ground comprising slightly clayey gravelly sand with medium cobble content. Anthropogenic inclusions of brick, concrete, glass, asphalt, metal, timber, ceramic, sandstone and rare slag and clinker.



Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	TP01	0.10-0.50	Non Hazardous		3
2	TP02	0.50-1.00	Non Hazardous		5
3	TP04	0.10-0.90	Non Hazardous		7
4	TP05	0.50-1.50	Non Hazardous		9

Related documents

#	Name	Description
1	BSL Suite	waste stream template used to create this Job

Report

Created by: Jake Wheaton

Created date: 16 Jan 2023 16:03 GMT

Appendices	Page
Appendix A: Classifier defined and non GB MCL determinands	11
Appendix B: Rationale for selection of metal species	12
Appendix C: Version	12



Classification of sample: TP01

✔ **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:
TP01	Chapter:
Sample Depth:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
0.10-0.50 m	Entry:
Moisture content:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
9.9%	
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 9.9% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
1	pH				10.7 pH		10.7	pH	10.7 pH		
2	arsenic { arsenic trioxide }				9 mg/kg	1.32	10.707	mg/kg	0.00107 %	✓	
	033-003-00-0	215-481-4	1327-53-3								
3	cadmium { cadmium sulfide }			1	0.6 mg/kg	1.285	0.695	mg/kg	0.0000541 %	✓	
	048-010-00-4	215-147-8	1306-23-6								
4	chromium in chromium(VI) compounds { chromium(VI) oxide }				<1.2 mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<LOD
	024-001-00-0	215-607-8	1333-82-0								
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				14 mg/kg	1.462	18.436	mg/kg	0.00184 %	✓	
		215-160-9	1308-38-9								
6	copper { dicopper oxide; copper (I) oxide }				30 mg/kg	1.126	30.433	mg/kg	0.00304 %	✓	
	029-002-00-X	215-270-7	1317-39-1								
7	lead { lead chromate }			1	120 mg/kg	1.56	168.647	mg/kg	0.0108 %	✓	
	082-004-00-2	231-846-0	7758-97-6								
8	mercury { mercury dichloride }				0.5 mg/kg	1.353	0.61	mg/kg	0.000061 %	✓	
	080-010-00-X	231-299-8	7487-94-7								
9	nickel { nickel dihydroxide }				14 mg/kg	1.579	19.924	mg/kg	0.00199 %	✓	
	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]								
10	selenium { selenium compounds with the exception of cadmium selenosulfide and those specified elsewhere in this Annex }				<1 mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<LOD
	034-002-00-8										
11	zinc { zinc chromate }				120 mg/kg	2.774	299.941	mg/kg	0.03 %	✓	
	024-007-00-3	236-878-9	13530-65-9								
12	naphthalene				2.2 mg/kg		1.982	mg/kg	0.000198 %	✓	
	601-052-00-2	202-049-5	91-20-3								
13	acenaphthylene				<0.05 mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		205-917-1	208-96-8								
14	acenaphthene				6.1 mg/kg		5.496	mg/kg	0.00055 %	✓	
		201-469-6	83-32-9								
15	fluorene				4.4 mg/kg		3.964	mg/kg	0.000396 %	✓	
		201-695-5	86-73-7								



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
16	phenanthrene	201-581-5	85-01-8		32 mg/kg		28.832 mg/kg	0.00288 %	✓	
17	anthracene	204-371-1	120-12-7		7.5 mg/kg		6.758 mg/kg	0.000676 %	✓	
18	fluoranthene	205-912-4	206-44-0		36 mg/kg		32.436 mg/kg	0.00324 %	✓	
19	pyrene	204-927-3	129-00-0		32 mg/kg		28.832 mg/kg	0.00288 %	✓	
20	benzo[a]anthracene	601-033-00-9	200-280-6		14 mg/kg		12.614 mg/kg	0.00126 %	✓	
21	chrysene	601-048-00-0	205-923-4		14 mg/kg		12.614 mg/kg	0.00126 %	✓	
22	benzo[b]fluoranthene	601-034-00-4	205-911-9		17 mg/kg		15.317 mg/kg	0.00153 %	✓	
23	benzo[k]fluoranthene	601-036-00-5	205-916-6		4.7 mg/kg		4.235 mg/kg	0.000423 %	✓	
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		14 mg/kg		12.614 mg/kg	0.00126 %	✓	
25	indeno[123-cd]pyrene	205-893-2	193-39-5		6 mg/kg		5.406 mg/kg	0.000541 %	✓	
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8		1.4 mg/kg		1.261 mg/kg	0.000126 %	✓	
27	benzo[ghi]perylene	205-883-8	191-24-2		6.5 mg/kg		5.857 mg/kg	0.000586 %	✓	
Total:								0.0671 %		

Key

- User supplied data
- Determinand values ignored for classification, see column 'Conc. Not Used' for reason
- Determinand defined or amended by HazWasteOnline (see Appendix A)
- Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
- <LOD** Below limit of detection
- ND** Not detected
- CLP: Note 1 Only the metal concentration has been used for classification



Classification of sample: TP02

✔ **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:	
TP02	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.50-1.00 m		
Moisture content:		
19%		
(wet weight correction)		

Hazard properties

None identified

Determinands

Moisture content: 19% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number									
1	pH				8.1	pH		8.1	pH	8.1 pH		
2	arsenic { arsenic trioxide }				27	mg/kg	1.32	28.876	mg/kg	0.00289 %	✓	
	033-003-00-0	215-481-4	1327-53-3									
3	cadmium { cadmium sulfide }			1	<0.2	mg/kg	1.285	<0.257	mg/kg	<0.00002 %		<LOD
	048-010-00-4	215-147-8	1306-23-6									
4	chromium in chromium(VI) compounds { chromium(VI) oxide }				<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<LOD
	024-001-00-0	215-607-8	1333-82-0									
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				9.4	mg/kg	1.462	11.128	mg/kg	0.00111 %	✓	
		215-160-9	1308-38-9									
6	copper { dicopper oxide; copper (I) oxide }				74	mg/kg	1.126	67.486	mg/kg	0.00675 %	✓	
	029-002-00-X	215-270-7	1317-39-1									
7	lead { lead chromate }			1	520	mg/kg	1.56	656.994	mg/kg	0.0421 %	✓	
	082-004-00-2	231-846-0	7758-97-6									
8	mercury { mercury dichloride }				2.1	mg/kg	1.353	2.302	mg/kg	0.00023 %	✓	
	080-010-00-X	231-299-8	7487-94-7									
9	nickel { nickel dihydroxide }				15	mg/kg	1.579	19.191	mg/kg	0.00192 %	✓	
	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]									
10	selenium { selenium compounds with the exception of cadmium selenosulfide and those specified elsewhere in this Annex }				<1	mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<LOD
	034-002-00-8											
11	zinc { zinc chromate }				52	mg/kg	2.774	116.847	mg/kg	0.0117 %	✓	
	024-007-00-3	236-878-9	13530-65-9									
12	naphthalene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
	601-052-00-2	202-049-5	91-20-3									
13	acenaphthylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		205-917-1	208-96-8									
14	acenaphthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		201-469-6	83-32-9									
15	fluorene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		201-695-5	86-73-7									



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
16	phenanthrene	201-581-5	85-01-8		0.22 mg/kg		0.178 mg/kg	0.0000178 %	✓	
17	anthracene	204-371-1	120-12-7		0.05 mg/kg		0.0405 mg/kg	0.00000405 %	✓	
18	fluoranthene	205-912-4	206-44-0		0.25 mg/kg		0.203 mg/kg	0.0000203 %	✓	
19	pyrene	204-927-3	129-00-0		0.26 mg/kg		0.211 mg/kg	0.0000211 %	✓	
20	benzo[a]anthracene	601-033-00-9	200-280-6		0.16 mg/kg		0.13 mg/kg	0.000013 %	✓	
21	chrysene	601-048-00-0	205-923-4		0.15 mg/kg		0.122 mg/kg	0.0000121 %	✓	
22	benzo[b]fluoranthene	601-034-00-4	205-911-9		0.17 mg/kg		0.138 mg/kg	0.0000138 %	✓	
23	benzo[k]fluoranthene	601-036-00-5	205-916-6		0.06 mg/kg		0.0486 mg/kg	0.00000486 %	✓	
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		0.18 mg/kg		0.146 mg/kg	0.0000146 %	✓	
25	indeno[123-cd]pyrene	205-893-2	193-39-5		0.1 mg/kg		0.081 mg/kg	0.0000081 %	✓	
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
27	benzo[ghi]perylene	205-883-8	191-24-2		0.13 mg/kg		0.105 mg/kg	0.0000105 %	✓	
Total:								0.0673 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
•	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification



Classification of sample: TP04

✔ **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:	
TP04	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.10-0.90 m		
Moisture content:		
15%		
(wet weight correction)		

Hazard properties

None identified

Determinands

Moisture content: 15% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
1	pH				7.8 pH		7.8	pH	7.8 pH		
2	arsenic { arsenic trioxide }				27 mg/kg	1.32	30.301	mg/kg	0.00303 %	✓	
	033-003-00-0	215-481-4	1327-53-3								
3	cadmium { cadmium sulfide }			1	<0.2 mg/kg	1.285	<0.257	mg/kg	<0.00002 %		<LOD
	048-010-00-4	215-147-8	1306-23-6								
4	chromium in chromium(VI) compounds { chromium(VI) oxide }				<1.2 mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<LOD
	024-001-00-0	215-607-8	1333-82-0								
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				17 mg/kg	1.462	21.119	mg/kg	0.00211 %	✓	
		215-160-9	1308-38-9								
6	copper { dicopper oxide; copper (I) oxide }				83 mg/kg	1.126	79.431	mg/kg	0.00794 %	✓	
	029-002-00-X	215-270-7	1317-39-1								
7	lead { lead chromate }			1	720 mg/kg	1.56	954.607	mg/kg	0.0612 %	✓	
	082-004-00-2	231-846-0	7758-97-6								
8	mercury { mercury dichloride }				2.1 mg/kg	1.353	2.416	mg/kg	0.000242 %	✓	
	080-010-00-X	231-299-8	7487-94-7								
9	nickel { nickel dihydroxide }				17 mg/kg	1.579	22.824	mg/kg	0.00228 %	✓	
	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]								
10	selenium { selenium compounds with the exception of cadmium selenosulfide and those specified elsewhere in this Annex }				<1 mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<LOD
	034-002-00-8										
11	zinc { zinc chromate }				66 mg/kg	2.774	155.63	mg/kg	0.0156 %	✓	
	024-007-00-3	236-878-9	13530-65-9								
12	naphthalene				0.1 mg/kg		0.085	mg/kg	0.0000085 %	✓	
	601-052-00-2	202-049-5	91-20-3								
13	acenaphthylene				<0.05 mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		205-917-1	208-96-8								
14	acenaphthene				0.12 mg/kg		0.102	mg/kg	0.0000102 %	✓	
		201-469-6	83-32-9								
15	fluorene				0.08 mg/kg		0.068	mg/kg	0.0000068 %	✓	
		201-695-5	86-73-7								



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
16	phenanthrene	201-581-5	85-01-8		0.84 mg/kg		0.714 mg/kg	0.0000714 %	✓	
17	anthracene	204-371-1	120-12-7		0.18 mg/kg		0.153 mg/kg	0.0000153 %	✓	
18	fluoranthene	205-912-4	206-44-0		0.97 mg/kg		0.825 mg/kg	0.0000824 %	✓	
19	pyrene	204-927-3	129-00-0		0.98 mg/kg		0.833 mg/kg	0.0000833 %	✓	
20	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3	0.45 mg/kg		0.383 mg/kg	0.0000383 %	✓	
21	chrysene	601-048-00-0	205-923-4	218-01-9	0.49 mg/kg		0.417 mg/kg	0.0000416 %	✓	
22	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2	0.44 mg/kg		0.374 mg/kg	0.0000374 %	✓	
23	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9	0.25 mg/kg		0.213 mg/kg	0.0000212 %	✓	
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8	0.42 mg/kg		0.357 mg/kg	0.0000357 %	✓	
25	indeno[123-cd]pyrene	205-893-2	193-39-5		0.2 mg/kg		0.17 mg/kg	0.000017 %	✓	
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3	0.06 mg/kg		0.051 mg/kg	0.0000051 %	✓	
27	benzo[ghi]perylene	205-883-8	191-24-2		0.26 mg/kg		0.221 mg/kg	0.0000221 %	✓	
Total:								0.0933 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
•	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification



Classification of sample: TP05

✔ **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:	
TP05	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.50-1.50 m		
Moisture content:		
11%		
(wet weight correction)		

Hazard properties

None identified

Determinands

Moisture content: 11% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
1	pH				8.5 pH		8.5	pH	8.5 pH		
2	arsenic { arsenic trioxide }				12 mg/kg	1.32	14.101	mg/kg	0.00141 %	✓	
	033-003-00-0	215-481-4	1327-53-3								
3	cadmium { cadmium sulfide }			1	0.5 mg/kg	1.285	0.572	mg/kg	0.0000445 %	✓	
	048-010-00-4	215-147-8	1306-23-6								
4	chromium in chromium(VI) compounds { chromium(VI) oxide }				<1.2 mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<LOD
	024-001-00-0	215-607-8	1333-82-0								
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				15 mg/kg	1.462	19.512	mg/kg	0.00195 %	✓	
		215-160-9	1308-38-9								
6	copper { dicopper oxide; copper (I) oxide }				39 mg/kg	1.126	39.08	mg/kg	0.00391 %	✓	
	029-002-00-X	215-270-7	1317-39-1								
7	lead { lead chromate }			1	240 mg/kg	1.56	333.177	mg/kg	0.0214 %	✓	
	082-004-00-2	231-846-0	7758-97-6								
8	mercury { mercury dichloride }				0.3 mg/kg	1.353	0.361	mg/kg	0.0000361 %	✓	
	080-010-00-X	231-299-8	7487-94-7								
9	nickel { nickel dihydroxide }				14 mg/kg	1.579	19.681	mg/kg	0.00197 %	✓	
	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]								
10	selenium { selenium compounds with the exception of cadmium selenosulfide and those specified elsewhere in this Annex }				<1 mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<LOD
	034-002-00-8										
11	zinc { zinc chromate }				110 mg/kg	2.774	271.589	mg/kg	0.0272 %	✓	
	024-007-00-3	236-878-9	13530-65-9								
12	naphthalene				1.2 mg/kg		1.068	mg/kg	0.000107 %	✓	
	601-052-00-2	202-049-5	91-20-3								
13	acenaphthylene				0.25 mg/kg		0.223	mg/kg	0.0000222 %	✓	
		205-917-1	208-96-8								
14	acenaphthene				1.5 mg/kg		1.335	mg/kg	0.000133 %	✓	
		201-469-6	83-32-9								
15	fluorene				1.3 mg/kg		1.157	mg/kg	0.000116 %	✓	
		201-695-5	86-73-7								



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
16	phenanthrene	201-581-5	85-01-8		10 mg/kg		8.9 mg/kg	0.00089 %	✓	
17	anthracene	204-371-1	120-12-7		2.4 mg/kg		2.136 mg/kg	0.000214 %	✓	
18	fluoranthene	205-912-4	206-44-0		14 mg/kg		12.46 mg/kg	0.00125 %	✓	
19	pyrene	204-927-3	129-00-0		14 mg/kg		12.46 mg/kg	0.00125 %	✓	
20	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3	6.4 mg/kg		5.696 mg/kg	0.00057 %	✓	
21	chrysene	601-048-00-0	205-923-4	218-01-9	6.4 mg/kg		5.696 mg/kg	0.00057 %	✓	
22	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2	8 mg/kg		7.12 mg/kg	0.000712 %	✓	
23	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9	2.2 mg/kg		1.958 mg/kg	0.000196 %	✓	
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8	6.8 mg/kg		6.052 mg/kg	0.000605 %	✓	
25	indeno[123-cd]pyrene	205-893-2	193-39-5		3.1 mg/kg		2.759 mg/kg	0.000276 %	✓	
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3	0.75 mg/kg		0.668 mg/kg	0.0000668 %	✓	
27	benzo[ghi]perylene	205-883-8	191-24-2		3.4 mg/kg		3.026 mg/kg	0.000303 %	✓	
Total:								0.0655 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
•	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Appendix A: Classifier defined and non GB MCL determinands

• pH (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

• chromium(III) oxide (worst case) (EC Number: 215-160-9, CAS Number: 1308-38-9)

Description/Comments: Data from C&L Inventory Database
Data source: <https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/33806>
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4; H332 , Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Resp. Sens. 1; H334 , Skin Sens. 1; H317 , Repr. 1B; H360FD , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

• acenaphthylene (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4; H302 , Acute Tox. 1; H330 , Acute Tox. 1; H310 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315

• acenaphthene (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Aquatic Chronic 2; H411

• fluorene (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

• phenanthrene (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 06 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Carc. 2; H351 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Skin Irrit. 2; H315

• anthracene (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

• fluoranthene (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 21 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

• pyrene (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 21 Aug 2015
Hazard Statements: Skin Irrit. 2; H315 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

• indeno[123-cd]pyrene (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2; H351

■ **benzo[ghi]perylene** (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 23 Jul 2015

Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

Appendix B: Rationale for selection of metal species

arsenic {arsenic trioxide}

Worst case species based on hazard statements

cadmium {cadmium sulfide}

Worst case species based on hazard statements

chromium in chromium(VI) compounds {chromium(VI) oxide}

Worst case species based on hazard statements

chromium in chromium(III) compounds {chromium(III) oxide (worst case)}

Worst case species based on hazard statements

copper {dicopper oxide; copper (I) oxide}

Most likely common species

lead {lead chromate}

Worst case species based on hazard statements

mercury {mercury dichloride}

Worst case species based on hazard statements

nickel {nickel dihydroxide}

Worst case species based on hazard statements

selenium {selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex}

Worst case species based on hazard statements

zinc {zinc chromate}

Worst case species based on hazard statements

Appendix C: Version

HazWasteOnline Classification Engine: **WM3 1st Edition v1.2.GB - Oct 2021**

HazWasteOnline Classification Engine Version: 2023.11.5483.10161 (11 Jan 2023)

HazWasteOnline Database: 2023.11.5483.10161 (11 Jan 2023)

This classification utilises the following guidance and legislation:

WM3 v1.2.GB - Waste Classification - 1st Edition v1.2.GB - Oct 2021

CLP Regulation - Regulation 1272/2008/EC of 16 December 2008

1st ATP - Regulation 790/2009/EC of 10 August 2009

2nd ATP - Regulation 286/2011/EC of 10 March 2011

3rd ATP - Regulation 618/2012/EU of 10 July 2012

4th ATP - Regulation 487/2013/EU of 8 May 2013

Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013

5th ATP - Regulation 944/2013/EU of 2 October 2013

6th ATP - Regulation 605/2014/EU of 5 June 2014

WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014

Revised List of Waste 2014 - Decision 2014/955/EU of 18 December 2014

7th ATP - Regulation 2015/1221/EU of 24 July 2015

8th ATP - Regulation (EU) 2016/918 of 19 May 2016

9th ATP - Regulation (EU) 2016/1179 of 19 July 2016

10th ATP - Regulation (EU) 2017/776 of 4 May 2017

HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017

13th ATP - Regulation (EU) 2018/1480 of 4 October 2018

14th ATP - Regulation (EU) 2020/217 of 4 October 2019

15th ATP - Regulation (EU) 2020/1182 of 19 May 2020

The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit)

Regulations 2020 - UK: 2020 No. 1567 of 16th December 2020

The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK:

2020 No. 1540 of 16th December 2020

GB MCL List - version 1.1 of 09 June 2021

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