IGE consulting

Parkmount Road, Manchester

Remedial Strategy Report

For: John Southworth Builders Ltd

JOHN SOUTHWORTH
BUILDING FUTURES TODAY

Job Number:	**4047**
Report Reference:	**4047-01A**
Issue Status / Revision:	**Revision A following EHO comments**
Date:	**May 2024**
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Previous Revisions and Date:	**Revision A – Section 2.1 and 2.2 Updated**

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CONTENTS

1.0 INTRODUCTION

1.1 Scope
1.2 Brief
1.3 Summary of Previous Phase 2 Investigation Findings

2.0 REMEDIAL STRATEGY FOR HUMAN HEALTH

2.1 Installation of a Clean Cover System
2.2 Validation of Clean Cover System

3.0 REMEDIAL STRATEGY FOR GROUND GAS PROTECTION

3.1 Ground Gas Risk Assessment

4.0 OTHER REMEDIAL REQUIREMENTS

4.1 Decommissioning of Wells
4.2 Definition of Waste: Code of Practice
4.3 Material Management
4.4 Discovery Strategy
4.5 Design Variation

APPENDICES

APPENDIX 1 LIMITATIONS OF INVESTIGATION WORK AND REPORT

APPENDIX 2 FIGURES AND DRAWINGS

- Proposed Development Plan, taken from AEW Architects Proposed Site Layout - Presentation (Ref. 12191-AEW-XX-XX-DR-A-0503 revision P06, July 2023.
- SI-01 Site Location Plan
- SI-02 Landscaping Plan
- SI-03 Conceptual Site Model

APPENDIX 3 DISCOVERY STRATEGY

APPENDIX 4 BROWNFIELD SOLUTIONS LTD PHASE 2 GEO-ENVIRONMENTAL ASSESSMENT REPORT

1.0 INTRODUCTION

This *Remedial Strategy Report (4047-01)* has been prepared at the request of John Southworth Builders Ltd. Instructions to proceed with this report were received in March 2024. This report primarily follows the findings and recommendations of the Brownfield Solutions Ltd Phase 2 Ground Investigation (Ref. MS/C4657/10658 + Rev A, January 2022). Additionally, this report uses findings and recommendations from the following documents:

- **Sladen Associates** *Phase 1 Geo-Environmental Study* (Ref. 20 2277, December 2020);
- **Redbox Surveys** *Topographical Survey* (Ref. RBS-20/2172/001, December 2020);
- **AEW Architects** *Proposed Site Layout - Presentation* (*12191-AEW-XX-XX-DR-A-0503 revision P06*, July 2023).

This report pertains to a c. 0.61 Ha site located to the south of Parkmount Road and east of Rochdale Road, Manchester at the approximate post code M9 8AH. The National Ordnance Survey Grid Reference for the centre of the site is 386028E, 402128N.

A site location plan is included in Appendix 2 (Drawing ref. *SI-01*).

The site currently comprises a vacant area of land utilised as public open space with established trees in the northern and eastern site sections. The site is currently utilised as public open space and can be accessed from Parkmount Road to the north, Rochdale Road in the west and Shepherd Street to the south. A c. 2.00m slope is noted east to west towards Rochdale Road across site. The site is bound by residential property to the east, Parkmount Road to the north, Rochdale Road to the west and Shepherd Street to the south. An aerial photo of the site is included below:

Figure 1: Aerial image of the site dated April 2022.

1.1 Scope

This Remedial Strategy Report has been undertaken to determine the remedial requirements of the site based upon the existing site investigation works. It is the Client's intention to develop the site into a residential development comprising 24 No. dwellings with associated private gardens, soft landscaping and access roads.

The proposed development plan is contained in Appendix 2. An extract of the proposed development plan is shown below:

Figure 2: Extract of the proposed development plan (taken from AEW Architects Proposed Site Layout - Presentation (Ref. 12191-AEW-XX-XX-DR-A-0503 revision P06, July 2023).

1.2 Brief

This report has been undertaken following the findings and recommendations of the Brownfield Solutions Ltd (BSL) Phase 2 Ground Investigation (Ref. MS/C4657/10658, January 2022). Based on the Brownfield Solutions ground investigation findings, this report will outline the remedial strategy with regard to human health, controlled waters and ground gas risk on site.

The limitations of the report are contained in Appendix 1.

1.3 Summary of Previous Phase 2 Investigation Findings

Brownfield Solutions Ltd (BSL) have undertaken an intrusive investigation of the site in December 2021, comprising 12 No. dynamic sample boreholes undertaken spatially across the site to depths of between 4.45m and 5.45m bgl and 2 No. falling head tests undertaken within WS02 and WS12 to obtain infiltration rates for drainage design, which were recorded as 2.55×10^{-5} and 1.78×10^{-5}, respectively. 17 No. environmental and 49 No. disturbed samples were obtained during the works, however 6 No. of these samples were submitted for environmental laboratory analysis. Elevated concentrations of lead, benzo(b)fluoranthene, benzo(a)pyrene and dibenz(a,h)anthracene have been recorded, with 5 No. samples exceeding the human health GAC of the respective materials. The below table summarises the findings of the chemical analysis of the samples.

Exploratory Hole	Depth (m bgl)	Determinand	Adopted Screening Value (mg/kg)	Concentration (mg/kg)
WS01	0.30 – 0.60	Lead	210	210
WS10	1.00 – 1.30			1200
WS01	0.30 – 0.60	Benzo(b)fluoranthene	3.7	3.7
WS06	0.30 – 0.60			7.3
WS08	0.00 – 0.20			3.8
WS01	0.30 – 0.60	Benzo(a)pyrene	5.0*	3.6
WS06	0.30 – 0.60			7.1
WS08	0.00 – 0.20			3.6
WS01	0.30 – 0.60	Dibenz(a,h)anthracene	0.30	0.57
WS06	0.30 – 0.60			0.99
WS08	0.00 – 0.20			0.50
WS10	1.00 – 1.30			0.32
WS12	0.30 – 0.60			0.32

*- Based on C4SL

The PAH exceedances were linked by BSL to the presence of ash within the Made Ground. A surrogate marker assessment has been undertaken based on the BaP value and the PAH profile from the Culp et al. toxicological study, and as a result exceedances with respect to PAH compounds were noted on site.

As a result of the BSL works, remedial measures were recommended for the proposed private front and rear gardens and soft landscaping areas to negate exposure pathway risks with existing site materials.

The risk of volatile / VOCs is regarded as negligible due to the lack of evidence for the potential sources of VOCs on site, consequently contaminative pathways for vapours are not considered.

Groundwater

Groundwater was recorded in 4 No. of the monitoring wells over the period of 4 No. monitoring visits between 1.70m and 2.15m in WS02 and WS09 and 4.78 and 4.84 in WS12. BSL believe the water depths are representative of localised perched water drained into the standpipes from granular soils.

Coal Mining

As the site is located within the Coal Authority Reporting Area, BSL have undertaken a coal mining risk assessment, and a Coal Authority Coal Mining Consultants Report has been obtained as part of the BSL Phase 2 investigation. The site is not located within a Development High Risk Area and there are no coal outcrops or mine entries recorded below site or in the vicinity of the site. Additionally, no past mining, unrecorded shallow workings, coal mining related land subsidence, mine gas or mine water treatments were noted on site on the mining report. In line with the CL:AIRE Good Practice for Risk Assessment for Coal Mine Gas Emissions (2021), the site is considered to pose negligible risk to the proposed development, therefore risks to the site with respect to coal mining and mine gas will not be considered as part of this remediation strategy.

2.0 REMEDIAL STRATEGY FOR HUMAN HEALTH

The proposed development is to include private gardens and areas of soft landscaping. The BLS Phase 2 Ground Investigation report recommended a cover system in these areas to break any pathways between the existing site soils and the end user. Following an assessment of the on-site ground gas conditions, BSL designated the site Green in line with NHBC Traffic Light System, consequently ground gas protection measures (including radon) were not recommended.

2.1 Installation of a Clean Cover System

The following Landscaping Plan details the proposed private rear gardens (red), private front gardens (blue) and POS soft landscaping (Public Open Space / POS_{resi} – green). The below remedial recommendations will refer to the landscaping designations detailed in the below extract.

Figure 3: Extract of the landscape plan of the site (SI-02 Landscaping Plan, Mar 2024).

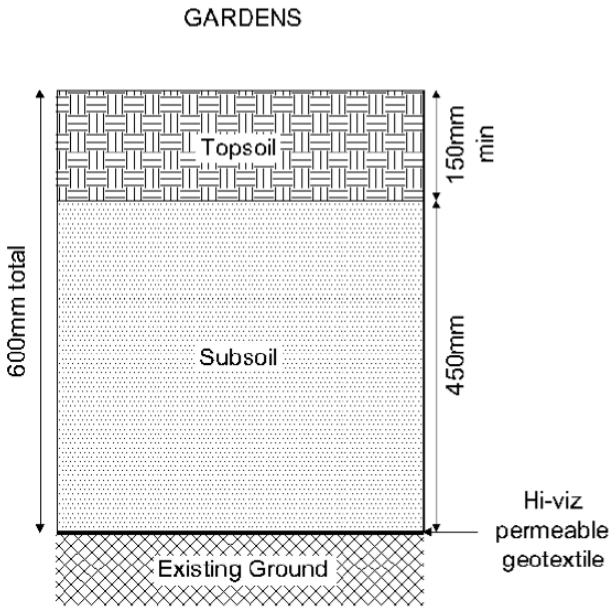
Red = private rear gardens. Blue = private front gardens. Green = soft landscaping / public open space.

Made Ground containing is present below finalised garden levels at depths shallower than 600mm (450mm in areas of soft landscaping) across the site. The following procedure is outlined for use in all private gardens and in areas of soft landscaping:

1. Excavate to 600mm bgl in private gardens (450mm in soft landscaping areas).
2. A 600mm clean cover system is recommended to be added to the proposed private gardens (450mm in soft landscaping areas). This is to consist of:
   - No less than 150mm and no more than 300mm suitable topsoil, underlain by;
   - Suitable subsoil to a total (topsoil + subsoil) depth of 600mm (450mm in areas of soft landscaping), underlain by;

- A high vis geotextile marker;
- Validate in line with the below strategy.

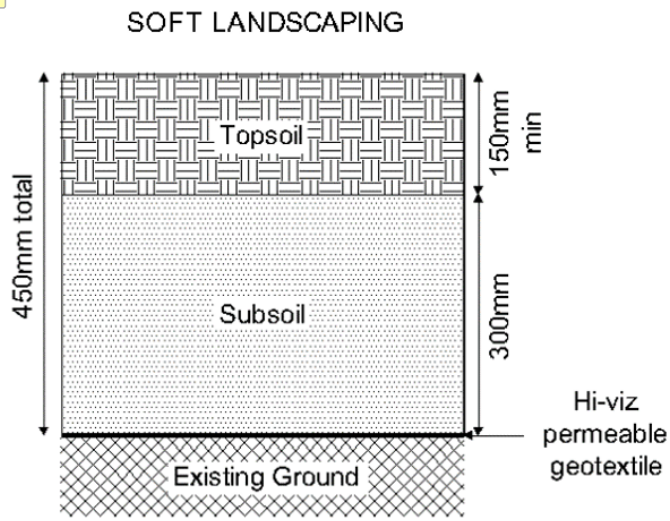
This is shown diagrammatically below:



The cover system for the soft landscaping is to be 450mm thick, due to the presence of asbestos on site, and consist of:

- A minimum of 150mm suitable topsoil, underlain by;
- Suitable subsoil, to a total thickness of 450mm.

This is shown diagrammatically below:



Soils for use in the above recommended cover system must be validated as detailed below to ensure their suitability for use.

2.2 Validation of Clean Cover System

Once the 600mm clean cover system is installed to break contaminative linkages (450mm in areas of soft landscaping), validation requirements include:

- Details of the source of the cover material;
- Chemical test results to demonstrate that the soil is free from contamination and 'suitable for use' in-line with the below chemical testing suites and rates.
- Waste transfer notes to provide evidence of source;
- Confirmation of cover depth by either measurement tape or topographical survey with photographs at a frequency of one pit per three plots.

No topsoil or subsoil is present on-site therefore all topsoil and subsoil will need to be imported and this <u>must be validated</u> as detailed below to ensure its suitability for use (i.e., no glass or plastic is to be included and meets chemical testing acceptability criteria).

Imported topsoil and subsoil is required to be tested at source prior to import to confirm suitability. All topsoil and subsoil, whether site-won or imported is required to be tested at the following frequency:

End-Use	Greenfield Soils	Remediated Soils	Brownfield Soils	Unknown Soil Source
Residential Gardens	1:200m^3	1:100m^3	1:50m^3	1:50m^3
Soft Landscaping	1:200m^3	1:150m^3	1:150m^3	1:150m^3
Other	1:200m^3	1:200m^3	1:200m^3	1:200m^3

- *Inline with Manchester City council chemical testing guidance*

3.0 REMEDIAL STRATEGY FOR GROUND GAS PROTECTION

3.1 Ground Gas Risk Assessment

Previous Ground Gas Monitoring

A programme of ground gas monitoring visits has been undertaken following the ground investigation works, with 6 No. visits completed between December 2021 and February 2022. The below table summarises the findings of the completed ground gas monitoring programme.

Exploratory Hole	Response Zone (m bgl)	Stratum	Peak CH4 (%)	Steady CO2 (%)	O2 (%)	CO (ppm)	H2S (ppm)	Steady Flow (l/hr)
WS02	1.50 – 4.50	Sandy gravelly Clay	0.1	0.2 – 5.1	14.2 – 20.7	0.0	0.0	-0.4 – 0.4
WS07	1.00 – 2.00	Made Ground						
WS09	1.00 – 2.00	Made Ground						
WS12	3.00 – 5.00	Sand / Silt						

A maximum flow of 0.4l/hr was recorded across the monitoring visits. This value has been used to derive GSV for methane and carbon dioxide for the site. BSL calculated the GSV for methane and carbon dioxide to be 0.0004 and 0.0304, respectively, based on the worst case scenario, including a 7.6% peak carbon dioxide concentration.

The highest steady flow rate was recorded as 0.4l/hr, consequently the worst case GSV for carbon dioxide at the site can be calculated as (7.6/100)*0.4= 0.0304l/hr.

The GSV and the worst case GSV for methane can be calculated as (0.4/100)*0.1= 0.0004l/hr.

While the methane GSV was not found to exceed the typical threshold concentrations, the carbon dioxide GSV did exceed the threshold value. The 5% threshold for carbon dioxide has only been recorded only during peak readings, and it was noted that the readings typically fall below 5% during monitoring visits.

The BSL Phase 2 report and the associated Sladen Associates Phase 1 Geo-Environmental Study report (December 2020) reported no significant sources of potentially hazardous ground gases. Consequently, following the completion of the ground gas monitoring programme, BSL designated the site as Green in line with NHBC Traffic Light System. Consequently, ground gas protection measures are not required for the proposed site development.

The Conceptual Site Model diagram is contained within Appendix 2. Full ground gas and groundwater monitoring results are contained within the BSL Phase 2 Report included within Appendix 4.

Radon

According to the findings of the Sladen Associates Phase 1 report, the site is located within an area where less than 1% of homes are above the action level. Consequently, in line with the recommendations from the Sladen Associates Phase 1 and BSL Phase 2 reports, no protection measures with respect to radon were deemed necessary.

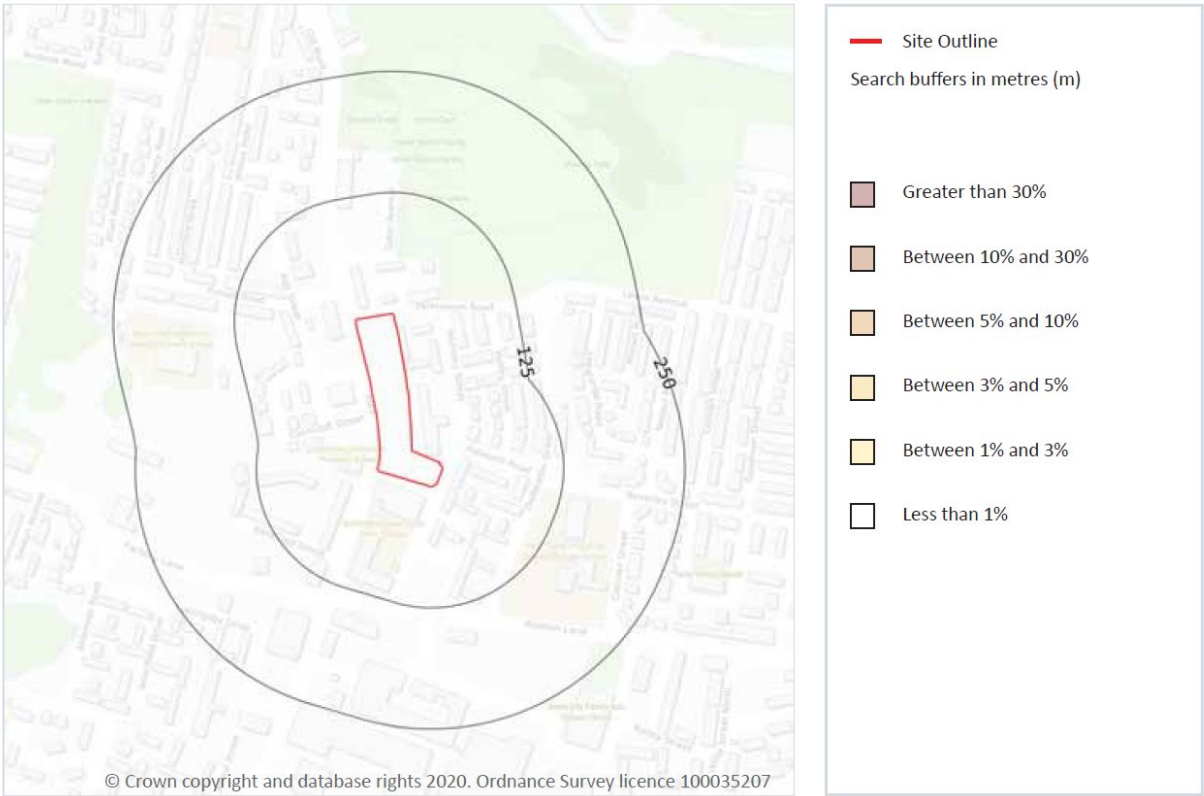


Figure 4: An extract of the Sladen Associates Phase 1 report radon map for the site.

4.0 OTHER REMEDIAL REQUIREMENTS

4.1 Decommissioning of Boreholes

It is imperative that all boreholes drilled into the site are located and appropriately grouted to negate any possible preferential ground gas pathways. Utilising guidance provided in the Environment Agency's '*Good practice for decommissioning redundant boreholes and wells*' (October 2012), it is prudent to secure redundant borehole to ensure that no groundwater pollution can occur. The Environment Agency (EA) offer advice on the methods of sealing wells to ensure that the preferential pathway is removed. The following diagram taken from the EA guidance shows a monitoring well (A) and 3 No. options for decommissioning (B, C and D):

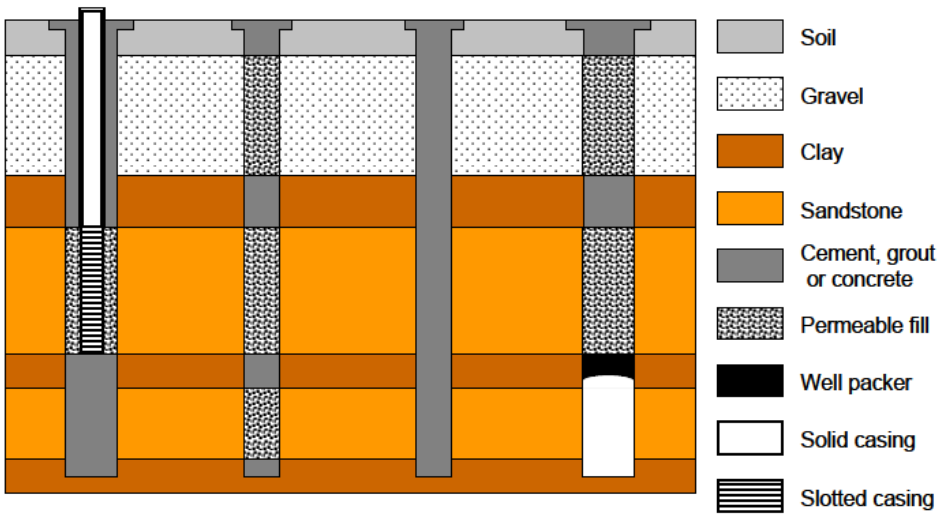


Figure 1: Schematic options (B–D) for decommissioning wells and boreholes

It is considered prudent to utilise Option C – low permeability backfill, shown in the diagram above, to adequately seal the borehole. The guidance recommends that 'the backfill materials must be clean, inert and non-polluting', e.g. bentonite. It is recommended to remove the standpipe and seal with bentonite to ground level. This will be sufficient to prevent contaminant transport.

4.2 Definition of Waste: Code of Practice

Due to the recommended handling and re-use of excavated site-won materials, it is possible to avoid complex waste legislation by utilising the Definition of Waste: Code of Practice (2011, DoW:CoP). This allows assessment of whether or not excavated materials are waste, and when excavated and treated waste can be classified as 'no longer waste'.

It is recommended that in line with DoW:CoP, a robust, site-specific material management plan (MMP) may need to be emplaced and adhered to and verified in an appropriate verification report. This must be reviewed by a 'Qualified Person' who must provide a Declaration to the EA prior to works within the MMP being commenced.

4.3 Material Management

4.3.1 Export of Materials

Any soils to be removed from site must be classified in accordance with WM3 under the definition of waste and chemically tested to determine their destination, i.e. reuse or landfill. Waste ticket records must also be retained as proof of the export of materials from site.

4.3.2 Stockpile Management

During the course of the development there will be areas of stockpiled soils intended for use within the soft landscaping area. These will have been subjected to off-site testing and approved for use on site.

It is imperative that the stockpiles are well managed to avoid inadvertent mixing or depositing of surplus or deleterious materials that would compromise the continued use. We would recommend that the site management reviews the proposed positions for placement of stockpiles and places either fencing or warning signs to ensure compliance.

4.4 Discovery Strategy

In the event of unexpected contamination being discovered, the Discovery Strategy must be followed – this is contained in Appendix 3.

4.5 Design Variation

Following any variation in a finalised proposed development layout and / or detailed design including earthworks design it is recommended that the above conclusions are re-appraised to determine their suitability.

APPENDIX 1

LIMITATIONS OF INVESTIGATION WORK AND REPORT

LIMITATIONS OF REPORT

This consultancy report was compiled and carried out by IGE Consulting Limited ('IGE') for the client, as defined in the main report (the 'client'), on the basis of a defined programme and scope of works and the terms of a contract between IGE and the client. IGE undertook this with all reasonable skill and care, taking into account the limits of the scope of works required by the client, the prevailing site conditions, the time scale involved and the resources, including financial and manpower resources, agreed between IGE and the client. IGE cannot accept responsibility to any parties whatsoever, following the issue of this report, for any matters arising which may be considered outwith the agreed scope of works.

Unless otherwise agreed this report has been prepared exclusively for the use and reliance of the client in accordance with generally accepted consulting practices. This report may not be relied upon, or transferred to, by any other party without the written agreement of its author. If a third party relies on this report, it does so wholly at its own and sole risk and IGE disclaims any liability to such parties.

It is IGE's understanding that this report is to be used for the purpose described in the 'Brief' section of this report. That purpose was a significant factor in determining the scope and the services to be provided. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of, or reliance upon the report in those circumstances by the client without IGE's review and advice shall be at the client's sole and own risk.

The information contained in this report is protected by disclosure under Part 3 of the Environmental Information Regulations 2004 pursuant to the provisions of Regulation 12(5) without the consent in writing of a Director of IGE.

This report is a function of the date it was written and should be read in light of any subsequent changes in legislation, statutory requirements and industry practices. Ground conditions can also change over time and further investigations or assessment should be made if there is any significant delay in acting on the findings of this report. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of IGE. In the absence of such written advice of IGE, reliance on the report in the future shall be at the client's own and sole risk. Should IGE be requested to review the report in the future, IGE shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between IGE and the client.

The observations and conclusions described in this report are based solely upon the scope of works agreed between the client and IGE. IGE has not performed any observations, investigations, studies or testing not specifically set out or mentioned within this report. IGE is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the agreed scope of works. For the avoidance of doubt, this report is strictly limited to the nature of contamination contained within the ground and groundwater at the site. The report does not cover environmental aspects such as air or noise pollution and ground vibrations and the like. In addition, ecological matters relating to wildlife, flora and fauna have not been investigated as part of this report. In particular, the site has not been inspected for the presence or otherwise of invasive species (e.g. Japanese Knotweed). It is recommended that the client appoints a specialist in this subject to carry out a detailed inspection / survey of the site if its presence is suspected. Where mention has been made to the suspected presence asbestos or asbestos-containing materials this is for indicative purposes only and does not constitute or replace full and proper surveys.

Throughout the report the term 'geotechnical' is used to describe aspects relating to the physical nature of the site (such as foundation requirements) and the term 'geo-environmental' is used to describe aspects relating to ground-related environmental issues (such as potential contamination). However, it should be appreciated that this is an integrated investigation and these two main aspects are inter-related. The geo-environmental sections are written in broad agreement with BS 10175:2011+A2 2017.

LIMITATIONS OF INVESTIGATION WORK

Desk Study References

This report is based upon IGE's observations of existing physical conditions at the site gained from a walkover survey of the site together with IGE's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. Reliance has been placed on this publicly available data obtained from the sources identified in the main report. When using the information, it has been assumed that it is correct. The findings and recommendations contained in this report are based in part upon information provided by third parties, and whilst IGE have no reason to doubt the accuracy and that it has been provided in full from those it was requested from, the items relied on have not been verified. No responsibility can be accepted for errors within third party items presented in this report. IGE did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services. IGE is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to IGE and including the doing of any independent investigation of the information provided to IGE except when otherwise provided in the terms of the contract between the client and IGE.

Historical Mapping

Historical Ordnance Survey maps do not provide a comprehensive description of a site history. They provide details of the site from a date prior to the publication of the map (i.e. a snapshot in time). The period between map editions can be substantial (i.e. several decades). Not all map series are available for every date range in many areas of the UK and therefore there will be gaps in this mapped record for some sites. Potentially contaminative land uses could have been present and removed during such periods and may therefore not form a part of this particular record. In addition, there will be potentially contaminative land uses which are not identified on the map records such as small scale storage / use of hazardous materials, illegal / unlicensed waste disposal activities etc. Different map series identify different features utilising different symbols which can result in features that remain on-site being removed from maps. Some features are also not mapped for security reasons (e.g. airfields and other military installations). These areas are mostly shown as blank areas on historical maps.

Site Walkover

During the site walkover reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not be made known or accessible.

Flooding

Flooding in this report is defined as flooding caused by the sea, ditches, rivers, streams, ponds, lakes, reservoirs and the like. It does not extend to flooding caused by surcharged piped drainage systems and investigations into flooding of this nature are excluded from this report.

Extent of Contamination Studies

Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities. The conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the reporting in full. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

Intrusive Investigation

Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions can also be variable and as investigation excavations only allow examination of the ground at discrete locations, the potential exists for ground conditions to be encountered which are different to those considered in this report. The explored extent of the site area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters, based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

The groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The normal speed of investigation usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions and higher groundwater levels may occur at other times of the year than were recorded during this investigation.

Exploratory Holes

Where exploratory holes have been carried out as part of this investigation, the spacing has been determined to provide a reasonable indication of the general ground conditions across the site, but the number has ultimately been limited by commercial constraints. The findings of the exploratory holes relate specifically to the exploratory hole locations and are no absolute guarantee of the ground conditions between such locations. Due allowance should be made for the possibility of variation in conditions between exploratory hole locations.

Extent of Contamination Testing

The extent of contaminated land testing carried out on samples obtained from the site has been determined in accordance with the latest legal guidance issued by the government to provide, with reasonable certainty, the probable general levels of contamination present on site that could pose a significant hazard to human health or waters. The extent of site investigation works including chemical testing has also been limited by reasonable commercial constraints. Although extensive testing of samples has been carried out, the volume of samples taken for testing are a minute fraction of the total volume of soils and groundwater present on site. Therefore, there is a residual risk that undetected pockets of contamination may be present on site, situated between testing locations.

When investigating or developing potentially contaminated land it is important to recognise that sub-surface conditions may vary spatially and temporally. The absence of certain ground, ground gas, contamination or groundwater conditions at the positions tested is not a guarantee that such conditions do not exist anywhere across the site. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

Extent of Geo-Environmental Studies

This report is strictly limited to the nature of contamination contained within the ground and groundwater at the site. The report does not cover environmental aspects such as air or noise pollution and ground vibrations and the like. In addition, ecological matters relating to wildlife, flora and fauna have not been investigated as part of this report. In particular, the site has not been inspected for the presence or otherwise of invasive species e.g. Japanese Knotweed. It is recommended that the Client appoints a specialist in this subject to carry out a detailed inspection / survey of the site if its presence is suspected. Where mention has been made to the identification asbestos or asbestos-containing materials this is for indicative purposes only and does not constitute or replace a full and proper survey. If an Unexploded Ordnance (UXO) report has been obtained within the report, it has been so on the basis of Health and Safety concerns and no assessment has been made other than transcribing the recommendations of the sub-contractor contained within the report. In terms of a potential contaminative source, unless ordnance has been manufactured / stored on site, UXOs will only be determined as a contaminative source following a positive identification on site.

PLANNING CONTEXT

The National Planning Policy Framework (NPPF, 2023) states that the purpose of the planning system is to contribute to the achievement of sustainable development. In order to do this the planning system has three overarching objectives, one of which directly relates to the potential for pollution and contaminated land:

- *'**environmental objective** - to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy'.*

In accordance with this environmental objective, Paragraph 124 clarifies that 'making effective use of land' includes to:

- *'give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land'*.

In accordance with this environmental objective, Paragraph 180 clarifies that' conserving and enhancing the natural environment includes:

- *'preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability*'; and
- *'remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate'.*

Paragraph 189 of the NPPF states that planning policies and decisions for developments should also ensure that:

- *'a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation)*'; and,
- '*after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990'*; and
- '*adequate site investigation information, prepared by a competent person, is available to inform these assessments'*.

This report has been prepared and authorised by staff that are competent as defined in the NPPF.

APPENDIX 2

FIGURES AND DRAWINGS

Site Layout - Proposed

Scale @ 1 : 500

NOTES

- All dimensions and levels are to be checked on site.
- Any discrepancies are to be reported to the architect before any work commences
- This drawing shall not be scaled to ascertain any dimensions. Work to figured dimensions only.
- This drawing shall not be reproduced without express written permission from AEW.
- Title overlay drawings and ownership boundaries are produced using all reasonable endeavors. AEW cannot be responsible for the accuracy or scale discrepancy of base plans supplied to them.
- All works are to be undertaken in accordance with Building Regulations and the latest British Standards.
- All proprietary materials and products are to be used strictly in accordance with the manufacturers recommendations.

This drawing contains the following model files: -

12191-XX-XX-M3-A-0001 [P0.1] [S0]

CDM 2015

Client notified of duties:

Principal Designer:

Unless noted below, all known hazards have been highlighted on the drawing:

N

0 5 10 20 30m

Scale @ 1:500

Layout subject to comments by LPA, acoustic consultant design, tree survey, ecological surveys, statuatory infrastructure layouts, drainage easement confirmation, title deeds etc.

Schedule Of Accommodation

Type	Area	Count
3B5P 2 Storey Townhouse	95.7m²	9
4B7P 3 Storey Townhouse	123.2m²	9
1B1P Walk Up Apartments	41m² GF 51m² 1F	3 3
	Total	24

Key

Indicative trees removed, to be confirmed by arboriculutral survey and report. Refer to seperate report

Drainage easement, exactl location to be confirmed by CCTV survey, easement size to be confirmed by drainage engineer

Site Boundary

Note: Dimensions from proposed proerties to existing based on topographical survey provided by Redbox Surveys Dec 2020

REV	Date	Drawn by: -	Checked by: -
P06	10.07.23	KJ	DAL
Rescaled to A1			
P05	15.06.23	BA	DS
Issued for planning			
P04	05.06.23	BA	DAL
Revised for amended access road to include homezone			
P03	22.05.23	DS	RH
Revised for Co-ordination pre planning			
P02	22.11.21	DAL	CS
Boundary Treatments shown on seperate drawing			
P01	17.11.21	DAL	CS
Initial Issue			

Status: S2

Purpose of Issue: For Information

drawing stage: **Stage 3**

client: **Mosscare St Vincent's**

project: **Parkmount Street**

drawing title: **Proposed Site Layout - Presentation**

date: 26.11.21 drawn: DAL

scale @ A1: 1 : 500 checked: BR

Rev **P06**

Dwg No **12191-AEW-XX-XX-DR-A-0503**

aew architects
0161 214 4370
www.aewarchitects.com

Rev	Drawn	Date	Description

Drawing Status:
Information

Contract:

Parkmount Street, Manchester

For: John Southworth Builders Ltd

Drawing Title:

Site Location Plan

IGE consulting

Office 16, Bartle House, Manchester, M2 3WQ
Email: contact@igeconsulting.co.uk
Web: www.igeconsulting.co.uk
Tel: 0161 914 9170

Scale: 1:1200 @A3	Date: Mar 2024	
Drawn: AS	Checked: AE	
Contract No. 4047	Drawing No. SI-01	P1

Rev	Drawn	Date	Description

Drawing Status:
Information

Contract:

Parkmount Street, Manchester

For: John Southworth Builders Ltd

Drawing Title:

Landscaping Plan

IGE consulting

Office 16, Bartle House, Manchester, M2 3WQ
Email: contact@igeconsulting.co.uk
Web: www.igeconsulting.co.uk
Tel: 0161 914 9170

Scale: 1:500 @A3	Date: Mar 2024	
Drawn: AS	Checked: AE	
Contract No. 4047	Drawing No. SI-02	P1

SOURCES

Sources
1. On-site Made Ground
2. On-site and off-site industrial land uses

Secondary Sources
3. Pooling beneath current and / or future foundations
4. Pooling in relative low points above low permeability deposits
5. Pooling within granular lenses within low permeability deposits

Ground Gas Sources
1. On-Site Made Ground

PATHWAYS

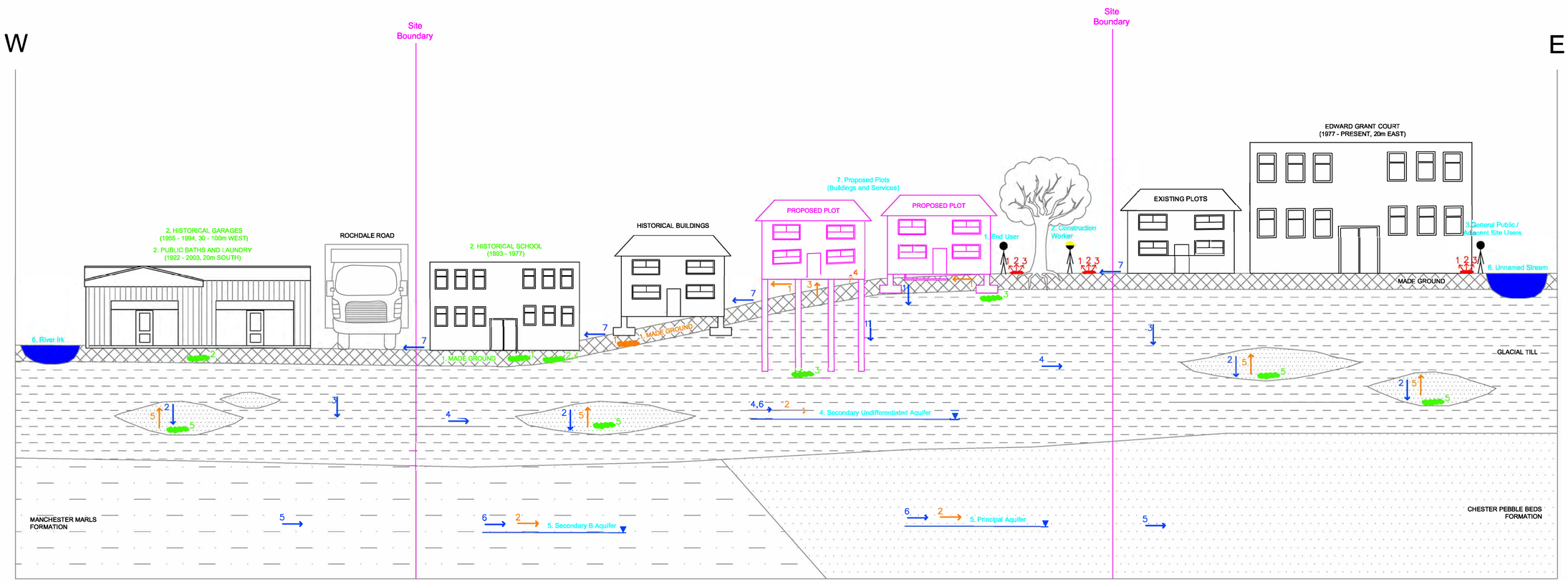
Pathways To Human Health
1. Dermal contact
2. Inhalation of soil dust and vapours
3. Ingestion of soil directly

Pathways To Controlled Waters
1. Vertical migration along current and future foundations
2. Vertical migration through coarse natural deposits
3. Negligible infiltration through low permeability natural fine deposits
4. Lateral migration along low-permeability natural fine deposits
5. Migration through fractures and fissures in bedrock
6. Migration along groundwater flow
7. Overland flow

Ground Gas Pathways
1. Preferential migration beneath hardstanding, along foundations, service ducts and trenches
2. Dissolved gases within groundwater
3. Ingress through wall cavities / floors and subsequent accumulation
4. Inhalation of ground gas and vapours
5. Vertical migration through granular deposits

RECEPTORS

Receptors
1. End user
2. Construction workers
3. General public / adjacent site users
4. Secondary Undifferetiated aquifer in superficial deposits
5. Secondary B aquifer (Manchester Marls) and Principal aquifer (Chester Pebble Beds Formation) in bedrock
6. Surface water - unamed stream (260m NE) and River Irk (520m W)
7. Buildings and services



Notes

1. This drawings is indicative and not to scale.
2. This drawing is to be read in conjunction with all relevant Architects and Service Engineers drawings.

Key

- Made Ground
- Glacial Till – Cohesive
- Glacial Till – Granular
- Chester Pebble Beds Formation – Sandstone
- Manchester Marls Formation – Mudstone

Rev	Drawn	Date	Description

Drawing Status
INFORMATION

Contract
PARKMOUNT ROAD, MANCHESTER

FOR: JOHN SOUTHWORTH BUILDERS LTD

Drawing Title
CONCEPTUAL SITE MODEL

IGE consulting

Office 16, Bartle House, Manchester, M2 3WQ
email: contact@igeconsulting.co.uk
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tel: 0161 914 9170

Scale	Date
NTS	MAR 2024
Drawn AS	**Checked** AE
Contract No. 4047	**Drawing No.** SI-03 P1

APPENDIX 3

DISCOVERY STRATEGY

Office 16
Bartle House
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M2 3WQ

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Email: contact@igeconsulting.co.uk
Web: www.igeconsulting.co.uk

DISCOVERY STRATEGY

What to Look Out For

Potentially contaminative material can be identified as follows:

- Appears oily / has an iridescent sheen
- Hydrocarbon odour e.g., oily or petroleum odour
- Solvent odour e.g., sharp or sweet odour
- Waste materials e.g., metals, plastic etc.
- Asbestos e.g., fibrous sheeting / roofing / board / lagging etc.
- 'Landfill' odour e.g., rotten / putrefying / leachate odour

Or any other material that looks man-made or does not match its surroundings – if in doubt, check.

Procedure for Discovery of Unexpected Contamination

If any of the above material is discovered, the following procedure must be carried out:

a) Stop works in the area of the contamination discovery.
b) Inform the Site Manager.
c) Record the visual and olfactory evidence of contamination.
d) Suitably qualified geo-environmental engineer to investigate the contamination; take samples, photographs and in-situ tests and discover the extents of the contamination, and to identify potential contaminants and specify chemical testing, if necessary.
e) Either dig out the contaminated material and stockpile, on an impermeable membrane if necessary, or leave in-situ whilst awaiting chemical test results, if needed – whichever presents the least risk.

f) Suitably qualified geo-environmental engineer to re-visit the site's risk assessment, taking into account the newly discovered contamination and recommend remediation, if necessary, or other next steps.
g) If the risk assessment and remediation strategy is changed as a result, the Local Authority and/or the Environment Agency should be informed and/or consulted.
h) Lastly, undertake remediation of the affected area if this has been deemed appropriate.

Procedure for Discovery of an Unexpected Tank

Former industrial sites may contain unrecorded underground storage tanks (USTs). Follow the below steps if a UST is found:

a) Stop works in the area of the UST discovery.
b) Inform the Site Manager.
c) Suitably qualified geo-environmental engineer to investigate the tank, including measuring the size, contents, condition, and visual and olfactory evidence of contamination. Geo-environmental engineer to record the location of the tank on a site plan, take photographs, and sample the contents to send for chemical testing to determine the contents.
d) Suitably qualified contractor to empty the tank and dispose of contents at a suitably licensed disposal facility.
e) Suitably qualified contractor to undertake integrity testing in line with the 'Blue Book' method (APEA / EI '*Design, Construction, Modification, Maintenance and Decommissioning of Petrol Filling Stations*' 4th ed. (April 2018)), to determine whether the tank is intact or has been compromised.
f) Suitably qualified geo-environmental engineer to undertake a risk assessment based on the contents of the tank and the results of the integrity testing, to determine whether to decommission the tank and leave in-situ or to remove the tank.
g) Suitably qualified contractor to clean and 'inert' the tank, and provide a gas safe certificate, in line with the 'Blue Book' method.

h) Suitably qualified contractor to either decommission the tank in-situ in line with the ‘Blue Book’ method or remove the tank and dispose of at an appropriate facility.

i) If excavated and removed, suitably qualified geo-environmental engineer to investigate the base and the sides of the resultant excavations and if any contamination is found, undertake the Procedure for Discovery of Unexpected Contamination above.

APPENDIX 4

BROWNFIELD SOLUTIONS LTD PHASE 2 GEO-ENVIRONMENTAL ASSESSMENT REPORT

BROWNFIELD SOLUTIONS LTD

GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

MOSSCARE ST VINCENTS HOUSING

Parkmount Road, Manchester

Phase II Geo-Environmental Assessment Report

MS/C4657/10658/Rev A

March 2022

www.brownfield-solutions.com

EXECUTIVE SUMMARY	
Location and Brief Site Description	The site is located off Parkmount Road, Manchester, M9 4AJ. It is situated approximately 4 Km north of Manchester City Centre, centred on National Grid Reference 386022, 402129 as shown on the Site Location Plan, Drawing No. C4657/01. The site comprises an 'L' shaped area of land, predominantly made up of soft landscaping turf with mature tree. There are two hardstanding footpaths running through the centre and south of the site.
Ground Conditions	Generalised ground conditions from the ground investigation comprise (top down): • Made ground encountered from ground level to between 1.10m and 2.60m bgl. • Natural strata encountered from 1.20mbgl to between 4.45m and 5.45m bgl. • Groundwater (perched) recorded between 1.70m and 4.84m bgl in the installations.
Human Health - Soils Contamination	• Elevated benzo(a)pyrene was detected in one sample of made ground. • Elevated lead was detected in one sample of made ground.
Controlled Waters	The overall risk to controlled waters is considered to be low and no further action is required.
Ground Gas	The ground gas risk assessment indicates that the site can be classified as NHBC Green and gas protective measures are not required.
Outline Remedial Strategy	Subject to regulatory approval, the following outline remedial strategy is recommended: • Cover system with 600mm thick of 'clean' validated topsoil and subsoil in private gardens and soft landscaping areas (Public Open Space – POS). • Verification of the above with validation reports produced.
Waste	Waste classification for the made ground soils and asphalt at the site has revealed soils to be non-hazardous. However, 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.
Foundations and Floor Slabs	Strip/trench fill foundations are considered suitable. At 1.50m bgl, an allowable bearing capacity not exceeding 125kN/m2 may be assumed increasing to 185kN/m2 at 2.00m bgl and 300kN/m2 at 2.50m bgl keeping total and differential settlement within acceptable limits. Deepening of foundations/heave protection is likely to be required to allow for the effects of trees Suspended floor slabs may be adopted.
Concrete Classification	DS1 AC1-S conditions prevail.
Highways Design	Made Ground CBR – 2% Superficial Strata CBR – cohesive/fine soils – 2% Superficial Strata CBR – granular/coarse soils – 5% The above should be confirmed by in-situ testing at formation level by a specialist geotechnical engineer during construction.
Sustainable Drainage Systems (SUDS)	Drainage to soakaways is considered potentially suitable for this site. Indicative soil infiltration rates range from 1.17×10^{-6}m/s to 8.85×10^{-7}m/s.
Further Work	The following further works will be required to progress to the construction phase: • Tree survey by qualified arboriculturist. • Detailed foundation design by a structural engineer, including foundation zonation plan and depth schedule. • Design of Remedial Strategy and confirmation with the Local Authority. • Implementation of the Remedial Strategy and verification of the remedial works.

This executive summary should be read in conjunction with the full report, reference MS/C4657/10658/Rev A and not as a standalone document.

PROJECT QUALITY CONTROL DATA SHEET

Site Name:	Parkmount Road, Manchester		
Document Name:	Phase II Geo-Environmental Assessment Report		
Reference:	MS/C4657/10658/Rev A		
Status:	-	31/01/2022	Interim.
	A	07/03/2022	Updated following completion of ground gas monitoring.

Issued By:	Client:	Project Manager:
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CONTENTS

1.0 INTRODUCTION 6

1.1 CONTEXT 6
1.2 PROPOSED DEVELOPMENT 6
1.3 PREVIOUS REPORTS 6
1.4 OBJECTIVES AND SCOPE 6
1.5 LIMITATIONS 6

2.0 THE SITE 9

2.1 LOCATION 9
2.2 SITE DESCRIPTION 9

3.0 SUMMARY OF PREVIOUS REPORTS 10

3.1 SLADEN ASSOCIATES DESK STUDY 10
3.2 COAL MINING 10

4.0 METHOD OF INVESTIGATION 12

4.1 OBJECTIVES 12
4.2 SITE WORKS 12
4.3 SAMPLING 12
4.4 LABORATORY TESTING 13
4.5 MONITORING 13

5.0 GROUND CONDITIONS 15

5.1 SUMMARY 15
5.2 MADE GROUND 15
5.3 NATURAL SUPERFICIAL STRATA 15
5.4 SOLID GEOLOGY 16
5.5 GROUNDWATER 16
5.6 OBSERVATIONS 16

6.0 TEST RESULTS 17

6.1 GEOTECHNICAL LABORATORY TESTING 17
6.2 AGGRESSIVE GROUND CONDITIONS – GEOTECHNICAL CHEMICAL TESTING 17
6.3 IN SITU GEOTECHNICAL TESTING 17
6.4 GEO-ENVIRONMENTAL TESTING 17

7.0 GEOTECHNICAL ASSESSMENT 18

7.1 GROUND MODEL SUMMARY 18
7.2 DESIGN SOIL PARAMETERS 18
7.3 FOUNDATIONS 19
7.4 BUILDING NEAR TREES 19
7.5 FLOOR SLABS 20
7.6 SITE PREPARATION AND CONSTRUCTION 20
7.7 CONCRETE CLASSIFICATION 20
7.8 HIGHWAYS 21
7.9 SUSTAINABLE DRAINAGE SYSTEMS (SUDS) 21

8.0 GEO-ENVIRONMENTAL RISK ASSESSMENT 23

8.1 INTRODUCTION 23
8.2 SOILS TEST RESULTS AND RISK ASSESSMENT – HUMAN HEALTH 23
8.3 SUMMARY – HUMAN HEALTH RISK ASSESSMENT 24
8.4 CONTROLLED WATERS RISK ASSESSMENT 25
8.5 PERMANENT GROUND GAS AND VAPOURS RESULTS 25
8.6 GROUND GAS RISK ASSESSMENT 25

CONTENTS

8.7 POTABLE WATER SUPPLY 26
8.8 QUALITATIVE RISK ASSESSMENT 26
8.9 OUTLINE REMEDIAL MEASURES 28
8.10 HEALTH AND SAFETY ISSUES 28

9.0 WASTE SOIL CLASSIFICATION & ASSESSMENT 30

9.1 SUMMARY 30
9.2 WASTE CLASSIFICATION PROCEDURE 30
9.3 WASTE CLASSIFICATION AND WASTE ACCEPTANCE CRITERIA (WAC) 31
9.4 OPTIONS ASSESSMENT 32
9.5 RE-USE OF SOILS 33

10.0 CONCLUSIONS 35

10.1 GEO-ENVIRONMENTAL 35
10.2 GEOTECHNICAL 35
10.3 FURTHER WORK 36

11.0 ABBREVIATIONS AND DEFINITIONS 37

12.0 REFERENCES 40

DRAWINGS

Drawing Number	Rev	Title
12191-AEW-XX-XX-DR-A-003	P6	Proposed Site Plan
C4657/01	-	Site Location Plan
C4657/02	-	Site Features Plan
C4657/03	-	Exploratory Hole Location Plan

APPENDICIES

Appendix	Title
Appendix A	BSL Methodology and Guidance
Appendix B	Mining Report
Appendix C	Exploratory Hole Logs
Appendix D	Chemical Testing Results
Appendix E	Geotechnical Testing Results
Appendix F	Monitoring Results
Appendix G	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 Mosscare St Vincents Housing as instructed by Poole Dick on a site off Parkmount Road, Manchester and has been completed in general accordance with the following guidance:

- 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.
- NHBC Standards. Chapter 4.1: Land Quality - Managing Ground Conditions.

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 residential end use with associated private gardens, highways and public open space (POS) areas as shown on the proposed site plan, drawing No. 12191-AEW-XX-XX-DR-A-0003_(P6) provided to BSL by the client.

1.3 Previous Reports

This report should be read in conjunction with Sladen Associates Desk Study Assessment Report (20 2277) issued in December 2020.

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 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, window sampling, gas and groundwater monitoring, 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, Mosscare St Vincents Housing. 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 Parkmount Road, Manchester, M9 4AJ. It is situated approximately 4 Km north of Manchester City Centre, centred on National Grid Reference 386022, 402129 as shown on the Site Location Plan, Drawing No. C4657/01.

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. C4657/02.

Feature	Description
Site Area	Approximately 0.69 hectares.
Site Access	Access to the site is gained off Parkmount Road to the north.
Current Land Use and Site Features	The site comprises an 'L' shaped area of land, predominantly made up of soft landscaping turf with mature tree. There are two hardstanding footpaths running through the centre and south of the site.
Potential Sources of Gross Contamination	There are no obvious potential sources of contamination.
Vegetation	There are approximately 15-20 mature trees across the site all located close to the east boundary.
Topography	The majority of the site slopes from east to west down to Rochdale Road with the eastern section being circa. 2.00m higher than the western section. The south area of the site adjacent to Shepard Street is flat.
Site Boundaries	There are no physical boundaries on the site. Parkmount Road is located north of the site, a row of houses runs adjacent to the eastern boundary of the site and Rochdale Road runs adjacent to the western boundary. Shepard Street runs adjacent to the south boundary.
Surrounding Area	The site is set within a mixed commercial and residential area. Residential buildings are located to the east and north. The Manchester college is located to the south and a medical centre is located to the west.

3.0 SUMMARY OF PREVIOUS REPORTS

3.1 Sladen Associates Desk Study

A summary of the relevant points from the Desk Study completed by Sladen Associates (Report No 20 2277) is presented below:

- The site has had previous development since 1853 for residential use and a school in the southern section of the site. A series of terraced housing was present until the 1970's where they were demolished. The site has remained an area of soft landscaping since this time.
- A timber yard and more residential houses were in close proximity of the site.
- Geology comprises Glacial Till deposits (Secondary Undifferentiated) over Chester Pebble Beds Sandstone (Principal Aquifer) and Manchester Marls Formation Mudstone (Secondary B)
- No faults are within an influencing distance of the site.
- The nearest watercourse is the River Irk circa 500m to the east of the site.
- The risk to human health is considered to be moderate.
- The risk from ground gas is considered to be low and the site is not located in an area requiring radon protection measures.
- The risk to controlled waters is low to moderate.
- Recommendations were for an appropriate Phase II ground investigation to be carried out to confirm the identified risks and obtain information for preliminary design.

3.2 Coal Mining

The site lies within a Coal Authority Reporting Area and therefore a mining search should be undertaken as part of the Phase 1 Desk Study to confirm risks to the proposed development from past or current coal mining.

It was noted that the Sladen report did not include a mining search and therefore BSL have procured one, the main findings of which are presented below:

Highlighted Evidence	Issue	Details
Past Underground Mining	No	No past mining recorded.
Probable Unrecorded Shallow workings	No	None.
Spine Roadways at Shallow Depth	No	No spine roadway recorded at shallow depth.
Future Underground Mining	No	None recorded.
Mine Entries	No	None recorded within 100 metres of the enquiry boundary.
Outcrops	No	No outcrops recorded.
Geological faults, fissures and breaklines	No	No faults, fissures or breaklines recorded.
Opencast Mines	No	None recorded within 500 metres of the enquiry boundary
Coal Authority Managed Tips	No	None recorded within 500 metres of the enquiry boundary.
Site Investigations	No	None recorded within 50 metres of the enquiry boundary.
Remediated Sites	No	None recorded within 50 metres of the enquiry boundary.
Coal mining subsidence	No	The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994. There is no current Stop Notice delaying the start of remedial works or repairs to the property. The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.
Mine gas	No	None recorded within 500 metres of the enquiry boundary.
Mine Water Treatment Schemes	No	None recorded within 500 metres of the enquiry boundary.
Coal Mining Licensing	No	None recorded within 200 metres of the enquiry boundary.

Highlighted Evidence	Issue	Details
Court Orders	No	None recorded.
Withdrawal of support	No	The property is not in an area where a notice to withdraw support has been given. The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.
Payments to Owners of Former Copyhold Land	No	The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

A copy of the mining report can be found in Appendix B.

The mining report indicates that the risks to the proposed development from past or current mining are low and no further consideration of coal mining risks are required.

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 and the potential need for detailed investigation.
- Install standpipes to allow future monitoring.
- Assess the potential contamination on the site and obtain samples for contamination screening.
- Assess the potential impact of any contamination on controlled waters.
- 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 8th and 9th December 2021.

Method	No.	Range Depths (m bgl)	Purpose
Window sample boreholes – Tracked WS rig	12	4.45 – 5.45	Establish general ground conditions on site. Allow Standard Penetration Tests (SPTs) to be carried out and obtain samples for contamination and geotechnical and testing. Installation of ground gas and water monitoring wells.
Falling Head tests	2	-	Obtain infiltration rates for drainage design.

The approximate locations of the exploratory holes are indicated on the Exploratory Hole Location Plan, Drawing No C4657/03. The exploratory hole logs are presented in Appendix C.

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

During the drilling of the exploratory holes, representative samples were taken 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 and a summary of the samples taken is presented in the table below:

Type	Number
Environmental (ES)	17
Disturbed (D)	49

4.4 Laboratory Testing

As part of the initial 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 impaction six 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.	6
Asbestos Screen.	6

The Chemical Laboratory Testing Results are presented in Appendix D.

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.	3
Plasticity Index Analysis.	3
pH Value.	3
Water Soluble Sulphate Contents.	3

The Geotechnical Laboratory Testing Results are presented in Appendix E.

4.5 Monitoring

Ground gas and ground water monitoring standpipes were installed in 4 boreholes and subsequently 6 monitoring visits have been undertaken in line with the recommendations of CIRIA C665. All gas monitoring was undertaken using a GFM436 infrared gas meter with integral electronic flow analyser.

Flow measurements on each standpipe (l/hr) were taken. Measurements of the percentage volume in air (%v/v) of oxygen (O_2), carbon dioxide (CO_2) and methane (CH_4) were recorded in addition to the percentage Lower Explosive Limit (%LEL) of methane (Note: 100% LEL equates to 5% by volume), the atmospheric pressure (mb) and average temperature during the visit (°C).

Standpipes were constructed in general accordance with the relevant guidance. A summary of the installation construction is presented in the table below:

Location	Internal Diameter Pipe	Response Zone (m bgl)	Targeted Strata	Purpose
WS02	50mm HDPE	1.50 – 4.50	Sandy gravelly CLAY	Ground Gas / Infiltration Test
WS07	35mm PVC	1.00 – 2.00	Made Ground	Ground Gas
WS09	35mm PVC	1.00 – 2.00	Made Ground	Ground Gas
WS12	50mm HDPE	3.00 – 5.00	SAND / SILT	Ground Gas / Infiltration Test

The gas monitoring visits recorded peak and steady state conditions. Peak results are those that occur on opening the valve on the borehole tap. Steady state conditions are those that occur a period of time afterwards when the initial (accumulated) gases have been purged from the borehole.

Ground gas monitoring results are presented in Appendix F of this report.

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	1.10 – 2.60	1.10 – 2.60	MG Topsoil/ Sandy gravelly clay / Sandy gravel.
Natural Superficial Strata	1.10 – 2.60	4.45 – 5.45	2.15 – 4.25	Slightly sandy slightly gravelly CLAY.

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

5.2 Made Ground

Made Ground – Topsoil
Made Ground Topsoil was encountered across the site from ground level to between 0.20m and 0.30m bgl, generally comprising dark brown slightly gravelly slightly sandy clay with occasional rootlets.

Made Ground – General
Made ground was encountered within all the exploratory holes across the site and was observed from ground level to depths between 1.10m and 2.60m bgl.

The composition of the made ground beneath the topsoil was fairly consistent across the site and represented demolition material comprising gravelly sandy clay with varying amounts of ash as a minor constituent. A low cobble content of brick and concrete was also observed.

The table below shows the depths that made ground was encountered across the 12 window sample boreholes:

Location	Depth of Made Ground (m)
WS01	1.10
WS01A	2.00
WS02	1.20
WS03	1.70
WS04	2.20
WS05	2.00
WS06	2.10
WS07	2.30
WS08	2.60
WS09	2.00
WS10	2.20
WS11	1.60
WS12	1.50

5.3 Natural Superficial Strata

The natural strata underlying the made ground was generally firm to very stiff clay with varying amounts of silt, sand and gravel as minor constituents. This was proven to a maximum depth of 5.45m bgl and is interpreted to represent Alluvium.

Bands of dense sand and stiff brown silt were encountered at depth in some of the exploratory boreholes. Details are highlighted below:

Location	Depth (m)	Strata
WS01A	4.60 – 4.80	Sand
	4.80 – 5.00	Silt
WS04	4.35 – 4.45	Sand
WS07	4.20 – 4.45	Dense Sand
WS08	5.30 – 5.45	Dense Sand
WS09	4.60 – 5.45	Dense Sand
WS10	3.80 – 5.10	Dense Sand
WS11	4.40 – 5.05	Dense Sand
WS12	2.90 – 4.80	Dense Sand
	4.80 – 5.45	Stiff Silt

5.4 Solid Geology

The solid geology of the Chester Pebble Beds Sandstone and Manchester Marls Formation Mudstone was not encountered in this investigation.

5.5 Groundwater

No groundwater was encountered during the site investigation. The groundwater depths recorded within the installations during the monitoring period are highlighted below:

Location	Depth During Monitoring Period (range) (m)
WS02	1.86 – 2.15
WS07	1.87 – 1.88
WS09	1.69 – 1.86
WS12	4.78 – 4.84

The groundwater recorded in the installations is not believed to be a representation of a wider water table below the site and is believed to be localised perched water that has drained into the installations from sand bands.

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 ash 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 borehole sidewalls were generally stable and window sampling progressed without the need to install casing.

6.0 TEST RESULTS

6.1 Geotechnical Laboratory Testing

Plasticity Index Analysis
Plasticity index results ranged between 18% and 24% indicating the cohesive soils to be of medium plasticity. Associated water contents ranged between 17.8% and 27.1%.

After modification of particle size in accordance with NHBC Chapter 4.2 the modified plasticity indices are in the range 17.1% to 25.9% indicating the cohesive soils to be of medium volume change potential.

6.2 Aggressive Ground Conditions – Geotechnical Chemical Testing

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

6.3 In Situ Geotechnical Testing

In Situ Hand Shear Vane Tests
Nine hand shear vane tests were carried out on suitable cohesive soils recovered from the trial pits. Each shear vane result recorded represents the mean value of three tests undertaken at the specified depth.

The results and distribution of the hand shear vane tests are recorded in kPa on the Exploratory Hole Logs which are presented in Appendix C.

In Situ Standard Penetration Tests
Standard Penetration Tests (SPTs) were carried out within the window sample boreholes at regular 1.0m intervals. The results of the individual blows and the N-values are recorded on the Exploratory Hole Logs in Appendix C.

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.

Permeability Test Results (Boreholes)
The results of permeability testing in boreholes using falling head methods are presented in the table below. These were carried out in general accordance with BS 5930 & BS 22282. Results are presented in Appendix E.

Location	Response Zone (m)	Stratum Type	Hydraulic Conductivity (m/sec)
WS02	1.50 – 4.50	Slightly gravelly slightly sandy CLAY	2.55×10^{-5}
WS12	2.00 – 5.00	SAND / SILT	1.78×10^{-5}

6.4 Geo-Environmental Testing

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

Ground Gas Monitoring
Ground gas monitoring installations have been monitored on 4 occasions to date out of 6 visits scheduled. The results are presented in Appendix F and are summarised and assessed within Section 8.0 of this report.

7.0 GEOTECHNICAL ASSESSMENT

7.1 Ground Model Summary

The site is currently an area of soft landscaping with some mature trees. Previous residential properties were demolished in the 1970's.

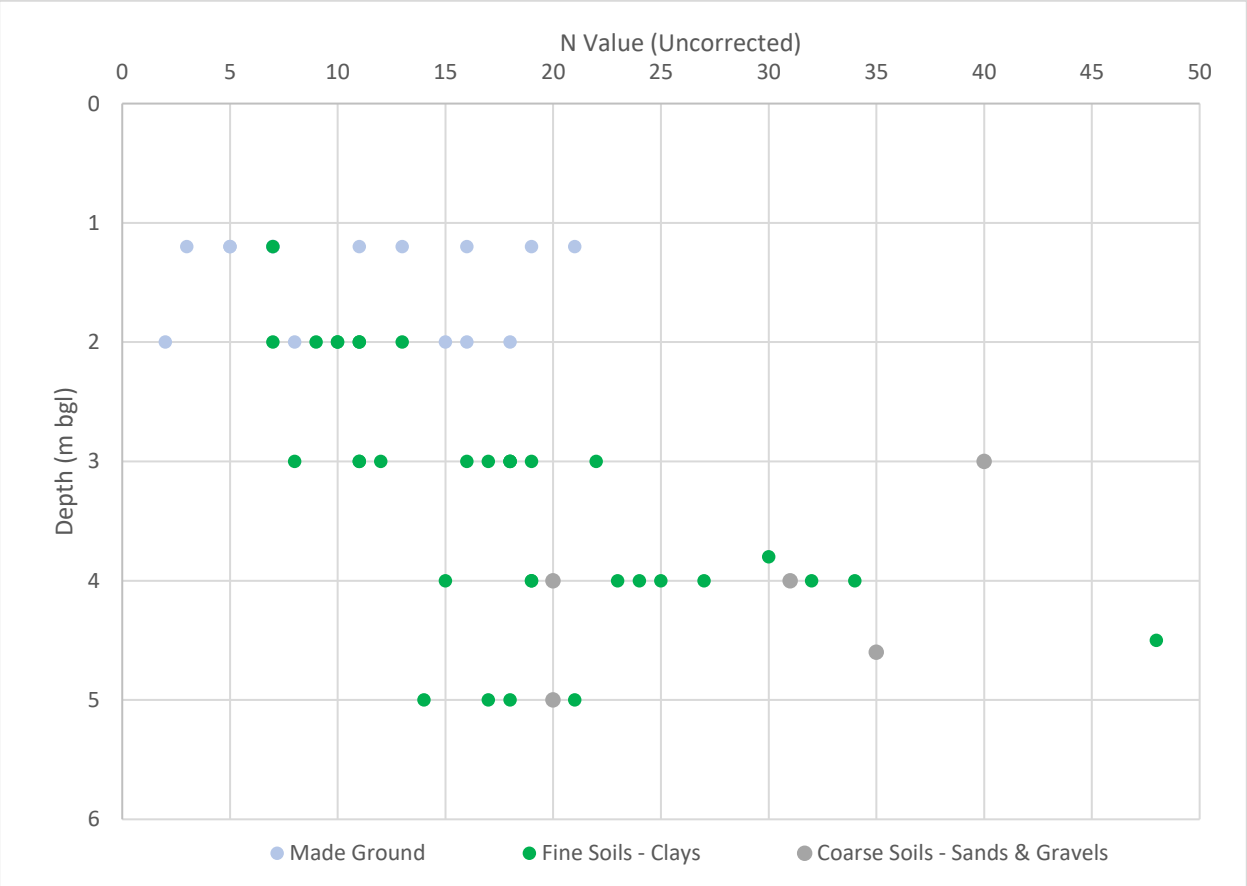
The ground conditions can be summarised as below (top down):

- Made ground generally comprising sandy gravelly clay from ground level to between 1.10m and 2.60 mbgl.
- Natural superficial deposits comprising sandy gravelly clay and sand/ silt proven to depths between 4.45m and 5.45 mbgl.
- No groundwater was encountered during site works.
- Post site works monitoring levels ranging between 1.70m and 4.84m bgl.

7.2 Design Soil Parameters

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

A depth (m bgl) vs SPT N value graph is provided below to provide a profile of the materials encountered underlying the site.



The above graph shows a general increase in soils density and strength as depth increases.

Characteristic Values
Characterisation of the geotechnical parameters above has been undertaken to obtain characteristic values, which are a cautious estimate of the values affecting the occurrence of the limit state.

Made ground is not considered to be a suitable founding medium, therefore no characteristic values have been interpreted for this stratum; foundations will need to be extended below the made ground present to depths between 1.20m and 2.60m bgl. The characteristic SPT N value in the cohesive deposits at 1.50-2.00mbgl (below the base of the majority of the made ground on site) is interpreted to be 10. Based on the correlation of Stroud (1975) based on 'average' plasticity and adopting an f1 value of 5, this gives a characteristic shear strength of 50 kN/m^2. At 3.00m depth, an N value of 15 has been adopted, corresponding to a derived shear strength of 75 kN/m^2.

The angle of shearing resistance (ϕ') of the granular (coarse) soils has been derived from the uncorrected SPT N value data and the correlation of Peck (1967). The characteristic SPT N value in the granular deposits at 3.00 has been taken as 40, although there appears to be a slight decrease in density below this depth. The characteristic ϕ' value at 3.00mbgl is interpreted to be 38° for Ultimate Limit State conditions.

7.3 Foundations

The development will comprise traditional two storey residential housing 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. 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. However, for the purpose of this assessment a typical load of 50kN has been assumed per storey.

The variance of existing levels and proposed levels will likely influence founding depths and should be considered at the detailed design stage.

Shallow Foundations – Strip / Trench Fill
The most suitable foundations for the proposed residential homes are considered to be strip / trench fill foundations, taken through the base of the made ground extending a minimum of 100mm into the specified bearing strata, therefore depths are likely to range between circa 1.20m and 2.70m bgl. The foundations may need to be deepened near trees and hedges in accordance with NHBC Chapter 4.2.

At depths between 1.50m-2.00 bgl, an allowable bearing capacity not exceeding 125kN/m^2 may be assumed increasing to 150kN/m^2 at 2.00m bgl. . These adopt a factor of safety of 3 which should limit settlements to within acceptable limits.

Trees are noted within and close to the area of the site proposed for development. Depending on their size, type and maturity, the required depth of founding based on the recommendations of NHBC Chapter 4.2 may exceed 2.5m. Should this prove to be the case, then piled foundations should be considered as a potentially more economical solution, unless it can be proven that the soils are not desiccated.

Note where foundations require deepening to greater than 2.5m below ground level, they must be designed by an engineer, as specified in NHBC Technical Requirement R5.

7.4 Building Near Trees

The clay soils on site are medium volume change potential. Where foundation excavations (or piles if adopted) encounter cohesive strata in the vicinity of existing, proposed or recently removed trees,

foundations should be adjusted in full accordance with NHBC Standards Chapter 4.2. All foundations should be deepened below roots of greater than 5mm diameter during excavations for footings.

A survey of all trees and hedges on the site and within influencing distance of the site boundary should be undertaken to identify tree species and heights by a qualified arboriculturist in accordance with BS 5837:2012 and NHBC Standards. This information will be required in order to assess the effects of trees on the cohesive strata.

Where foundation depths due to trees already present or recently removed exceeds 1.50m, there is a possibility for heave to occur on removal of the tree and guidance states that compressible material or void former is required against the inside face of the foundation / ground beam, unless it can be satisfied that the soil is not desiccated.

7.5 Floor Slabs

Given the thickness of made ground present (generally >600mm), suspended floor slabs should be adopted at the site in accordance with NHBC standards.

Where foundation depths due to trees already present in cohesive (shrinkable) strata exceeds 1.50m, there is a possibility for heave to occur on removal of the tree, unless it can be satisfied the soils are not desiccated. In this instance, NHBC Guidance states that either a precast concrete floor (i.e. beam and block), a suspended timber or a cast in-situ concrete floor must be used. We recommend the former, where the required void size for beneath floor slabs on this site is 250mm based on the medium volume change potential clays.

7.6 Site Preparation and Construction

Topsoil and subsoil should be removed from beneath all buildings and hardstanding areas.

There are a known services crossing the site adjacent to the hardstanding footpaths. To allow remediation and construction, all services will need to be disconnected and any suspected dead services are confirmed as dead by testing.

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'.

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.

To protect against the effects of heave, new drainage should be designed to take account of potential ground movement, including where pipes and services which pass through substructure walls or foundations. The volume change potential on this site is medium and the potential ground movements that need to be considered for design are 100mm.

Recorded post site works groundwater levels ranged between 1.70m and 4.84m bgl. This is believed to be perched water and not a representation of the natural groundwater table. It is considered unlikely that groundwater will be encountered within the probable excavation depths.

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 that groundwater was not encountered during the intrusive investigation.

Stratum	No. Samples	Characteristic SO_4 (g/l)	Characteristic pH	DS Class	ACEC Class
Natural Superficial Strata	3	0.094	7.7	DS-1	AC-1s

Based on the above, the results of laboratory pH and sulphate content, indicate that sulphate class DS-1 and ACEC Class AC-1s conditions prevail 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 made ground and natural clay soils for pavement design purposes, unless proven otherwise by in-situ testing at formation level by a specialist geotechnical engineer.

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.

To achieve the required design CBR value, improvement works should be carried out in accordance with DMRB IAN 73/06 Rev 1 Chapter 5 and may include proof rolling, excavation and re-engineering / replacement of weaker soils, the inclusion of a geogrid or use of stabilisation techniques such as the addition of hydraulic binders (e.g. cement/lime).

Based on the fines content of the soils, they are considered to be frost susceptible, therefore highway construction should be a minimum thickness of 450mm to mitigate against the risk.

Care should be taken to ensure the stratum at formation level is protected against inclement weather, as this is likely to lead to surface deterioration and a decrease in soils strengths.

7.9 Sustainable Drainage Systems (SuDS)

In accordance with CIRIA C753 "The SUDS Manual", infiltration viability should be given full consideration where rates of 10^{-6} m/s or greater exist on the site. Where rates are less than this value, the soils can still usefully be used for interception delivery, but disposal of significant volumes of run-off may not be appropriate unless a large area is available, or some form of attenuation can be incorporated.

The tests undertaken across the site indicate good drainage conditions, particularly in natural sand strata which was encountered at depth in some of the exploratory boreholes. Based on the infiltration rates obtained, on the order of 1.78×10^{-5} and 2.55×10^{-5} m/s, it is possible that some form of sustainable drainage solution will be feasible at the site in area where granular deposits are encountered at depth. We recommend the design of any SuDS features is carried out in accordance with BRE 365 and CIRIA C753.

Sufficient attenuation and storage capacity will likely be required, which should be considered during the detailed design stage. Consideration should also be given to future maintenance, where infiltration capacity can be reduced as a result of blinding through ingress of fines.

Note the base of any soakaway incorporated into the future development of the site is required to be at least 1m above the water table.

If drainage to soakaways is to be considered, it is suggested that this is discussed with the Local Authority at the earliest opportunity, to confirm the adequacy of proposed testing and to allow their inspection of any test results.

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 residential end use with homegrown produce have been adopted as Tier 1 generic screening values.

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 D 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
The following elevated metals were detected:

Exploratory Hole	Depth (m)	Metal	Concentration (mg/kg)	Adopted Screening Value (mg/kg)
WS10	1.00-1.30	Lead	1200	210

Asbestos
No asbestos fibres have been detected in any of the 6 samples screened.

Poly Aromatic Hydrocarbons (PAHs)
BSL consider the main risk drivers for PAHs to be benzo(a)pyrene (B(a)P) and naphthalene. This is due to B(a)P being one of the most toxic of the PAHs, and naphthalene the most volatile and soluble. Category 4 Screening Levels (C4SLs) indicate B(a)P as a surrogate marker for carcinogenic PAHs, if it falls within appropriate limits, since the risk from other non-carcinogenic PAHs are considered negligible. Given the difference in chemical properties between the two, naphthalene will be treated separately using the LQM S4ULs.

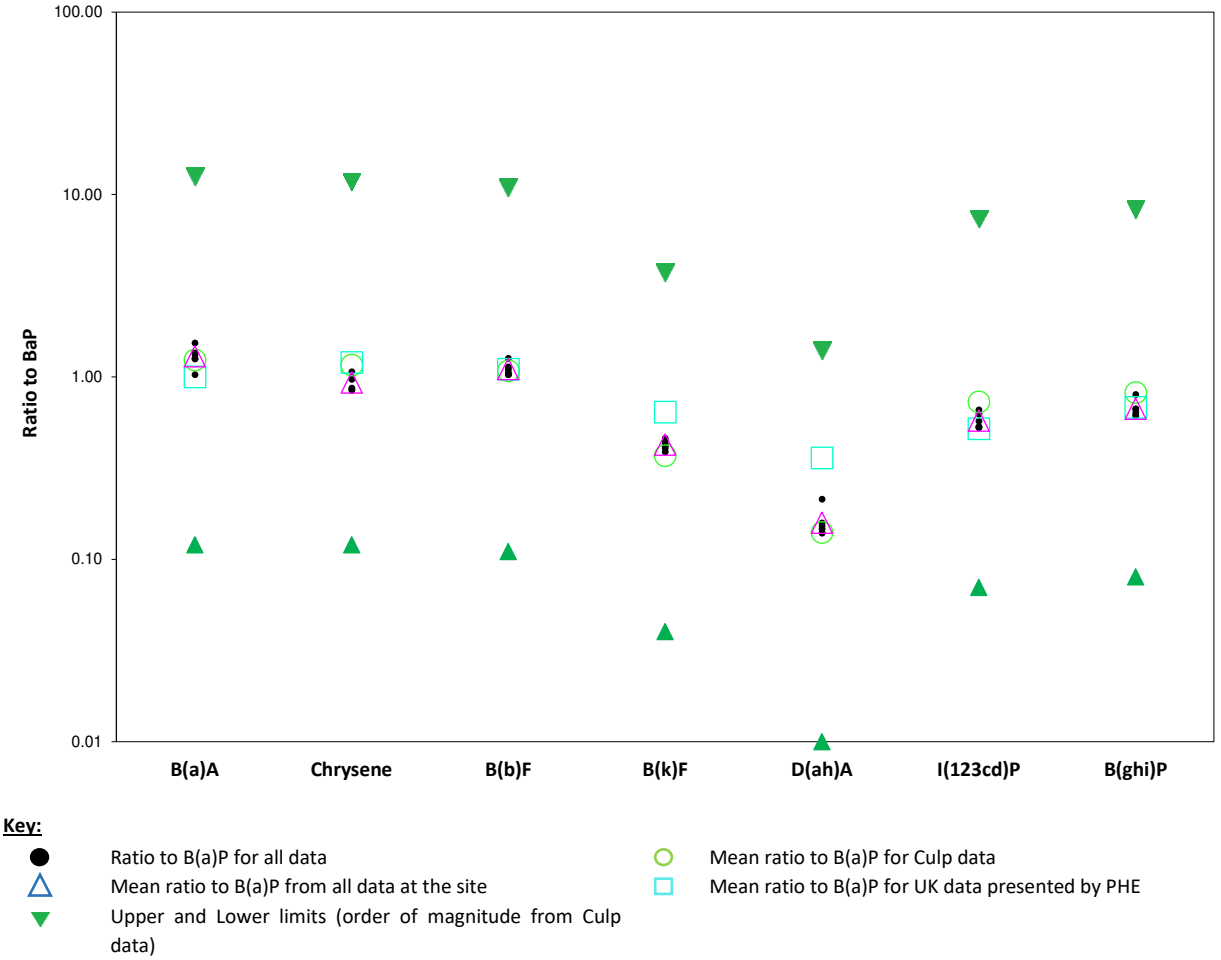
PAHs and B(a)P as a Surrogate Marker
In line with CL:AIRE and Public Heath England (PHE) guidance, benzo(a)pyrene is considered to be one of the most potent PAHs, and it would be appropriate to assume the cancer risk in a mixture is proportional to the concentration of a surrogate marker PAH (benzo(a)pyrene) in the mixture. The ratio of PAHs within the mixture can be assessed to ensure that the profile is similar to that seen for the test material (coal tar mixtures) in the toxicological study by Culp et al. The International Programme on Chemical Safety (IPCS) considered that the PAH profile of the soil sample may deviate from the average profile by about an order of magnitude (up or down).

A more recent study by Bull et al (2013) which analysed PAH concentrations in soil samples from 274 sites, showed that the levels of PAH relative to B(a)P showed little variability and were similar to that recorded for the coal tar mix used in the Culp et al study. Given this, it was concluded that benzo(a)pyrene is a suitable surrogate marker to represent mixtures of PAH in soil.

In order to risk assess the PAH mixture in the site soil samples using human health guideline values, notably C4SLs, the PAH profile in the soil samples, the ratio of the seven genotoxic PAHs shown below, relative to B(a)P, should be calculated to ensure it is similar to the test material used in the Culp study (PHE 2010). To

be considered sufficiently similar, the ratio relative to B(a)P should fit within the upper and lower limits (representing an order of magnitude above and below the mean ratio to B(a)P of test material used in the Culp et al study). In such cases B(a)P is considered an adequate surrogate marker and the Low Levels of Toxicological concern (LLTC) for B(a)P may be used in the risk assessment.

The graph below summarises the site data with respect to how the ratios of carcinogenic PAHs relate to B(a)P, within the confidence limits provided in the PHE documents.



Based on the above, elevated PAHs were recorded in one location to date as shown in the table below:

Exploratory Hole	Depth (m)	Species	Concentration (mg/kg)	Adopted Screening Value (mg/kg)
WS06	0.30-0.60	Benzo(a)pyrene	7.3	5.0*

* Based on C4SL

8.3 Summary – Human Health Risk Assessment

Based on the testing and assessment undertaken it would appear that there is contamination within the made ground in the form of PAHs attributed to ash within the made ground strata. Localised lead contamination has also been identified in made ground soils in WS10.

The above pose a risk to human health and will require further consideration.

8.4 Controlled Waters Risk Assessment

Based on the investigation works undertaken to date and subject to agreement with the Environment Agency, the site is not considered to pose a significant risk to controlled water for the following reasons:

- There is no indication under present conditions of 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 garden soils.
- The nearest watercourse is over 500m 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.
- The site does not lie within 500m of an SPZ.
- There are no groundwater abstractions within 2000m.
- There are no potable (sensitive) water abstractions within 2000m.
- Evidence indicates the nearby wells are historical and related to low sensitivity commercial use.

8.5 Permanent Ground Gas and Vapours Results

Ground gas monitoring visits have been carried out on 6 occasions between the dates of 13th December 2021 and 22nd February 2022. Results are summarised in the table below:

	CH_4 (%)		CO_2 (%)		O_2 (%)		CO (ppm)		H_2S (ppm)		TVOC (ppm)		Flow	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Peak	0.1	0.1	0.3	7.6	8.0	20.7	0.0	0.0	0.0	0.0	N/A	N/A	0.1	0.3
Steady	0.1	0.1	0.2	5.1	14.2	20.8	0.0	0.0					-0.4	0.4

Notes: CH_4 = Methane; CO_2= Carbon dioxide; O_2= Oxygen; CO= Carbon Monoxide; H_2S= Hydrogen Sulphide; TVOC (PID)= Total Volatile Organic Compounds (as measured with Photo Ionisation Detector); ppm= Parts Per Million.

No methane concentrations were recorded above the limit of detection (0.1% v/v), whilst the highest carbon dioxide concentration was recorded in WS12 (7.6% v/v) on the first visit. The maximum flow of 0.4 l/hr was recorded in WS12 on the second visit.

The atmospheric pressure ranged between 997mb and 1026mb over the monitoring period, of which visits were conducted over a range of steady, falling and rising pressure trends.

8.6 Ground Gas Risk Assessment

In order to assess the ground gas situation and the requirement for ground gas precautionary measures at the site, guidance was taken from CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings' and BS8485:2015+A1:2019 'Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'.

As the proposed end-use is for a low rise residential development, guidance dictates that the gas monitoring results should be assessed in accordance with the Boyle and Witherington.

The Boyle and Witherington methodology uses the concept of a Gas Screening Value (GSV) which is derived using the following equation: (max gas concentration / 100) x maximum flow.

A maximum positive flow of 0.4l/hr has been used to derive the GSVs, alongside the peak gas concentrations for methane and carbon dioxide to provide a conservative 'worst case' value. The GSV's for the site are presented below.

Gas	GSV (l/h)	Typical Threshold Concentration Exceeded	Classification
Methane	0.0004	No	Green
Carbon Dioxide	0.0304	Yes	Green / Amber 1

The GSVs for carbon dioxide and methane places the site the site into Green classification of the Boyle and Witherington Traffic Light System as outlined in CIRIA C665, however guidance indicates that where concentrations of carbon dioxide exceed the 5% threshold then consideration should be given to upgrading the site to Amber 1.

To date, the 5% threshold for carbon dioxide has been exceeded on several occasions, however these have generally only occurred during 'peak' readings and with a maximum concentration of 7.6% v/v recorded (though generally less than 6.0% v/v). The maximum steady state concentration recorded is 5.1% v/v, with readings typically falling well below the 5% threshold.

There are no significant sources of hazardous ground gases identified within the Sladen Desk Study report. In addition, significant thicknesses of putrescible made ground capable of generating large quantities of ground gases were not identified during the intrusive investigation. Material which was identified would likely have a very low gas generation potential in accordance with BS 8576:2013.

Given that flow rates are typically low to negligible, and methane has not been recorded at the site, the carbon dioxide detected during ground gas monitoring is potentially indicative of a microbial generation source.

Based on the above, it is considered that there is no requirement for the classification to be upgraded, and that the site should be classified as Green, whereby gas protective measures are not required within new houses.

8.7 Potable Water Supply

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.

8.8 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	Root uptake, ingestion, direct contact, inhalation of dusts	End-users	Low likelihood	Severe	Moderate	Elevations in PAHs and heavy metals have been detected in the made ground soils and the near surface made ground topsoil. This poses a risk to site end-users and further mitigation will be required in garden and other soft landscaping areas. The risk at this stage is considered to be moderate.
On site Made Ground Metals and organic contamination	Migration into/chemical attack of water supply pipelines	Water Pipelines / End users	Low likelihood	Mild	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	Unlikely	Medium	Low	Significant thicknesses of putrescible made ground have not been identified during the intrusive investigation. Concentrations of methane have not been detected above the limit of detection (0.01% v/v) and carbon dioxide has been recorded at a peak concentration of 7.6% v/v however typically is present at very low concentrations of <2% v/v. The risk is considered to be low.

8.9 Outline Remedial Measures

Given the presence of contaminants in the made ground, where gardens or soft landscaping are present a cover of "clean" subsoil and topsoil should be provided to break the pathway to site end users. This should be 600mm thick in private garden areas and 450mm in soft landscaping areas (Public Open Space – POS) in accordance with BRE 465. This will allow plants to be grown and prevent undesirable soils being brought to the surface. Elsewhere, hardstanding will break the pathway to site end users.

To date, only limited testing of the topsoil has been carried out as part of this initial site assessment. It would be prudent to carry out further confirmatory testing and assessment on the topsoil across the site to see what volume of the material, if any, could potentially be re-used in garden areas. The soils may also potentially be suitable in POS areas, where less stringent screening criteria apply.

Prior to import or re-use of any clean cover soils, if required, they should be tested to confirm chemical suitability. After installation of the clean cover, soil depths should be verified by a suitably qualified independent geo-environmental engineer, such as BSL.

We have not been provided with the final levels for the site, however the site does slope westwards. Should made ground material be removed as part of site levelling works then a clean cover system may not be required where made ground has been removed entirely and only clean natural soils remain. In such a situation, verification of made ground removal would be required, with clean topsoil placed as a growth medium conforming to BS3882:2015.

Ground Gas Protection Systems
The ground gas risk assessment indicates that the site can be classified as NHBC Green and gas protective measures are not required.

General
It is recommended that the approval of the Regulators (Local Authority /NHBC / Environment Agency) is obtained in regard to the above prior to any irrevocable action is taken at the site.

Once the above bodies have approved the above outline remedial proposals, a Remedial Strategy 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.

8.10 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, petroleum hydrocarbons)	Ingestion, direct contact, inhalation of dusts.	Construction Workers	Likely	Mild	Moderate/low

Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk
Asbestos	Ingestion, direct contact, inhalation of dusts.	Construction Workers	Unlikely	Medium	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.

It is noted that concentrations of carbon dioxide (an asphyxiant) in the soil exceed HSE Workplace Exposure Limits for personnel in the working environment of 1.5% for short term (15 minutes) exposure and/or 0.5% for long term exposure. Furthermore, soil concentrations of oxygen are below the HSE recommendations of 18%.

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:

	PRIOR TO LEAVING SITE			
Classification based on Total Concentrations[1]	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").

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

The Waste Classification Report is presented in Appendix G. The results of the waste assessment based on total concentrations are presented in the table below.

Location	Depth (m)	Stratum	Waste Classification	WAC Analysis	Landfill	Comments
WS01	0.30 – 0.60	MADE GROUND	Non-hazardous	N/A	N/A	-
WS04	0.30 – 0.60	MADE GROUND	Non-hazardous	N/A	N/A	-
WS06	0.30 – 0.60	MADE GROUND	Non-hazardous	N/A	N/A	-
WS08	0.00 – 0.20	MADE GROUND	Non-hazardous	N/A	N/A	-
WS10	1.00 – 1.30	MADE GROUND	Non-hazardous	N/A	N/A	-
WS12	0.30 – 0.60	MADE GROUND	Non-hazardous	N/A	N/A	-

Based on the waste classification database assessment, the majority of the made ground soils have been classified as **non-hazardous.** The sample of the made ground topsoil has also 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
Crush	The crushed concrete is site derived from structures which had not been used for potentially contaminative activities. These should be subject to an asbestos survey and removal of asbestos as required, prior to demolition and crushing of structures. Assuming the above criteria are met, with materials containing no asbestos or ACM, crushed concrete is considered to be inert without testing. Where samples of crushed concrete have been subject to totals testing this is likely to hazardous due to pH, and where subject to WAC testing, the sulphate and TDS limits are breached, this is to be expected due to the presence of concrete.
Made Ground from site levelling/foundations excavations/services excavations	Samples of made ground from across the site have been classified as non-hazardous and hazardous for off-site disposal purposes, although should be suitable for re-use on site if required under suitable exemptions/permits.

Waste Generation Source	Comments
Natural ground from site levelling/foundations excavations/services excavations	The Till may be considered suitable for re-use onsite as fill where the criteria of the WFD exception for re-use of naturally occurring soils can be met. Naturally occurring clean materials could also be exported to another site under the direct transfer scenario of the DoWCoP. Classified as non-hazardous and below inert WAC testing criteria for off-site disposal purposes.

General
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-complaint 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
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 and topsoil revealed three exceedances of benzo(a)pyrene and elevated lead in one sample.

The above is considered to pose a risk to human health and at this stage it is considered remedial measures are required in the form of a cover system comprising 600mm clean soils in private gardens and 450mm in soft landscaping areas. This will allow plants to be grown and prevent undesirable soils being brought to the surface. Further confirmatory testing of the topsoil would be prudent to determine what volume of these soils, if any, could be re-used as part of the development.

The ground gas risk assessment indicates that the site can be classified as NHBC Green and gas protective measures are not required.

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 the made ground soils to be non-hazardous. However, 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.

10.2 Geotechnical

Foundations
The most suitable foundations for the proposed residential homes are considered to be strip foundations, with minimum depths likley to range between 1.20m and 2.70m bgl. This will also account for the medium volume change potential clays, but foundations will also need to be deepened near trees and hedges in accordance with NHBC Chapter 4.2.

At 1.50m bgl, an allowable bearing capacity not exceeding 125kN/m^2 may be assumed increasing to 150kN/m^2 at 2.00m bgl.

Floor slabs
Suspended floor slabs may be adopted.

Concrete classification
DS1 AC1-S conditions prevail.

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 clay 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.

Drainage (SuDS)
The tests undertaken across the site indicate good drainage conditions, particularly in natural sand strata which was encountered at depth in some of the exploratory boreholes. Based on the infiltration rates obtained, on the order of 1.78x10^{-5} and 2.555x10^{-5} m/s, it is possible that drainage to SuDS features will

be feasible at the site. We recommend the design of SuDS is carried out in accordance with BRE 365 and CIRIA C753.

10.3 Further Work

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

- Tree survey by qualified arboriculturist.
- Detailed foundation design by a structural engineer, including foundation zonation plan and depth schedule.
- Design of Remedial Strategy and confirmation with the Local Authority.
- Implementation of the Remedial Strategy and verification of the remedial works.

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

12.0 REFERENCES

Association of Ground Investigation Specialists. 'Guidelines for Good Practice in Site Investigation'. Issue 2, March 2006.

Black, W.P.M. & Lister, N.W. The strength of clay fill subgrades, its prediction in relation to road performance Report LR889, TRRL. 1979.

BRE Special Digest 1: 'Concrete in Aggressive Ground' 3rd Ed 2005.

BRE Report BR211, Scivyer, C. 'Radon – Guidance on protective measures for new buildings' 2015 Edition.

BRE Digest, vols. 240 and 241 'Low-rise buildings on shrinkable clay soils'. 1993.

BRE Digest 298 'The influence of trees on house foundations in clay soils'. 1999.

BRE Digest 365 'Soakaway Design'. 2016.

BRE Report 391 "Specifying vibro stone columns". 2000.

BRE Report 414. 'Protective measures for housing on gas contaminated land. Building Research Establishment Report'. 2011.

BRE Report 465 'Cover Systems for Land Regeneration'. 2004.

BRE Report 470 'Working platforms for tracked plant: good practice guide to the design, installation, maintenance and repair of ground-supported working platforms'. 2004.

British Geological Survey Technical Report WD/97/34. 312pp. Environment Agency R&D Publication 8. 'The physical properties of major aquifers in England and Wales'. 1997.

British Geological Survey Technical Report WD/00/04. 234pp. Environment Agency R&D Publication 68 'The physical properties of minor aquifers in England and Wales'.

British Geological Survey 'The advanced soil geochemical atlas of England and Wales'. 2012.

BS 1377 'Method of Test for Soils for Civil Engineering Purposes'. 1990.

BS EN 1997-1. 'Eurocode 7 – Geotechnical design - Part 1: General rules'. Plus associated UK National Annex. 2004.

BS EN 1997-2. 'Eurocode 7 – Geotechnical design - Part 2: 'Geotechnical investigation and testing'. Plus associated UK National Annex. 2007.

BS 3882: 'Specification for topsoil'. 2015.

BS 5837: 'Trees in relation to design, demolition and construction Recommendations'. 2012.

BS 5930+A1:2020: 'Code of Practice for Site Investigations'. 2020.

BS 6031: 'Code of practice for earthworks'. 2009.

BS 8004: 'Code of practice for foundations'. 2015.

BS 8485+A1: 'Code of practise for the design of protective measures for methane and carbon dioxide ground gases for new buildings'. 2019.

BS 8500-1 AMD 2. Concrete. Complementary BS to BS EN 206. Part 1. 'Method of specifying and guidance for the specifier'. 2018.

BS 8576 'Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs)'. 2013.

BS 10175:2011+A2 'Investigation of Potentially Contaminated sites - code of practice'. 2017.

BS 10176:2020 'Taking soil samples for determination of volatile organic compounds (VOCs)'. 2020.

BS EN ISO 14688 'Geotechnical investigation and testing – Identification and classification of soil'. 2018.

BS EN ISO 14689 'Geotechnical investigation and testing – Identification and classification of rock'. 2018.

BS EN ISO 17892 'Geotechnical investigation and testing. Laboratory testing of soil.' Parts 1-12 :2018.

BULL ET AL. Promoting the Use of B(a)P as a Marker for PAH Exposure in UK Soils. February 2013.

CIRIA Special Publication SP32, PSA Civil Engineering Technical Guide 34, 'Construction over abandoned mine workings'. 1984.

CIRIA Special Publications 101-112, 'Remedial Treatment for Contaminated Land'. 1998.

CIRIA Special Publication 124, 'Barriers, liners and cover systems for containment and control of land contamination'. 1996.

CIRIA R143, 'The Standard Penetration Test (SPT): methods and use'. 1995.

CIRIA 149 'Protecting Development from Methane'. 1995.

CIRIA 150 'Methane Investigation Strategies'. 1995.

CIRIA 151 'Interpreting Measurements of Gas in the Ground'. 1995.

CIRIA 152 'Risk assessment for Methane and Other Gases from the Ground'. 1995.

CIRIA 552 'Contaminated Land Risk Assessment – A guide to good practice'. 2001.

CIRIA C659 'Assessing risks posed by hazardous ground gases to buildings.' 2006.

CIRIA C665 'Assessing Risks Posed by Hazardous Ground Gases to Buildings'. 2007.

CIRIA C681 'Unexploded Ordnance (UXO) A guide for the construction industry'. 2009.

CIRIA C716 'Remediating and mitigating risks from volatile organic compound (VOC) vapours from land affected by contamination'. 2012.

CIRIA C733 'Asbestos in Soil And Made Ground: A Guide To Understanding And Managing Risks'. 2014.

CIRIA C735 'Good Practice on The Testing and Verification of Protection Systems for Buildings Against Hazardous Ground Gases'. 2014.

CIRIA C748 'Guidance on the Use of Plastic Membranes as VOC Vapour Barriers'. 2014.

CIRIA C750 'Groundwater control: design and practice, second edition". 2016.

CIRIA C753 'The SuDS Manual'. 2015.

CIRIA C758 'Abandoned Mine Workings Manual'. 2019.

CL:AIRE and CIEH. 'Guidance on Comparing Soil Contamination Data with a Critical Concentration'. May 2008.

CL:AIRE 'The Definition of Waste: Development Industry Code of Practice'. Version 2. March 2011.

CL:AIRE RB17 'A Pragmatic Approach to Ground Gas Risk Assessment'. 2012.

CL:AIRE SP1010 'Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination'. Rev 2 2014.

CL:AIRE 'Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials – CAR-SOILTM'. 2016.

CL:AIRE 'Petroleum Hydrocarbons in Groundwater: Guidance on assessing petroleum hydrocarbons using existing hydrogeological risk assessment methodologies' Version 1. March 2017.

CULP, S.J., ET AL., A comparison of the tumours induced by coal tar and benzo[a]pyrene in a 2-year bioassay. Carcinogenesis. 1998.

DEFRA and the Environment Agency, CLR10 'Soil Guideline Value Reports for Individual Soil Contaminants'. 2002-2004.

DEFRA and the Environment Agency, CLR Report No 11 'Model Procedures for the Management of Contaminated Land'. 2004. [Withdrawn 2019.]

Department of the Environment, CLR Report No 1 'A framework for assessing the impact of contaminated land on groundwater and surface water'. 1994.

Department of the Environment, CLR Report No 2 'Guidance on Preliminary Site Inspection of Contaminated Land'. 1994.

Department of the Environment, CLR Report No 3 'Documentary research on Industrial Sites'. 1994.

Department of the Environment, CLR Report No 4 'Sampling Strategies for Contaminated Land'. 1994.

Department of the Environment Waste Management Paper No. 27. 'Landfill Gas: A Technical Memorandum Providing Guidance on the Monitoring and Control of Landfill Gas'. 1992.

Department of the Environment. 'Industry Profiles' - 48 separate publications available from The Stationery Office, London. 1995.

DETR. Circular: Contaminated Land. 2006.

EC Regulation 1272/2008 'The Classification, labelling and packaging of substances and mixtures (CLP)' 2008.

Environment Agency guidance - Land Contamination: Risk Management (LCRM). 2019.

Environment Agency 'Using Soil Guideline Values'. 2009.

Environment Agency, 'Updated Technical Background to the CLEA model'. 2009.

Environment Agency, 'Human health toxicological assessment of contaminants in soil'. 2009.

Environment Agency Hazardous Waste: 'Guidance on the classification and assessment of waste' WM3 ver 1.1 May 2018.

Environment Agency. 'Remedial Targets Methodology. Hydrogeological Risk Assessment for Land Contamination'. 2006.

Environment Agency & NHBC. R&D Publication 66. 'Guidance for the Safe Development of Housing on Land Affected by Contamination'. 2008.

Environment Agency. R&D Publication 20. 'Methodology for the Derivation of Remedial Targets for Soil and Groundwater to Protect Water Resources'. 1999.

Environment Agency Technical Guidance Note 01. Hydrogeological Risk Assessment for Landfills. [Withdrawn Feb 2016. Replaced with below].

Environment Agency and DEFRA 'Landfill developments: groundwater risk assessment for leachate'. 2016.

Environment Agency Petroleum Hydrocarbons in Groundwater 'Supplementary Guidance for Hydrogeological Risk Assessment'. 2009.

Environment Agency 'Groundwater protection: Principles and practice (GP3)'. 2013. [Superseded 2017 by www.gov.uk online guidance].

Environmental Permitting Guidance: version 3.1 'The Landfill Directive for the Environmental Permitting (England and Wales) Regulations'. 2010.

Environmental Quality Standards. 2008.

European Parliament Directive 2008/98/EC of the Council of 19 November 2008 on waste and repealing certain Directives. 2008.

European Parliament. Directive 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.

Ground Engineering. Wilson & Card 'Proposed method classifying gassing sites' /1999.

Hazardous Waste (England and Wales) Regulations. 2005.

Health & Safety Executive (HSE). 'Protection of Workers & the General Public during the Development of Contaminated Land'. 1991.

Health and Safety Executive (HSE). Control of Asbestos Regulations (CAR). 2012.

Highways Agency. Design Guidance for Road Pavement Foundations (Draft HD25). Interim Advice Note 73/06. Rev 1. Highway Agency, London. 2009. [Withdrawn 30th May 2017].

ICE Thomas Telford 'Applications of Dynamic Cone Penetrometer testing in East Anglia'. 1989.

Land Quality Press, Nathanail, C. P., McCaffrey, C., Gillett, A., Ogden, R. C. and Nathanail, J.F. 'The LQM/CIEH S4ULs for Human Health Risk Assessment.' 2015.

Landfill Directive 'Directive 1999/31/EC on the landfilling of waste'. 1999.

Japanese Geotechnical Society. Hatanaka and Uchida 'Empirical correlation between penetration resistance and effective friction of sandy soil'. Soils & Foundations, 36 (4), 1-9. 1996.

Manual of Contract Documents for Highway Works, Specification for Highway Works: Volume 1, Amendment August 2014. [Withdrawn 30th May 2017].

Manual of Contract Documents for Highway Works, Specification for Highways Works – Series 600 Earthworks November 2006. [Withdrawn 30th May 2017, Replacement unknown].

National Planning Policy Framework (NPPF). July 2018.

National Planning Policy Framework - Technical Guidance. March 2012.

NHBC Standards 2020, Part 1 'Introduction and Technical Requirements.' 2020.

NHBC Standards, Part 4 'Foundations.' 2020.

NHBC Standards. Chapter 4.1: Land Quality - Managing Ground Conditions. 2020.

NHBC. Boyle and Witherington. 'Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present.' Report No. 10627-R01(04). 2007.

Public Health England (PHE). Contaminated land information sheet: risk assessment approaches for polycyclic aromatic hydrocarbons (PAHs). September 2017.

Total Petroleum Hydrocarbon Criteria Working Group Volume 1 'Analysis of Petroleum Hydrocarbons in Environmental Media'. 1999.

Total Petroleum Hydrocarbon Criteria Working Group Volume 2 Composition of Petroleum Mixtures. May 1998.

Total Petroleum Hydrocarbon Criteria Working Group Volume 3 'Selection of Representative TPH Fractions Based on Fate and Transport Considerations'. July 1997.

Total Petroleum Hydrocarbon Criteria Working Group Volume 4 'Development of Fraction Specific Reference Doses (RfDs) and Reference Concentrations (RfCs) for Total Petroleum Hydrocarbons (TPH)'. 1997

Total Petroleum Hydrocarbon Criteria Working Group Volume 5 'Human Health Risk-Based Evaluation of Petroleum Release Sites: Implementing the Working Group Approach' June 1999.

SEPA 'Land remediation and waste management guidelines' publication date unknown.

UK Drinking Water Standards: Water Supply (Water Quality) Regulations 1989 (SI 1989/1147) and Water Supply (Water Quality) Regulations 2000 (SI 2000/3184).

UKTAG. Updated recommendations on environmental standards. River Basin Management (2015-21). UK Technical Advisory Group on the Water Framework Directive. November 2013 (updated January 2018).

UKTAG-WFD. UKTAG River & Lake Assessment Method, Specific Pollutants (Metals), Metal Bioavailability Assessment Tool (M-BAT). Water Framework Directive – United Kingdom Technical Advisory Group. 2014.-

UKWIR Report 10/WM/03/21 2010 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites' 2010.

Water Framework Directive, 2000.

Water UK HBF. Contaminated Land Assessment Guidance. Water UK and the Home Builders Federation.

DRAWINGS

Boundary Key

- Retaining masonry wall to SE. Detail
- 900mm - Metal powder coated railings
- 900mm - Masonry dwarf wall, with piers and metal powder coated railing infills

NOTES

- All dimensions and levels are to be checked on site.
- Any discrepancies are to be reported to the architect before any work commences
- This drawing shall not be scaled to ascertain any dimensions. Work to figured dimensions only.
- This drawing shall not be reproduced without express written permission from AEW.
- Title overlay drawings and ownership boundaries are produced using all reasonable endeavors. AEW cannot be responsible for the accuracy or scale discrepancy of base plans supplied to them.
- All works are to be undertaken in accordance with Building Regulations and the latest British Standards.
- All proprietary materials and products are to be used strictly in accordance with the manufacturers recommendations.

This drawing contains the following model files: -

12191-XX-XX-M3-A-0001 [P0.1] [S0]

CDM 2015

Client notified of duties:

Principal Designer:

Unless noted below, all known hazards have been highlighted on the drawing:

N

0 2 4 6 8 10m

Scale @ 1:200

Schedule Of Accommodation

Type	Area	Count
3B5P 2 Storey Townhouse	96m² Approx	9
4B7P 3 Storey Townhouse	121m² Approx	9
1B1P Walk Up Apartments	41m² Approx	6
	Total	24

REV	Date	Drawn by: -	Checked by: -
P6	05.02.21	DS	CK
Schedule updated			
P5	02.02.21	DS	CK
Schedule Added			
P4	29.01.2021	DS	CS
Housing mix updated following planning feedback			
P3	16.12.2020	DAL	CK
Boundary Treatments Added			
P3	16.12.2020	DAL	CK
Boundary Treatments Added			
P2	09.12.2020	DAL	CK
Issued for Information			
P1	04.12.2020	DS	CS
Issued for Information			

Status: S2 — Purpose of Issue: For Comment

drawing stage: **Feasibility**

client: **Mosscare St Vincent's**

project: **Parkmount Street**

drawing title: **Proposed Site Plan**

date: 04.12.2020 — drawn: DS

scale @ A0: As indicated — checked: CS

Rev: **P6**

Dwg No: **12191-AEW-XX-XX-DR-A-0003**

aew architects
0161 214 4370
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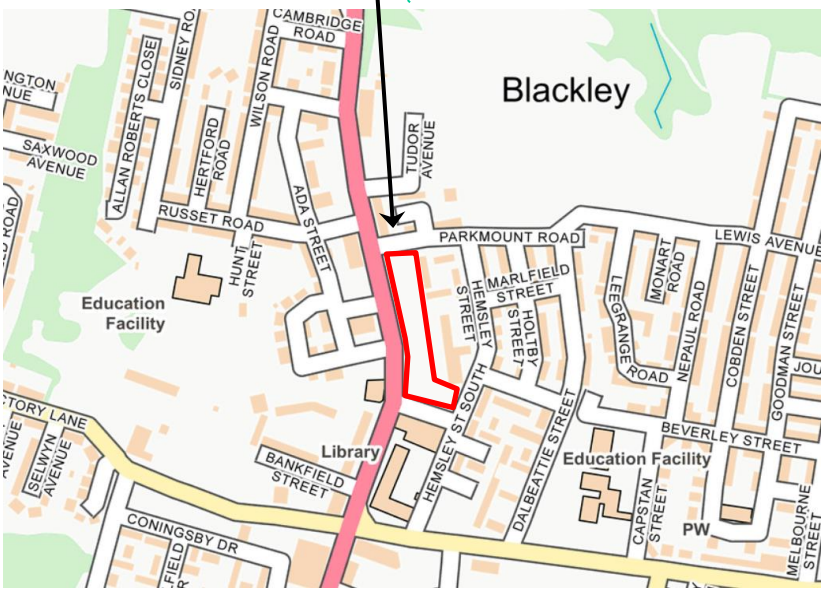
SITE LOCATION

NEAREST POSTCODE: M9 4AB



REV	DATE	DESCRIPTION	BY	CKD

BROWNFIELD SOLUTIONS LTD
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

CLIENT
CLIENT

PROJECT TITLE
PARKMOUNT ROAD, MANCHESTER

DRAWING TITLE
SITE LOCATION PLAN

DRAWING No.	REVISION	SCALE	DATE
C4657/01	-	NTS	11/11/21

DRAWN BY	CHECKED BY
SD	LC

PARKMOUNT ROAD

RESIDENTIAL HOUSING

MATURE TREES

FOOTPATH

KEY

APPROXIMATE SITE BOUNDARY

REV	DATE	DESCRIPTION	BY	CKD

BROWNFIELD SOLUTIONS LTD
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

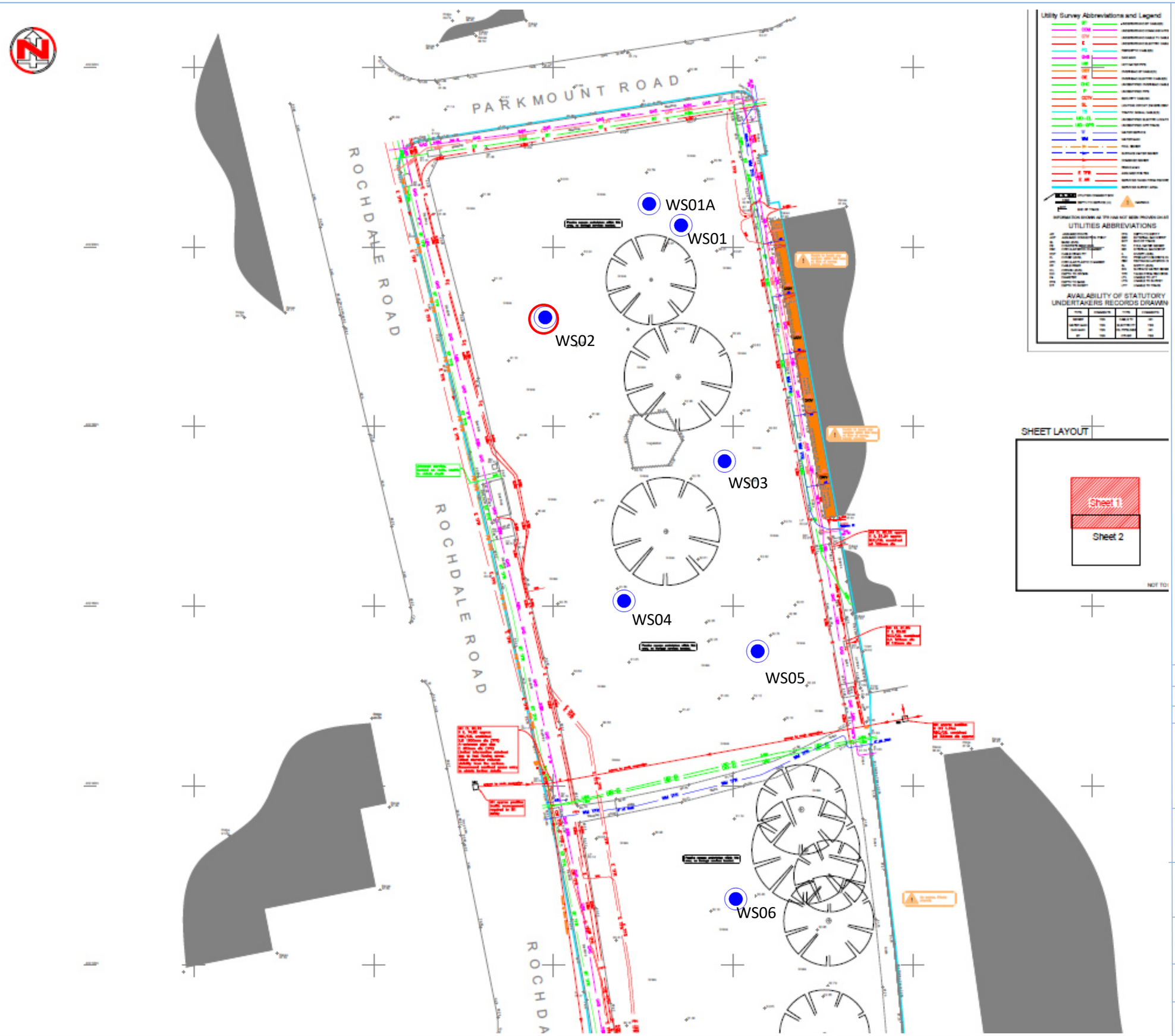
CLIENT
MOSSCARE ST VINCENT'S HOUSING GROUP

PROJECT TITLE
PARKMOUNT ROAD, MANCHESTER

DRAWING TITLE
SITE FEATURESPLAN

DRAWING No.	REVISION	SCALE	DATE
C4657/03		NTS	14/12/21

DRAWN BY	CHECKED BY
MS	LC



KEY

WINDOW SAMPLE BOREHOLE

BOREHOLE INSTALLATION

Location	Depth of Made Ground (m)
WS01	1.10
WS01A	2.00
WS02	1.20
WS03	1.70
WS04	2.20
WS05	2.00
WS06	2.10
WS07	2.30
WS08	2.60
WS09	2.00
WS10	2.20
WS11	1.60
WS12	1.50

REV	DATE	DESCRIPTION	BY	CKD

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GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

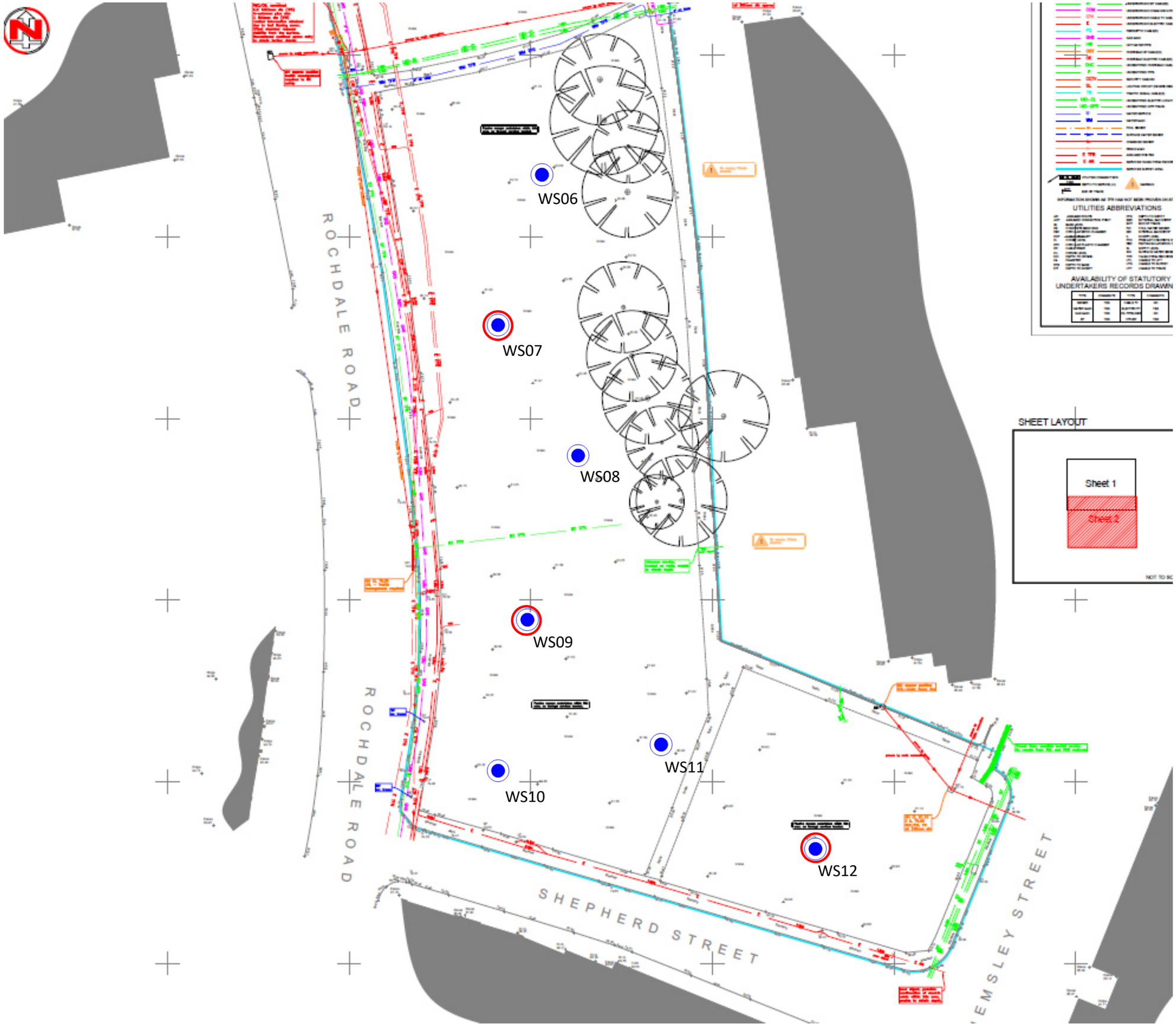
CLIENT
MOSSCARE ST VINCENT'S HOUSING GROUP

PROJECT TITLE
PARKMOUNT ROAD, MANCHESTER

DRAWING TITLE
PROPOSED EXPLORATORY LOCATION PLAN PAGE 1/2

DRAWING No.	REVISION	SCALE	DATE
C4657/03		NTS	14/12/21

DRAWN BY	CHECKED BY
MS	LC



KEY

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WS07	2.30
WS08	2.60
WS09	2.00
WS10	2.20
WS11	1.60
WS12	1.50

REV	DATE	DESCRIPTION	BY	CKD

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PROJECT TITLE
PARKMOUNT ROAD, MANCHESTER

DRAWING TITLE
PROPOSED EXPLORATORY LOCATION PLAN PAGE 2/2

DRAWING No.	REVISION	SCALE	DATE
C4657/03		NTS	14/12/21

DRAWN BY	CHECKED BY
MS	LC

APPENDIX A

BSL Methodology and Guidance

BSL Methodology and Guidance – Geo-Environmental Assessment Reports

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.

Desk Studies are written in broad agreement with BS 10175:2011+A2:2017. The first stage of a two-staged investigation and assessment of a site is the Preliminary Investigation (BS 10175:2011+A2:2017), often referred to as a Phase 1 Desk Study Assessment, comprising a desk study and walk-over survey, which culminates in the Preliminary Risk Assessment. A preliminary conceptual site model (CSM) is developed. From this are identified any 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.

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 the exploratory, main and supplementary Investigations described in BS 10175:2011+A2:2017.

Legislative Background

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 (England) Regulations 2000;
- The DETR circular 02/2000 Environmental Protection Act 1990: Part IIA Contaminated Land.

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;
- **Receptor** - a receptor that may be harmed, for example the water environment, humans and water.

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 SPR 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, Contaminated Land: Implementation of Part IIA of the Environmental Protection Act 1990.
- CLR11 – Model Procedures.
- Brownfields – Managing the development of previously developed land – A client's guide, CIRIA 2002.
- DEFRA and Environment Agency publications CLR7 – 10, supported by the TOX guides and SGV guides, dated March 2002.
- Environment Agency technical advice to third parties on Pollution of Controlled Waters for Part IIA of the EPA1990, May 2002.
- Contamination and Environmental Matters - Their implications for Property Professionals (2nd Edition RICS Nov 2003).
- BS 10175:2011+A2:2017.

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).
- Health and Safety at Work Act.

Contaminated Land Risk Assessment

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

CLR11 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 CLR11, three tiers of risk assessment exist - Preliminary, Generic Quantitative and Detailed Quantitative.

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:

- **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;

- **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;

- **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;

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

The severity is also classified using a system based on CIRIA C552. 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	No risk			

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 and no further action is required.

Ground Gas Guidance

Redevelopment on brownfield sites is an ever increasing occurrence, including those sites where a potential ground gas issue is present.

BS8485:2015+A1:2019 and CIRIA C665 is the current guidance which gives up-to-date advice on all aspects of ground gas. It outlines good practice in investigation, the collection of relevant data and monitoring programmes in a risk-based approach to gas contaminated land. 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.

CIRIA C665 and the advice it contains has been prepared to be generally consistent with CLR11 *Model Procedures for the management of land contamination* (Defra and Environment Agency, 2004a). The aim of CIRIA C665 is a consistent approach to decision making, particularly relating to the scope of protective design measures on a site specific basis.

Legislative Framework
CIRIA C665 provides technical guidance however also recognises 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* (DETR, 2000a).

Frequency and Duration of Monitoring
The monitoring period for a specific site covers the "worst case" scenario. A "worst case" scenario will 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.

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 (Flats)	2 months	3 months	6 months	12 months	24 months
	High (Residential with Gardens)	3 months	6 months	6 months	12 months	24 months

Typical/idealised frequency of monitoring

		Generation of Potential Source				
		Very Low	Low	Moderate	High	Very High
Sensitivity of Development	Low (Commercial)	4	6	6	12	12
	Moderate (Flats)	6	6	9	12	24
	High (Residential with Gardens)	6	9	12	24	24

Note

1 NHBC guidance also recommends this period of monitoring (Boyle and Witherington, 2007).
2 There is no industry consent over "high", "medium" or "low" generation potential of source.
3 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.

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 and controlled waters (surface and ground waters).

The purpose of using 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; CLEA Model, toxicological reports and soil guideline values (SGV), 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, all of the original SGV's that were published have been withdrawn and publication of new SGV's commenced in 2009.

For determinands where no SGVs are available, S4UL values have been published using the CLEA 1.06 Model. These are the third set of generic assessment criteria generated by CIEH, and replace the previous two sets of GACs. The revised S4UL values are based on greater knowledge of relevant toxicology and further consideration of exposure frequencies.

No SGV or S4UL is available for lead as this is derived based on blood lead levels. 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. The C4SL values are based on a sandy loam with 6% Soil Organic Matter. These screening values were published by DEFRA for Part 2A use, although with the dual purpose for use under planning. However these have not been officially accepted by Local Government for use under planning. 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
- Current UK SGV's
- 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 more detailed investigation, including the deriving of site specific values to better define the risk and to design appropriate remedial measures.

			Proposed End Use														
			Residential with Homegrown Produce			Residential without Homegrown Produce			Commercial			Public Open Space (POS) resi			Public Open Space (POS) park		
Source	Contaminant	Unit															
		SOM (%)	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6
LQM S4UL	Arsenic	mg/kg	37	37	37	40	40	40	640	640	640	79	79	79	170	170	170
LQM S4UL	Cadmium	mg/kg	11	11	11	85	85	85	190	190	190	120	120	120	532	532	532
LQM S4UL	Chromium (III)	mg/kg	910	910	910	910	910	910	8600	8600	8600	1500	1500	1500	33000	33000	33000
LQM S4UL	Chromium (VI)	mg/kg	6	6	6	6	6	6	33	33	33	7.7	7.7	7.7	220	220	220
LQM S4UL	Copper	mg/kg	2400	2400	2400	7100	7100	7100	68000	68000	68000	12000	12000	12000	44000	44000	44000
C4SL	Lead	mg/kg	200	200	200	330	330	330	2300	2300	2300	760	760	760	1400	1400	1400
LQM S4UL	Mercury, Elemental	mg/kg	1.2	1.2	1.2	1.2	1.2	1.2	58	58	58	16	16	16	30	30	30
LQM S4UL	Nickel	mg/kg	180	180	180	180	180	180	980	980	980	230	230	230	3400	3400	3400
LQM S4UL	Selenium	mg/kg	250	250	250	430	430	430	12000	12000	12000	1100	1100	1100	1800	1800	1800
LQM S4UL	Zinc	mg/kg	3700	3700	3700	40000	40000	40000	730000	730000	730000	81000	81000	81000	170000	170000	170000
LQM S4UL	Phenol (total)	mg/kg	280	550	1100	750	1300	2300	760	1500	3200	760	1500	3200	760	1500	3200
LQM S4UL	Acenaphthene	mg/kg	210	510	1100	3000	4700	6000	84000	97000	100000	15000	15000	15000	29000	30000	30000
LQM S4UL	Acenaphthylene	mg/kg	170	420	920	2900	4600	6000	83000	97000	100000	15000	15000	15000	29000	30000	30000
LQM S4UL	Anthracene	mg/kg	2400	5400	11000	31000	35000	37000	520000	540000	540000	74000	74000	74000	150000	150000	150000
LQM S4UL	Benz(a)anthracene	mg/kg	7.2	11	13	11	14	15	170	170	180	29	29	29	49	56	62
LQM S4UL	Benzo(a)pyrene	mg/kg	2.2	2.7	3.0	3.2	3.2	3.2	35	35	36	5.7	5.7	5.7	11	12	13
LQM S4UL	Benzo(b)fluoranthene	mg/kg	2.6	3.3	3.7	3.9	4	4	44	44	45	7.1	7.2	7.2	13	15	16
LQM S4UL	Benzo(ghi)perylene	mg/kg	320	340	350	360	360	360	3900	4000	4000	640	640	640	1400	1500	1600
LQM S4UL	Benzo(k)fluoranthene	mg/kg	77	93	100	110	110	110	1200	1200	1200	190	190	190	370	410	440
LQM S4UL	Chrysene	mg/kg	15	22	27	30	31	32	350	350	350	57	57	57	93	110	120
LQM S4UL	Dibenz(a,h)anthracene	mg/kg	0.24	0.28	0.30	0.31	0.32	0.32	3.5	3.6	3.6	0.57	0.57	0.58	1.1	1.3	1.4
LQM S4UL	Fluoranthene	mg/kg	280	560	890	1500	1600	1600	23000	23000	23000	3100	3100	3100	6300	6300	6400
LQM S4UL	Fluorene	mg/kg	170	400	860	2800	3800	4500	63000	68000	71000	9900	9900	9900	20000	20000	20000
LQM S4UL	Indeno(1,2,3,cd)pyrene	mg/kg	27	36	41	45	46	46	500	510	510	82	82	82	150	170	180
LQM S4UL	Naphthalene	mg/kg	2.3	5.6	13	2.3	5.6	13	190	460	1100	4900	4900	4900	1200	1900	3000
LQM S4UL	Phenanthrene	mg/kg	95	220	440	1300	1500	1500	22000	22000	23000	3100	3100	3100	6200	62000	6300
LQM S4UL	Pyrene	mg/kg	620	1200	2000	3700	3800	3800	54000	54000	54000	7400	7400	7400	15000	15000	15000
LQM S4UL	Petroleum Hydrocarbons Aliphatic EC 5 - 6	mg/kg	42	78	160	42	78	160	3200	5900	12000	570000	590000	600000	95000	130000	180000
LQM S4UL	Petroleum Hydrocarbons Aliphatic EC 6 - 8	mg/kg	100	230	530	100	230	530	7800	17000	40000	600000	610000	620000	150000	220000	320000
LQM S4UL	Petroleum Hydrocarbons Aliphatic EC 8 - 10	mg/kg	27	65	150	27	65	150	2000	4800	11000	13000	13000	13000	14000	18000	21000
LQM S4UL	Petroleum Hydrocarbons Aliphatic EC 10 - 12	mg/kg	130	330	760	130	330	770	9700	23000	47000	13000	13000	13000	21000	23000	24000
LQM S4UL	Petroleum Hydrocarbons Aliphatic EC 12 - 16	mg/kg	1100	2400	4300	1100	2400	4400	59000	82000	90000	13000	13000	13000	25000	25000	26000
LQM S4UL	Petroleum Hydrocarbons Aliphatic EC 16 - 35	mg/kg	65000	92000	110000	65000	92000	110000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000
LQM S4UL	Petroleum Hydrocarbons Aliphatic EC 35 - 44	mg/kg	65000	92000	110000	65000	92000	110000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000
LQM S4UL	Petroleum Hydrocarbons Aromatic EC 5 - 7	mg/kg	70	140	300	370	690	1400	26000	46000	86000	56000	56000	56000	76000	84000	92000
LQM S4UL	Petroleum Hydrocarbons Aromatic EC 7 - 8	mg/kg	130	290	660	860	1800	3900	56000	110000	180000	56000	56000	56000	87000	95000	100000
LQM S4UL	Petroleum Hydrocarbons Aromatic EC 8 - 10	mg/kg	34	83	190	47	110	270	3500	8100	17000	5000	5000	5000	7200	8500	9300
LQM S4UL	Petroleum Hydrocarbons Aromatic EC 10 - 12	mg/kg	74	180	380	250	590	1200	16000	28000	34000	5000	5000	5000	9200	9700	10000
LQM S4UL	Petroleum Hydrocarbons Aromatic EC 12 -16	mg/kg	140	330	660	1800	2300	2500	36000	37000	38000	5100	5100	5000	10000	10000	10000
LQM S4UL	Petroleum Hydrocarbons Aromatic EC 16 - 21	mg/kg	260	540	930	1900	1900	1900	28000	28000	28000	3800	3800	3800	7600	7700	7800
LQM S4UL	Petroleum Hydrocarbons Aromatic EC 21 - 35	mg/kg	1100	1500	1700	1900	1900	1900	28000	28000	28000	3800	3800	3800	7800	7800	7900
LQM S4UL	Petroleum Hydrocarbons Aromatic EC 35 - 44	mg/kg	1100	1500	1700	1900	1900	1900	28200	28200	28200	3800	3800	3800	7800	7800	7900
LQM S4UL	Benzene	mg/kg	0.087	0.17	0.37	0.38	0.7	1.4	27	47	90	72	72	73	90	100	110
LQM S4UL	Toluene	mg/kg	130	290	660	880	1900	3900	56000	110000	180000	56000	56000	56000	87000	95000	100000
LQM S4UL	Ethyl Benzene	mg/kg	47	110	260	83	190	440	5700	13000	27000	24000	24000	25000	17000	22000	27000
LQM S4UL	Xylene - o	mg/kg	60	140	330	88	210	480	6600	15000	33000	41000	42000	43000	17000	24000	33000
LQM S4UL	Xylene - m	mg/kg	59	140	320	82	190	450	6200	14000	31000	41000	42000	43000	17000	24000	32000
LQM S4UL	Xylene - p	mg/kg	56	130	310	79	180	430	5900	14000	30000	41000	42000	43000	17000	23000	31000
CL:AIRE 2010	MTBE (methyl tert-butyl ether)	mg/kg	49	84	160	49	84	160	7900	13000	24000	49	84	160	49	84	160
LQM S4UL	Chloroethene (Vinyl Chloride)	mg/kg	0.00064	0.00087	0.0014	0.00077	0.001	0.0015	0.059	0.077	0.12	3.5	3.5	3.5	4.8	5	5.4
LQM S4UL	1,2-Dichloroethane (1,2-DCA)	mg/kg	0.0071	0.011	0.019	0.0092	0.013	0.023	0.67	0.97	1.7	29	29	29	21	24	28
LQM S4UL	1,1,1-Trichloroethane	mg/kg	8.8	1.8	39	9	18	40	660	1300	3000	14000	14000	14000	57000	76000	100000
LQM S4UL	1,1,2,2-Tetrachloroethane	mg/kg	1.6	3.4	7.5	3.9	8	17	270	550	11000	1400	1400	1400	1800	2100	2300
LQM S4UL	1,1,1,2-Tetrachloroethane	mg/kg	1.2	2.8	6.4	1.5	3.5	8.2	0.79	1.9	4.4	1400	1400	1400	1500	1800	2100
LQM S4UL	Tetrachloroethene (PCE)	mg/kg	0.18	0.39	0.9	0.18	0.4	0.92	19	42	95	1400	1400	1400	810	1100	1500
LQM S4UL	Tetrachloromethane (carbon tetrachloride)	mg/kg	0.026	0.056	0.13	0.026	0.056	0.13	2.9	6.3	14	890	920	950	190	270	400

			Proposed End Use														
Source	Contaminant	Unit	Residential with Homegrown Produce			Residential without Homegrown Produce			Commercial			Public Open Space (POS) resi			Public Open Space (POS) park		
		SOM (%)	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6
LQM S4UL	Trichloroethene **(TCE)**	mg/kg	0.016	0.034	0.075	0.017	0.036	0.08	1.2	2.6	5.7	120	120	120	70	91	120
LQM S4UL	Trichloromethane (chloroform)	mg/kg	0.91	1.7	3.4	1.2	2.1	4.2	99	170	350	2500	2500	2500	2600	2800	3100
LQM S4UL	Chlorobenzene	mg/kg	0.45	1	2.4	0.46	1	2.4	56	130	290	11000	13000	14000	1300	2000	2900
LQM S4UL	1, 2 Dichlorobenzene	mg/kg	23	55	130	24	57	130	2000	4800	11000	90000	95000	98000	24000	26000	51000
LQM S4UL	1, 3 Dichlorobenzene	mg/kg	0.4	1	2.3	0.44	1.1	2.5	30	73	170	300	300	300	390	440	470
LQM S4UL	1, 4 Dichlorobenzene	mg/kg	61	150	350	61	150	340	4400	10000	25000	17000	17000	17000	26000	36000	36000
LQM S4UL	1, 2, 3 Trichlorobenzene	mg/kg	1.5	3.6	8.6	1.5	3.7	8.8	102	250	590	1800	1800	1800	770	1100	1600
LQM S4UL	1, 2, 4 Trichlorobenzene	mg/kg	2.6	6.4	15	2.6	6.4	15	220	530	1300	15000	17000	19000	1700	2600	4000
LQM S4UL	1, 2, 3, 4 Trichlorobenzene	mg/kg	0.33	0.81	1.9	0.33	0.81	1.9	23	55	130	1700	1700	1800	280	580	860
LQM S4UL	1, 2, 3, 4 Tetrachlorobenzene	mg/kg	15	36	78	24	56	120	1700	3080	4400	830	830	830	1500	1600	1600
LQM S4UL	1, 2, 3, 5 Tetrachlorobenzene	mg/kg	0.66	1.6	3.7	0.75	1.9	4.3	49	120	240	78	79	79	110	120	130
LQM S4UL	1, 2, 4, 5 Tetrachlorobenzene	mg/kg	0.33	0.77	1.6	0.73	1.7	3.5	42	72	96	13	13	13	25	26	26
LQM S4UL	Pentachlorobenzene	mg/kg	5.8	12	22	19	30	38	640	770	830	100	100	100	190	190	190
LQM S4UL	Hexachlorobenze	mg/kg	1.8	3.3	4.9	4.1	5.7	6.7	110	120	120	16	16	16	30	30	30

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See LQM/CIEH S4ULs for Human Health Risk Assessment document for notes regarding derivation.

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 is 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	
WAC testing	Below inert WAC limit values:	Above inert WAC limit values:	Below hazardous WAC limit values	Above hazardous 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.

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

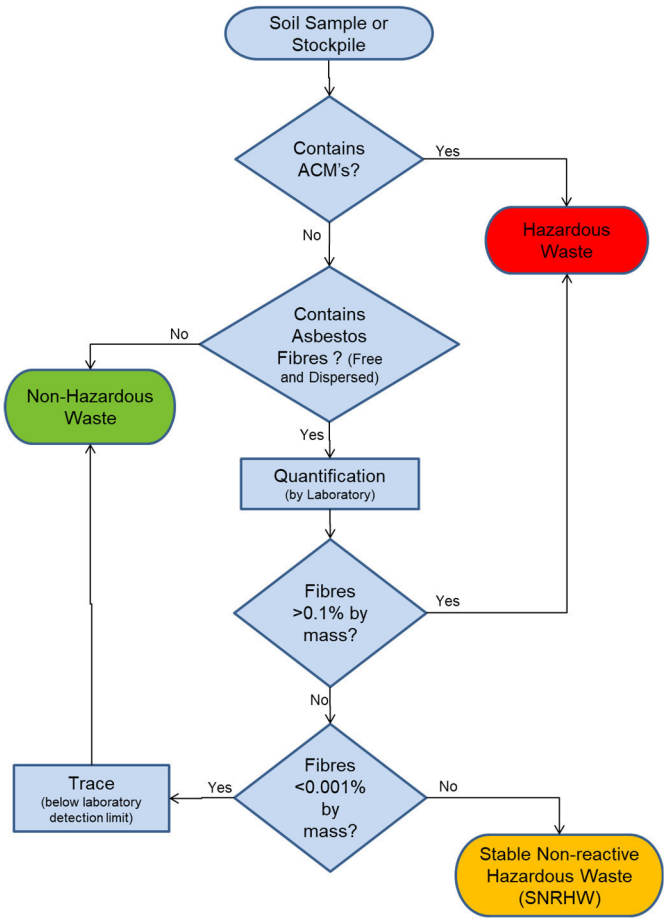
1. Environmental Permitting (England and Wales) Regulations 2010 (as amended) (EP Regulations), the Landfill Directive (1999/31/EC) and the subsequent Council Decisions.
2. Environment Agency Environmental Permitting Regulations: "Inert Waste Guidance- Standards and Measures for the Deposit of Inert 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 site[1]. 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/m^3.
- 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 (eg 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. These are at a "Beta" test stage and further publications will be provided in due course.

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	
	Recycle	Inert	SNR Hazardous	Hazardous		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 repeated handling and compaction.	Clean cover and a hard dig layer. A plan should be in place for future excavations as part of the Health and Safety File.

2 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.

3 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

Mining Report

The Coal Authority

Consultants

Coal Mining Report

1
Edward Grant Court
2 Hemsley Street South
Manchester
M9 4AB

Date of enquiry:	**11 November 2021**
Date enquiry received:	**11 November 2021**
Issue date:	**11 November 2021**
Our reference:	**51002715238001**
Your reference:	**C4657/2615/SD**

Consultants

Coal Mining Report

This report is based on and limited to the records held by the Coal Authority at the time the report was produced.

Client name

BROWNFIELD SOLUTIONS LIMITED

Enquiry address

1
Edward Grant Court
2 Hemsley Street South
Manchester
M9 4AB

Approximate position of property

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200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

www.groundstability.com

@coalauthority
/company/the-coal-authority
/thecoalauthority
/thecoalauthority

Section 1 – Mining activity and geology

Past underground mining
No past mining recorded.

Probable unrecorded shallow workings
None.

Spine roadways at shallow depth
No spine roadway recorded at shallow depth.

Mine entries
None recorded within 100 metres of the enquiry boundary.

Abandoned mine plan catalogue numbers
The following abandoned mine plan catalogue numbers intersect with some, or all, of the enquiry boundary:

16820		

Please contact us on 0345 762 6848 to determine the exact abandoned mine plans you require based on your needs.

Outcrops
No outcrops recorded.

Geological faults, fissures and breaklines
No faults, fissures or breaklines recorded.

Opencast mines
None recorded within 500 metres of the enquiry boundary.

Coal Authority managed tips
None recorded within 500 metres of the enquiry boundary.

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Section 2 – Investigative or remedial activity

Please refer to the 'Summary of findings' map (on separate sheet) for details of any activity within the area of the site boundary.

Site investigations

None recorded within 50 metres of the enquiry boundary.

Remediated sites

None recorded within 50 metres of the enquiry boundary.

Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

Mine gas

None recorded within 500 metres of the enquiry boundary.

Mine water treatment schemes

None recorded within 500 metres of the enquiry boundary.

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Section 3 – Licensing and future mining activity

Future underground mining
None recorded.

Coal mining licensing
None recorded within 200 metres of the enquiry boundary.

Court orders
None recorded.

Section 46 notices
No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

Withdrawal of support notices
The property is not in an area where a notice to withdraw support has been given.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

Payments to owners of former copyhold land
The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

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Section 4 – Further information

Based on the responses in this report, no further information has been highlighted.

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Section 5 – Data definitions

The datasets used in this report have limitations and assumptions within their results. For more guidance on the data and the results specific to the enquiry boundary, please **call us on 0345 762 6848** or **email us at groundstability@coal.gov.uk.**

Past underground coal mining

Details of all recorded underground mining relative to the enquiry boundary. Only past underground workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination, will be included.

Probable unrecorded shallow workings

Areas where the Coal Authority believes there to be unrecorded coal workings that exist at or close to the surface (less than 30 metres deep).

Spine roadways at shallow depth

Connecting roadways either, working to working, or, surface to working, both in-seam and cross measures that exist at or close to the surface (less than 30 metres deep), either within or within 10 metres of the enquiry boundary.

Mine entries

Details of any shaft or adit either within, or within 100 metres of the enquiry boundary including approximate location, brief treatment details where known, the mineral worked from the mine entry and conveyance details where the mine entry has previously been sold by the Authority or its predecessors British Coal or the National Coal Board.

Abandoned mine plan catalogue numbers

Plan numbers extracted from the abandoned mines catalogue containing details of coal and other mineral abandonment plans deposited via the Mines Inspectorate in accordance with the Coal Mines Regulation Act and Metalliferous Mines Regulation Act 1872. A maximum of 9 plan extents that intersect with the enquiry boundary will be included. This does not infer that the workings and/or mine entries shown on the abandonment plan will be relevant to the site/property boundary.

Outcrops

Details of seam outcrops will be included where the enquiry boundary intersects with a conjectured or actual seam outcrop location (derived by either the British Geological Survey or the Coal Authority) or intersects with a defined 50 metres buffer on the coal (dip) side of the outcrop. An indication of whether the Coal Authority believes the seam to be of sufficient thickness and/or quality to have been worked will also be included.

Geological faults, fissures and breaklines

Geological disturbances or fractures in the bedrock. Surface fault lines (British Geological Survey derived data) and fissures and breaklines (Coal Authority derived data) intersecting with the enquiry boundary will be included. In some circumstances faults, fissures or breaklines have been known to contribute to surface subsidence damage as a consequence of underground coal mining.

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Opencast mines

Opencast coal sites from which coal has been removed in the past by opencast (surface) methods and where the enquiry boundary is within 500 metres of either the licence area, site boundary, excavation area (high wall) or coaling area.

Coal Authority managed tips

Locations of disused colliery tip sites owned and managed by the Coal Authority, located within 500 metres of the enquiry boundary.

Site investigations

Details of site investigations within 50 metres of the enquiry boundary where the Coal Authority has received information relating to coal mining risk investigation and/or remediation by third parties.

Remediated sites

Sites where the Coal Authority has undertaken remedial works either within or within 50 metres of the enquiry boundary following report of a hazard relating to coal mining under the Coal Authority's Emergency Surface Hazard Call Out procedures.

Coal mining subsidence

Details of alleged coal mining subsidence claims made since 31 October 1994 either within or within 50 metres of the enquiry boundary. Where the claim relates to the enquiry boundary confirmation of whether the claim was accepted, rejected or whether liability is still being determined will be given. Where the claim has been discharged, whether this was by repair, payment of compensation or a combination of both, the value of the claim, where known, will also be given.

Details of any current 'Stop Notice' deferring remedial works or repairs affecting the property/site, and if so the date of the notice.

Details of any request made to execute preventative works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991. If yes, whether any person withheld consent or failed to comply with any request to execute preventative works.

Mine gas

Reports of alleged mine gas emissions received by the Coal Authority, either within or within 500 metres of the enquiry boundary that subsequently required investigation and action by the Coal Authority to mitigate the effects of the mine gas emission.

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Mine water treatment schemes

Locations where the Coal Authority has constructed or operates assets that remove pollutants from mine water prior to the treated mine water being discharged into the receiving water body.

These schemes are part of the UK's strategy to meet the requirements of the Water Framework Directive. Schemes fall into 2 basic categories: Remedial – mitigating the impact of existing pollution or Preventative – preventing a future pollution incident.

Mine water treatment schemes generally consist of one or more primary settlement lagoons and one or more reed beds for secondary treatment. A small number are more specialised process treatment plants.

Future underground mining

Details of all planned underground mining relative to the enquiry boundary. Only those future workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination will be included.

Coal mining licensing

Details of all licenses issued by the Coal Authority either within or within 200 metres of the enquiry boundary in relation to the under taking of surface coal mining, underground coal mining or underground coal gasification.

Court orders

Orders in respect of the working of coal under the Mines (Working Facilities and Support) Acts of 1923 and 1966 or any statutory modification or amendment thereof.

Section 46 notices

Notice of proposals relating to underground coal mining operations that have been given under section 46 of the Coal Mining Subsidence Act 1991.

Withdrawal of support notices

Published notices of entitlement to withdraw support and the date of the notice. Details of any revocation notice withdrawing the entitlement to withdraw support given under Section 41 of the Coal Industry Act 1994.

Payment to owners of former copyhold land

Relevant notices which may affect the property and any subsequent notice of retained interests in coal and coal mines, acceptance or rejection notices and whether any compensation has been paid to a claimant.

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APPENDIX C

Exploratory Hole Logs

Borehole Log

BROWNFIELD SOLUTIONS LTD

PROJECT NO:	C4657	**CO-ORDS:**	
PROJECT NAME:	PARKMOUNT ROAD	**LEVEL:**	
CLIENT:	MSV HOUSING	**DATES:**	09/12/21

Window Sampler No.		
WS01		
Sheet 1 of 1		
Hole Type		
WS		
Scale		
1:30		
Logged	**Checked**	
MS	LC	

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
		0.30-0.60	ES		0.25			MADE GROUND: Grass over soft dark brown slightly gravelly slightly sandy clay topsoil with rootlets. Sand is fine to coarse. Gravel is angular to subrounded fine to medium of mudstone and sandstone.
					1.10			MADE GROUND: Soft dark brown slightly sandy gravelly clay with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of brick, slate, limestone and mudstone. Cobbles are angular of brick and concrete up to 150mm in diameter.
								End of Borehole at 1.10m

1.0
2.0
3.0
4.0
5.0
6.0

Remarks

1. Hand dug pit down to 1.10m bgl.
2. No groundwater encountered
3. Obstruction encountered at 1.10m bgl.
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

Borehole Log

BROWNFIELD SOLUTIONS LTD

PROJECT NO:	C4657	**CO-ORDS:**	
PROJECT NAME:	PARKMOUNT ROAD	**LEVEL:**	
CLIENT:	MSV HOUSING	**DATES:**	09/12/21

Window Sampler No.	
WS01A	
Sheet 1 of 1	
Hole Type	
WS	
Scale	
1:30	
Logged	**Checked**
MS	LC

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description	
					0.25			MADE GROUND: Grass over soft dark brown slightly gravelly slightly sandy clay topsoil with rootlets. Sand is fine to coarse. Gravel is angular to subrounded fine to medium of mudstone and sandstone.	
		0.80-1.00	ES					MADE GROUND: Soft dark brown slightly sandy gravelly clay with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of brick, ash, slate, limestone and mudstone. Cobbles are angular of brick and concrete up to 150mm in diameter.	1.0
		1.20	SPT	N=7 (3,3/2,2,1,2)					
		2.00	D SPT	N=11 (1,1/2,3,3,3)	2.00			Stiff brown slightly gravelly slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mudstone.	2.0
		3.00	D SPT	N=18 (3,2/3,4,5,6)					3.0
		4.00	D SPT	N=19 (7,7/6,5,4,4)					4.0
					4.60			Light brown fine to coarse SAND.	
					4.80			Brown SILT.	
		5.00	D SPT	N=14 (4,3/2,4,4,4)	5.00			Stiff brown slightly gravelly slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mudstone.	5.0
					5.45			End of Borehole at 5.45m	6.0

Remarks

1. Hand dug pit down to 1.20m bgl.
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

Borehole Log

BROWNFIELD SOLUTIONS LTD		Window Sampler No.	WS02
			Sheet 1 of 1
PROJECT NO:	C4657	**CO-ORDS:**	**Hole Type** WS
PROJECT NAME:	PARKMOUNT ROAD	**LEVEL:**	**Scale** 1:30
CLIENT:	MSV HOUSING	**DATES:** 09/12/21	**Logged** MS / **Checked** LC

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description	
		0.30-0.60	ES		0.25			MADE GROUND: Grass over soft dark brown slightly gravelly slightly sandy clay topsoil with rootlets. Sand is fine to coarse. Gravel is angular to subrounded fine to medium of mudstone and sandstone.	
								MADE GROUND: Soft dark brown slightly sandy gravelly clay with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of brick, ash, slate, limestone and mudstone. Cobbles are angular of brick and concrete up to 150mm in diameter.	1.0
		1.20	D SPT	N=7 (1,0/2,2,2,1)	1.20			Firm grey mottled brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mudstone.	
		2.00	D SPT	N=10 (1,2/2,2,3,3)				*Becoming stiff at 2.00m bgl.*	2.0
		3.00	D SPT	N=18 (3,3/4,4,5,5)					3.0
		4.00	D SPT	N=15 (2,3/3,3,4,5)					4.0
		5.00	D SPT	N=18 (6,6/5,4,4,5)					5.0
					5.45			End of Borehole at 5.45m	6.0

Remarks

1. Hand dug pit down to 1.20m bgl.
2. Groundwater encountered at 2.20m bgl
3. Installation down to 4.50m bgl: 1.50m plain, 3.00m slotted.

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

Borehole Log

BROWNFIELD SOLUTIONS LTD

PROJECT NO:	C4657	**CO-ORDS:**	
PROJECT NAME:	PARKMOUNT ROAD	**LEVEL:**	
CLIENT:	MSV HOUSING	**DATES:**	09/12/21

Window Sampler No.	
WS03	
Sheet 1 of 1	
Hole Type	
WS	
Scale	
1:30	
Logged	**Checked**
MS	LC

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description	
					0.25			MADE GROUND: Grass over soft dark brown slightly gravelly slightly sandy clay topsoil with rootlets. Sand is fine to coarse. Gravel is angular to subrounded fine to medium of mudstone and sandstone.	
		0.40-0.60	ES		0.40			MADE GROUND: Soft dark brown slightly sandy gravelly clay with low cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of brick, ash, slate, limestone and mudstone. Cobbles are angular of brick and concrete up to 150mm in diameter.	
		1.20	SPT	N=16 (3,11/7,4,3,2)				MADE GROUND: Firm grey slightly sandy gravelly clay. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of brick, concrete, limestone and mudstone.	1.0
		1.70	D		1.70			Firm to stiff grey mottled brown slightly gravelly slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mudstone.	
		2.00	SPT	N=9 (1,1/2,2,3,2)					2.0
		2.50	D						
		3.00	D SPT	N=19 (3,3/4,4,5,6)				*Becoming stiff at 3.00m bgl.*	3.0
		4.00	D SPT	N=19 (4,4/4,5,5,5)					4.0
					4.45			End of Borehole at 4.45m	
									5.0
									6.0

Remarks

1. Hand dug pit down to 1.20m bgl.
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

Borehole Log

BROWNFIELD SOLUTIONS LTD		Window Sampler No.	WS04
			Sheet 1 of 1
PROJECT NO:	C4657	**CO-ORDS:**	**Hole Type** WS
PROJECT NAME:	PARKMOUNT ROAD	**LEVEL:**	**Scale** 1:30
CLIENT:	MSV HOUSING	**DATES:** 09/12/21	**Logged** MS / **Checked** LC

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description	
		0.30-0.60	ES		0.25			MADE GROUND: Grass over soft dark brown slightly gravelly slightly sandy clay topsoil with rootlets. Sand is fine to coarse. Gravel is angular to subrounded fine to medium of mudstone and sandstone.	
								MADE GROUND: Soft to firm dark grey slightly sandy gravelly clay. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of brick, limestone and mudstone.	1.0
		1.20	SPT	N=3 (0,2/1,0,1,1)					
		2.00	SPT	N=15 (3,6/5,4,3,3)				*Becoming stiff at 2.00m bgl.*	2.0
		2.20	D		2.20			Stiff grey mottled brown slightly gravelly slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mudstone.	
		3.00	D SPT	N=16 (2,3/3,4,4,5)					3.0
		4.00	D SPT	N=34 (3,4/5,6,10,13)				*Becoming very stiff at 4.00m bgl.*	4.0
					4.35			Light brown fine to coarse SAND.	
					4.45			End of Borehole at 4.45m	5.0
									6.0

Remarks

1. Hand dug pit down to 1.20m bgl.
2. Groundwater encountered at 2.20m bgl.
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

Borehole Log

BROWNFIELD SOLUTIONS LTD

PROJECT NO:	C4657	**CO-ORDS:**	
PROJECT NAME:	PARKMOUNT ROAD	**LEVEL:**	
CLIENT:	MSV HOUSING	**DATES:**	09/12/21

Window Sampler No.	
WS05	
Sheet 1 of 1	
Hole Type	
WS	
Scale	
1:30	
Logged	**Checked**
MS	LC

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description	
		0.30-0.60	ES		0.25			MADE GROUND: Grass over soft dark brown slightly gravelly slightly sandy clay topsoil with rootlets. Sand is fine to coarse. Gravel is angular to subrounded fine to medium of mudstone and sandstone.	
		1.20	SPT	N=21 (3,4/5,6,6,4)				MADE GROUND: Firm to stiff dark brown slightly sandy slightly gravelly clay. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of brick, concrete, limestone and mudstone.	1.0
					1.70			MADE GROUND: Grey and brown very sandy gravel. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of limestone and brick.	
		2.00	D SPT	N=11 (2,2/2,2,3,4)	2.00			Stiff grey mottled brown slightly gravelly slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mudstone.	2.0
		3.00	D SPT	N=11 (2,2/2,3,3,3)					3.0
		4.00	D SPT	N=27 (4,4/5,6,7,9)				*Becoming very stiff at 4.00m bgl.*	4.0
					4.45			End of Borehole at 4.45m	
									5.0
									6.0

Remarks

1. Hand dug pit down to 1.20m bgl.
2. Groundwater encountered at 1.70m bgl
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

Borehole Log

BROWNFIELD SOLUTIONS LTD		Window Sampler No.	WS06
			Sheet 1 of 1
PROJECT NO:	C4657	**CO-ORDS:**	**Hole Type** WS
PROJECT NAME:	PARKMOUNT ROAD	**LEVEL:**	**Scale** 1:30
CLIENT:	MSV HOUSING	**DATES:** 09/12/21	**Logged** MS / **Checked** LC

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description	
		0.30-0.60	ES		0.25			MADE GROUND: Grass over soft dark brown slightly gravelly slightly sandy clay topsoil with rootlets. Sand is fine to coarse. Gravel is angular to subrounded fine to medium of mudstone and sandstone.	
		1.20	SPT	N=19 (12,11/6,4,4,5)				MADE GROUND: Soft to firm dark grey slightly sandy gravelly clay. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of brick, limestone and mudstone.	1.0
		2.00	D SPT	N=8 (1,1/2,2,2,2)	2.10			Stiff grey mottled brown slightly gravelly slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mudstone.	2.0
		3.00	D SPT	N=11 (2,2/2,2,3,4)					3.0
		4.00	D SPT	N=32 (5,5/6,7,8,11)				*Becoming very stiff at 4.00m bgl.*	4.0
		5.00	D SPT	N=21 (3,3/4,4,5,8)					5.0
					5.45			End of Borehole at 5.45m	6.0

Remarks

1. Hand dug pit down to 1.20m bgl.
2. Groundwater encountered at 2.10m bgl.
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

Borehole Log

BROWNFIELD SOLUTIONS LTD		Window Sampler No.	WS07
			Sheet 1 of 1
PROJECT NO:	C4657	**CO-ORDS:**	**Hole Type** WS
PROJECT NAME:	PARKMOUNT ROAD	**LEVEL:**	**Scale** 1:30
CLIENT:	MSV HOUSING	**DATES:** 09/12/21	**Logged** MS / **Checked** LC

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
		0.30-0.60	ES		0.25			MADE GROUND: Grass over soft dark brown slightly gravelly slightly sandy clay topsoil with rootlets. Sand is fine to coarse. Gravel is angular to subrounded fine to medium of mudstone and sandstone.
		1.20	SPT	N=13 (3,2/1,3,4,5)				MADE GROUND: Soft to firm dark grey slightly sandy gravelly clay. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of brick, limestone and mudstone.
		2.00	SPT	N=16 (5,7/6,5,3,2)				
		2.40	D		2.30			Stiff grey mottled brown slightly gravelly slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mudstone.
		3.00	D SPT	N=18 (3,3/4,4,5,5)				
		4.00	D SPT	N=25 (3,4/5,6,6,8)	4.20			Light brown fine to coarse SAND.
					4.45			End of Borehole at 4.45m

1.0 2.0 3.0 4.0 5.0 6.0

Remarks

1. Hand dug pit down to 1.20m bgl.
2. Groundwater encountered at 2.30m bgl
3. Installation down to 2.00m bgl: 1.00m plain, 1.00m slotted.

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

Borehole Log

BROWNFIELD SOLUTIONS LTD

PROJECT NO:	C4657	**CO-ORDS:**	
PROJECT NAME:	PARKMOUNT ROAD	**LEVEL:**	
CLIENT:	MSV HOUSING	**DATES:**	08/12/21

Window Sampler No.	
WS08	
Sheet 1 of 1	
Hole Type	
WS	
Scale	
1:30	
Logged	**Checked**
MS	LC

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description	
		0.00-0.20	ES					MADE GROUND: Grass over soft dark brown slightly gravelly slightly sandy clay topsoil with rootlets. Sand is fine to coarse. Gravel is angular to subrounded fine to medium of mudstone and sandstone.	
		0.30-0.60	ES		0.20			MADE GROUND: Soft to firm dark brown slightly sandy gravelly clay. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of brick, limestone and mudstone.	
		1.00-1.30	ES						1.0
		1.20	SPT	N=7 (4,4/3,2,1,1)				*Becoming firm at 1.20m bgl.*	
		2.00	SPT	N=18 (3,6/6,5,4,3)				*Becoming stiff at 2.00m bgl.*	2.0
		2.60	D		2.60			Stiff grey mottled brown slightly gravelly slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mudstone.	
		3.00	SPT	N=12 (2,2/2,3,3,4)					3.0
		3.50	D						
		4.00	SPT	N=23 (4,4/4,5,6,8)				*Becoming very stiff at 4.00m bgl.*	4.0
		5.00	D SPT	N=29 (3,3/4,4,8,13)					5.0
					5.30			Dense light brown fine to coarse SAND.	
					5.45			End of Borehole at 5.45m	
									6.0

Remarks

1. Hand dug pit down to 1.20m bgl.
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

Borehole Log

BROWNFIELD SOLUTIONS LTD

PROJECT NO:	C4657	**CO-ORDS:**	
PROJECT NAME:	PARKMOUNT ROAD	**LEVEL:**	
CLIENT:	MSV HOUSING	**DATES:**	08/12/21

Window Sampler No.		
WS09		
Sheet 1 of 1		
Hole Type		
WS		
Scale		
1:30		
Logged	**Checked**	
MS	LC	

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description	
		0.30-0.60	ES		0.25			MADE GROUND: Grass over soft dark brown slightly gravelly slightly sandy clay topsoil with rootlets. Sand is fine to coarse. Gravel is angular to subrounded fine to medium of mudstone and sandstone.	
								MADE GROUND: Soft dark brown slightly sandy gravelly clay. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of brick, limestone and mudstone.	1.0
		1.20	SPT	N=5 (4,3/2,1,1,1)					
		2.00	D		2.00				2.0
			SPT	N=10 (2,2/2,2,3,3)				Stiff grey mottled brown slightly gravelly slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mudstone.	
		3.00	D						3.0
			SPT	N=22 (3,3/4,5,6,7)					
		3.80	SPT	N=30 (4,5/6,6,8,10)					
		4.00	D						4.0
		4.50	SPT	N=48 (8,10/11,12,13,12)	4.60			Dense light brown fine to coarse SAND.	
		5.00	D						5.0
					5.45			End of Borehole at 5.45m	
									6.0

Remarks

1. Hand dug pit down to 1.20m bgl.
2. No groundwater encountered
3. Installation down to 2.00m bgl: 1.00m plain, 1.00m slotted.

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

Borehole Log

BROWNFIELD SOLUTIONS LTD

PROJECT NO:	C4657	**CO-ORDS:**	
PROJECT NAME:	PARKMOUNT ROAD	**LEVEL:**	
CLIENT:	MSV HOUSING	**DATES:**	08/12/21

Window Sampler No.		
WS10		
Sheet 1 of 1		
Hole Type		
WS		
Scale		
1:30		
Logged	**Checked**	
MS	LC	

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description	
		0.30-0.60	ES		0.25			MADE GROUND: Grass over soft dark brown slightly gravelly slightly sandy clay topsoil with rootlets. Sand is fine to coarse. Gravel is angular to subrounded fine to medium of mudstone and sandstone.	
					0.90			MADE GROUND: Dark brown slightly clayey very sandy fine to coarse angular to subrounded gravel with a low cobble content. Sand is fine to coarse. Gravel is of brick, concrete, plastic, sandstone and mudstone. Cobbles are angular of brick upto 150mm in diameter.	
		1.00-1.30	ES		1.00			MADE GROUND: Black sandy angular to subrounded fine to coarse gravel of ash, mudstone and sandstone. Sand is fine to coarse.	1.0
		1.20	SPT	N=7 (4,4/3,1,2,1)	1.30			MADE GROUND: Grey and brown clayey sand and gravel. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of brick, concrete, slate, wood, limestone and mudstone.	
		2.00	SPT	N=2 (1,1/0,1,0,1)				MADE GROUND: Soft dark grey slightly sandy gravelly clay. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of brick, limestone and mudstone.	2.0
		2.20	D		2.20			Firm to stiff grey mottled brown slightly gravelly slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mudstone.	
		3.00	D SPT	N=8 (1,1/1,2,2,3)					3.0
					3.80			Dense light brown fine to coarse SAND.	
		4.00	D SPT	N=20 (3,3/4,6,5,5)					4.0
		5.00	SPT	N=20 (3,4/5,4,5,6)					5.0
		5.10	D		5.10			Stiff grey mottled brown slightly gravelly slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mudstone.	
					5.45			End of Borehole at 5.45m	6.0

Remarks

1. Hand dug pit down to 1.20m bgl.
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

Borehole Log

BROWNFIELD SOLUTIONS LTD		Window Sampler No.	WS11
			Sheet 1 of 1
PROJECT NO:	C4657	**CO-ORDS:**	**Hole Type** WS
PROJECT NAME:	PARKMOUNT ROAD	**LEVEL:**	**Scale** 1:30
CLIENT:	MSV HOUSING	**DATES:** 08/12/21	**Logged** MS / **Checked** LC

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description	
		0.30-0.60	ES		0.30			MADE GROUND: Grass over soft dark brown slightly gravelly slightly sandy clay topsoil with rootlets. Sand is fine to coarse. Gravel is angular to subrounded fine to medium of mudstone and sandstone.	
		0.80-1.00	ES		0.80			MADE GROUND: Dark brown slightly clayey very sandy angular to subrounded fine to coarse gravel with a low cobble content. Sand is fine to coarse. Gravel is of brick, concrete, plastic, sandstone and mudstone. Cobbles are angular of brick upto 150mm in diameter.	
		1.20	SPT	N=5 (4,3/2,1,1,1)	1.00			MADE GROUND: Soft black slightly sandy gravelly clay. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of brick, limestone, glass and mudstone.	1.0
					1.60			MADE GROUND: Grey and brown sand and gravel. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of brick, concrete, limestone and mudstone.	
		2.00	D SPT	N=7 (1,1/1,2,2,2)				Firm to stiff grey mottled brown slightly gravelly slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mudstone.	2.0
		3.00	D SPT	N=17 (3,3/3,4,4,6)				*Becoming stiff at 3.00m bgl.*	3.0
		4.00	D SPT	N=24 (4,4/5,5,6,8)					4.0
		4.50 4.60	D SPT	N=35 (4,6/8,9,8,10)	4.40			Dense light brown fine to coarse SAND.	
					5.05			End of Borehole at 5.05m	5.0
									6.0

Remarks

1. Hand dug pit down to 1.20m bgl.
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

Borehole Log

BROWNFIELD SOLUTIONS LTD

PROJECT NO:	C4657	**CO-ORDS:**	
PROJECT NAME:	PARKMOUNT ROAD	**LEVEL:**	
CLIENT:	MSV HOUSING	**DATES:**	08/12/21

Window Sampler No.	
WS12	
Sheet 1 of 1	
Hole Type	
WS	
Scale	
1:30	
Logged	**Checked**
MS	LC

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description	
		0.30-0.60	D ES		0.25			MADE GROUND: Grass over soft dark brown slightly gravelly slightly sandy clay topsoil with rootlets. Sand is fine to coarse. Gravel is angular to subrounded fine to medium of mudstone and sandstone.	
					0.80			MADE GROUND: Dark brown and grey clayey sandy and gravel. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of brick, limestone, mudstone and sandstone.	
		1.20	D SPT	N=11 (7,5/4,3,2,2)				MADE GROUND: Black and grey slightly clayey sandy and gravel. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of ash, brick, wood, limestone, mudstone and sandstone.	1.0
		1.50	D		1.50			Firm to stiff grey mottled brown slightly gravelly slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mudstone.	
		2.00	D SPT	N=13 (3,3/3,3,3,4)					2.0
		2.50	D						
					2.90			Light brown fine to coarse SAND. *Becoming dense at 3.00m bgl.*	
		3.00	D SPT	N=40 (5,7/8,10,11,11)					3.0
		3.80	SPT	N=31 (11,12/11,8,6,6)					
		4.00	D						4.0
					4.80			Stiff brown SILT.	
		5.00	D SPT	N=17 (3,3/4,4,4,5)					5.0
					5.45			End of Borehole at 5.45m	
									6.0

Remarks

1. Hand dug pit down to 1.20m bgl.
2. No groundwater encountered
3. Installation down to 5.00m bgl: 3.00m plain, 2.00m slotted.

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 D

Chemical Testing Results

Human Health Assessment Summary					Soil Type:						
					Location:	WS01	WS04	WS06	WS08	WS10	WS12
					Depth:	0.30-0.60	0.30-0.60	0.30-0.60	0.00-0.20	1.00-1.30	0.30-0.60
Contaminant	GAC (mg/kg)	No. Samples	Min. Value	Max. Value	No. Samples ≥GAC						
Moisture Content	-	6	14.00	32.00	-	18	14	15	32	22	22
Soil Organic Matter	-	6	3.30	8.40	-	3.6	4.0	3.3	8.4	4.5	3.4
pH	-	6	6.70	9.30	-	8.0	7.9	8.2	6.7	7.9	9.3
Water Soluble Sulphate (2:1 Leachate Equivalent)	-	0	0.00	<LOD	-						
Arsenic	37	6	11.00	19.00	0	18.0	13	13	11	19	14
Cadmium	11	6	< LOD	1.60	0	< 0.2	0.90	< 0.2	0.50	1.60	< 0.2
Chromium (III)	910	6	15.00	24.00	0	24.0	17	19	15	19	19
Hexavalent Chromium (VI)	6	6	< LOD	<LOD	0	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Copper	2400	6	43.00	90.00	0	58.0	52	43	46	90	54
Lead	210	6	120.00	1200.00	2	210.0	130	120	170	1200	130
Mercury	1.2	6	< LOD	0.30	0	< 0.3	< 0.3	0.3	< 0.3	< 0.3	< 0.3
Nickel	130	6	16.00	27.00	0	22.0	22	20	16	27	18
Selenium	250	6	< LOD	<LOD	0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc	3700	6	100.00	420.00	0	170.0	120	100	120	420	110
Cyanide (free)	26	0	0.00	<LOD	0						
Phenol (total)	1100	0	0.00	<LOD	0						
Naphthalene	13.0	6	< LOD	0.56	0	0.34	< 0.05	0.29	0.26	0.56	< 0.05
Acenaphthylene	920	6	< LOD	<LOD	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	1100	6	< LOD	1.70	0	0.93	< 0.05	1.70	0.29	0.23	0.52
Fluorene	860	6	< LOD	1.10	0	0.65	< 0.05	1.10	0.22	0.22	0.37
Phenanthrene	440	6	1.40	11.00	0	6.80	1.4	11.0	2.9	2.4	3.0
Anthracene	11000	6	0.37	2.70	0	1.30	0.37	2.70	0.73	0.53	0.71
Fluoranthene	890	6	2.90	18.00	0	9.60	2.9	18.0	7.0	3.6	4.9
Pyrene	2000	6	2.90	16.00	0	8.90	2.9	16.0	6.8	3.2	4.6
Benzo(a)anthracene	13.0	6	1.90	8.90	0	4.90	1.9	8.9	3.7	2.3	2.8
Chrysene	27	6	1.30	6.00	0	3.50	1.3	6.0	3.5	1.6	1.8
Benzo(b)fluoranthene	3.7	6	1.70	7.30	3	3.70	1.7	7.3	3.8	1.9	2.3
Benzo(k)fluoranthene	100	6	0.64	2.90	0	1.60	0.64	2.90	1.40	0.69	0.88
Benzo(a)pyrene	3.0	6	1.50	7.10	3	3.60	1.5	7.1	3.6	1.5	2.1
Indeno(1,2,3-cd)pyrene	41	6	0.94	3.80	0	1.90	0.94	3.80	1.90	0.99	1.20
Dibenz(a,h)anthracene	0.30	6	0.22	0.99	5	0.57	0.22	0.99	0.50	0.32	0.32
Benzo(ghi)perylene	350	6	1.00	4.40	0	2.30	1.00	4.40	2.20	1.20	1.40
Asbestos Detected (Detected or Not-Detected)	Y	6	-	0.00	0	N	N	N	N	N	N
Asbestos Quantification (% w/w)	0	0	1.00	<LOD	0						
Petroleum Hydrocarbons Aliphatic >EC5-EC6	160	0	0.00	<LOD	0						
Petroleum Hydrocarbons Aliphatic >EC6-EC8	530	0	0.00	<LOD	0						
Petroleum Hydrocarbons Aliphatic >EC8-EC10	150	0	0.00	<LOD	0						
Petroleum Hydrocarbons Aliphatic >EC10-EC12	760	0	0.00	<LOD	0						
Petroleum Hydrocarbons Aliphatic >EC12-EC16	4300	0	0.00	<LOD	0						
Petroleum Hydrocarbons Aliphatic >EC16-EC35	110000	0	0.00	<LOD	0						
Petroleum Hydrocarbons Aromatic >EC5-EC7	300	0	0.00	<LOD	0						
Petroleum Hydrocarbons Aromatic >EC7-EC8	660	0	0.00	<LOD	0						
Petroleum Hydrocarbons Aromatic >EC8-EC10	190	0	0.00	<LOD	0						
Petroleum Hydrocarbons Aromatic >EC10-EC12	380	0	0.00	<LOD	0						
Petroleum Hydrocarbons Aromatic >EC12-EC16	660	0	0.00	<LOD	0						
Petroleum Hydrocarbons Aromatic >EC16-EC21	930	0	0.00	<LOD	0						
Petroleum Hydrocarbons Aromatic >EC21-EC35	1700	0	0.00	<LOD	0						
Benzene	0.370	0	0.00	<LOD	0						
Toluene	660	0	0.00	<LOD	0						
Ethyl benzene	260	0	0.00	<LOD	0						
o-Xylene	330	0	0.00	<LOD	0						
m- & p-Xylene	630	0	0.00	<LOD	0						
MTBE	160	0	0.00	<LOD	0						
Mean Average SOM	**4.5**										
Mean Average pH	**8.0**										
	Residential with Homegrown Produce 6% SOM					**Values in RED are > the relevant GAC (Generic Assesment Criteria).**					
Job Number:	**C4657**										
Client:	**MSV HOUSING**										
Site:	**PARKMOUNT ROAD, MANCHESTER**										
Soil Group Type	**Made Ground**										

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Analytical Report Number : 21-29340

Project / Site name:	Parkmount Road, Manchester	**Samples received on:**	15/12/2021
Your job number:	C4657	**Samples instructed on/ Analysis started on:**	15/12/2021
Your order number:	C4656-2701-TM	**Analysis completed by:**	22/12/2021
Report Issue Number:	1	**Report issued on:**	22/12/2021
Samples Analysed:	6 soil samples		

Signed: A. Czerwińska

Agnieszka Czerwińska
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

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

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 21-29340
Project / Site name: Parkmount Road, Manchester
Your Order No: C4656-2701-TM

Lab Sample Number				2117876	2117877	2117878	2117879	2117880
Sample Reference				WS01	WS04	WS06	WS08	WS10
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30-0.60	0.30-0.60	0.30-0.60	0.00-0.20	1.00-1.30
Date Sampled				09/12/2021	09/12/2021	09/12/2021	09/12/2021	09/12/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	18	14	15	32	22
Total mass of sample received	kg	0.001	NONE	0.40	0.40	0.40	0.40	0.40

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

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.0	7.9	8.2	6.7	7.9
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	52	120	93	61	190
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.026	0.058	0.047	0.030	0.094
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	26.0	57.8	46.5	30.4	93.8
Organic Matter (automated)	%	0.1	MCERTS	3.6	4.0	3.3	8.4	4.5

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.34	< 0.05	0.29	0.26	0.56
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.93	< 0.05	1.7	0.29	0.23
Fluorene	mg/kg	0.05	MCERTS	0.65	< 0.05	1.1	0.22	0.22
Phenanthrene	mg/kg	0.05	MCERTS	6.8	1.4	11	2.9	2.4
Anthracene	mg/kg	0.05	MCERTS	1.3	0.37	2.7	0.73	0.53
Fluoranthene	mg/kg	0.05	MCERTS	9.6	2.9	18	7.0	3.6
Pyrene	mg/kg	0.05	MCERTS	8.9	2.9	16	6.8	3.2
Benzo(a)anthracene	mg/kg	0.05	MCERTS	4.9	1.9	8.9	3.7	2.3
Chrysene	mg/kg	0.05	MCERTS	3.5	1.3	6.0	3.5	1.6
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	3.7	1.7	7.3	3.8	1.9
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	1.6	0.64	2.9	1.4	0.69
Benzo(a)pyrene	mg/kg	0.05	MCERTS	3.6	1.5	7.1	3.6	1.5
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.9	0.94	3.8	1.9	0.99
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.57	0.22	0.99	0.50	0.32
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	2.3	1.0	4.4	2.2	1.2

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	50.5	16.9	91.8	38.9	21.2

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	18	13	13	11	19
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	0.9	< 0.2	0.5	1.6
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	24	17	19	15	19
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	24	17	19	16	19
Copper (aqua regia extractable)	mg/kg	1	MCERTS	58	52	43	46	90
Lead (aqua regia extractable)	mg/kg	1	MCERTS	210	130	120	170	1200
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	22	22	20	16	27
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	170	120	100	120	420

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

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 21-29340
Project / Site name: Parkmount Road, Manchester
Your Order No: C4656-2701-TM

Lab Sample Number				2117881
Sample Reference				WS12
Sample Number				None Supplied
Depth (m)				0.30-0.60
Date Sampled				09/12/2021
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	22
Total mass of sample received	kg	0.001	NONE	0.40

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

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	9.3
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	920
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.46
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	461
Organic Matter (automated)	%	0.1	MCERTS	3.4

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.52
Fluorene	mg/kg	0.05	MCERTS	0.37
Phenanthrene	mg/kg	0.05	MCERTS	3.0
Anthracene	mg/kg	0.05	MCERTS	0.71
Fluoranthene	mg/kg	0.05	MCERTS	4.9
Pyrene	mg/kg	0.05	MCERTS	4.6
Benzo(a)anthracene	mg/kg	0.05	MCERTS	2.8
Chrysene	mg/kg	0.05	MCERTS	1.8
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	2.3
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.88
Benzo(a)pyrene	mg/kg	0.05	MCERTS	2.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.2
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.32
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.4

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	26.9

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	14
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2
Chromium (III)	mg/kg	1	NONE	19
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	19
Copper (aqua regia extractable)	mg/kg	1	MCERTS	54
Lead (aqua regia extractable)	mg/kg	1	MCERTS	130
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	18
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	110

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

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number : 21-29340
Project / Site name: Parkmount Road, 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 *
2117876	WS01	None Supplied	0.30-0.60	Brown clay and loam with gravel and vegetation.
2117877	WS04	None Supplied	0.30-0.60	Brown clay and loam with gravel and vegetation.
2117878	WS06	None Supplied	0.30-0.60	Brown clay and loam with gravel and vegetation.
2117879	WS08	None Supplied	0.00-0.20	Brown clay and loam with gravel and vegetation.
2117880	WS10	None Supplied	1.00-1.30	Brown clay and sand with gravel and vegetation.
2117881	WS12	None Supplied	0.30-0.60	Brown clay and sand with gravel and vegetation.

Analytical Report Number : 21-29340
Project / Site name: Parkmount Road, 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
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
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
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	MCERTS
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	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
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
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
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' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

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

Geotechnical Testing Results

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS EN ISO 17892-12:2018+A1:2021, Clause 5.3.14 and 5.5, Fall Cone Method, 1 Point Test

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

UKAS TESTING 4041

Environmental Science

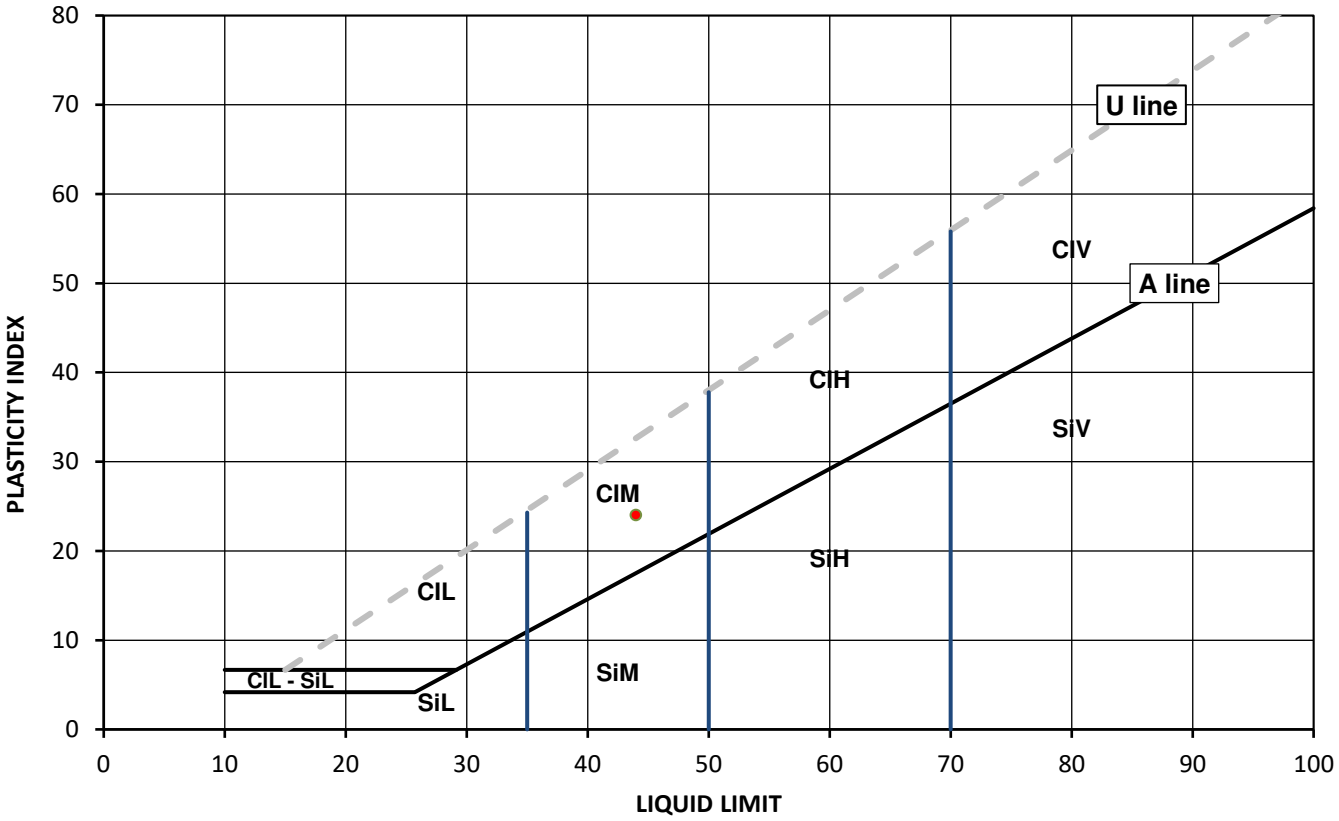
Client:	Brownfield Solutions Ltd	Client Reference:	C4657
Client Address:	William Smith House, 173 - 183 Witton Street, Northwich, Cheshire, CW9 5LP	Job Number:	21-29709
		Date Sampled:	09/12/2021
		Date Received:	14/12/2021
Contact:	Matthew Shore	Date Tested:	28/12/2021
Site Address:	Parkmount Road Manchester	Sampled By:	Not Given

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

Test Results:

Laboratory Reference:	2119970	Depth Top [m]:	1.20
Hole No.:	WS02	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brown slightly gravelly sandy CLAY		
Sample Preparation:	Tested after >0.425mm removed by hand;		
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
27.1	44	1.020	20	24	96



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

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

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

Remarks: Re-issue 1: Additional results of Atterberg (sample 2128837)

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: Katarzyna Koziel

Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

Date Reported: 13/01/2022

GF 360.10

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS EN ISO 17892-12:2018+A1:2021, Clause 5.3.14 and 5.5, Fall Cone Method, 1 Point Test

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

UKAS TESTING 4041

Environmental Science

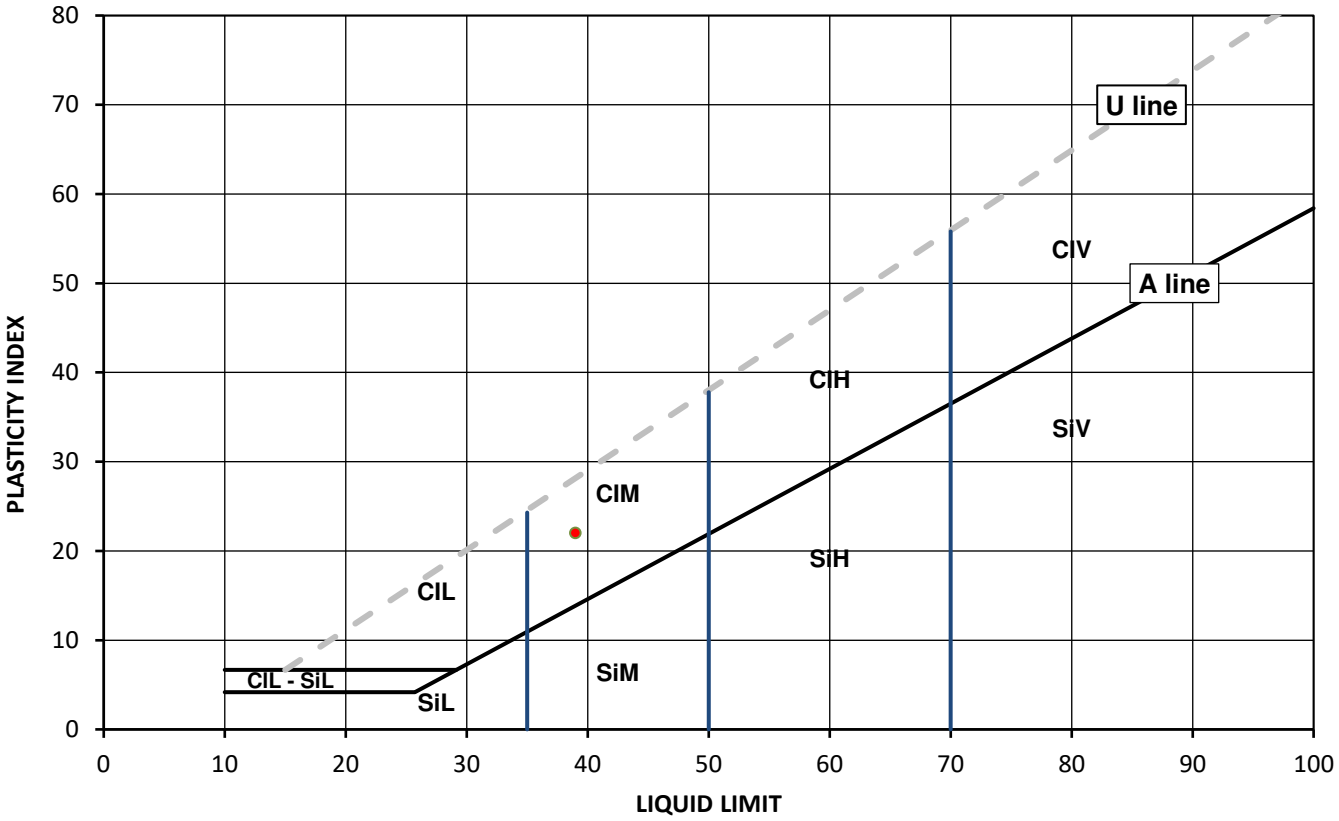
Client:	Brownfield Solutions Ltd	Client Reference:	C4657
Client Address:	William Smith House, 173 - 183 Witton Street, Northwich, Cheshire, CW9 5LP	Job Number:	21-29709
		Date Sampled:	09/12/2021
		Date Received:	14/12/2021
Contact:	Matthew Shore	Date Tested:	28/12/2021
Site Address:	Parkmount Road Manchester	Sampled By:	Not Given

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

Test Results:

Laboratory Reference:	2119972	Depth Top [m]:	2.00
Hole No.:	WS12	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brown slightly gravelly sandy CLAY		
Sample Preparation:	Tested after >0.425mm removed by hand;		
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
18.8	39	1.000	17	22	93



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

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

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

Remarks: Re-issue 1: Additional results of Atterberg (sample 2128837)

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Signed: Katarzyna Koziel

Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

Date Reported: 13/01/2022

GF 360.10

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS EN ISO 17892-12:2018+A1:2021, Clause 5.3.14 and 5.5, Fall Cone Method, 1 Point Test

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

UKAS TESTING 4041

Environmental Science

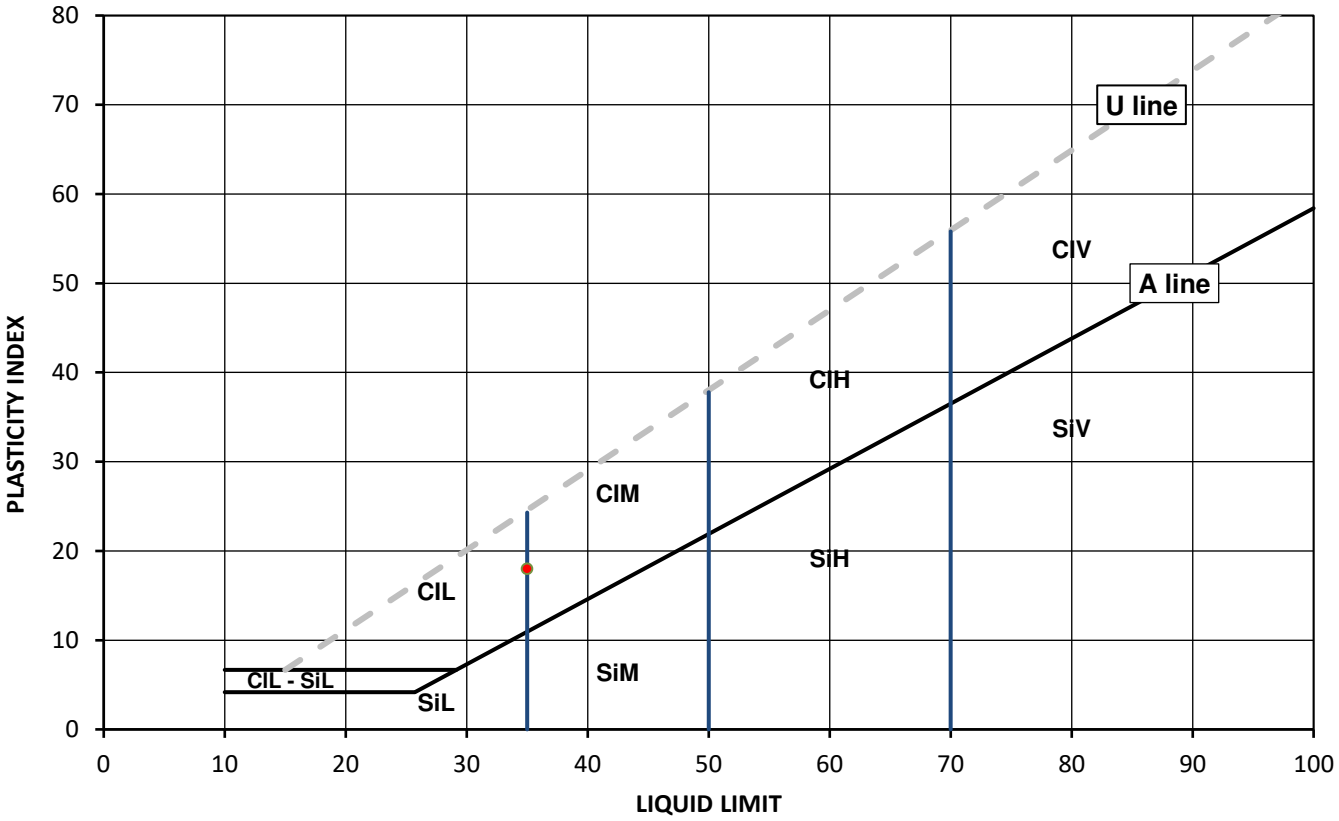
Client:	Brownfield Solutions Ltd	Client Reference:	C4657
Client Address:	William Smith House, 173 - 183 Witton Street, Northwich, Cheshire, CW9 5LP	Job Number:	21-29709
		Date Sampled:	Not Given
		Date Received:	14/12/2021
Contact:	Matthew Shore	Date Tested:	11/01/2022
Site Address:	Parkmount Road Manchester	Sampled By:	Not Given

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

Test Results:

Laboratory Reference:	2128837	Depth Top [m]:	3.00
Hole No.:	WS06	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brown slightly gravelly sandy CLAY		
Sample Preparation:	Tested after >0.425mm removed by hand;		
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
17.8	35	1.015	17	18	95



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

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

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

Remarks: Re-issue 1: Additional results of Atterberg (sample 2128837)

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Signed: Katarzyna Koziel

Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

Date Reported: 13/01/2022

GF 360.10

SUMMARY REPORT

SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with:

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

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

4041

Client: Brownfield Solutions Ltd
Client Address: William Smith House, 173 - 183 Witton Street, Northwich, Cheshire, CW9 5LP
Contact: Matthew Shore
Site Address: Parkmount Road Manchester

Client Reference: C4657
Job Number: 21-29709
Date Sampled: 09/12/2021
Date Received: 14/12/2021
Date Tested: 28/12/2021 - 11/01/2022
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 m	Depth Base m	Type			%	% Passing 425um %	WL* %	Correlation Factor	Wp %	Ip %	Cone type	Sample Preparation	bulk Mg/m3	dry Mg/m3	PD Mg/m3
2119970	WS02	Not Given	1.20	Not Given	D	Brown slightly gravelly sandy CLAY	Atterberg 1 Point	27.1	96	44	1.020	20	24	80g/30 deg	N/A			
2128837	WS06	Not Given	3.00	Not Given	D	Brown slightly gravelly sandy CLAY	Atterberg 1 Point	17.8	95	35	1.015	17	18	80g/30 deg	N/A			
2119971	WS07	Not Given	2.40	Not Given	D	Brown slightly gravelly CLAY		20.0										
2119972	WS12	Not Given	2.00	Not Given	D	Brown slightly gravelly sandy CLAY	Atterberg 1 Point	18.8	93	39	1.000	17	22	80g/30 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: Re-issue 1: Additional results of Atterberg (sample 2128837)

Signed:

Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

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Date Reported: 13/01/2022 **GF 361.10**

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

e: m.shore@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 : 21-29712

Project / Site name:	Parkmount Road Manchester	**Samples received on:**	14/12/2021
Your job number:	C4657	**Samples instructed on/ Analysis started on:**	15/12/2021
Your order number:		**Analysis completed by:**	28/12/2021
Report Issue Number:	1	**Report issued on:**	28/12/2021
Samples Analysed:	3 soil samples		

Signed:

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

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

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

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

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

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

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

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

Analytical Report Number: 21-29712
Project / Site name: Parkmount Road Manchester

Lab Sample Number				2119989	2119990	2119991
Sample Reference				WS02	WS07	WS12
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				1.20	2.40	2.00
Date Sampled				09/12/2021	09/12/2021	09/12/2021
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	< 0.1
Moisture Content	%	0.01	NONE	18	15	14
Total mass of sample received	kg	0.001	NONE	0.60	0.60	0.60

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.0	8.2	7.7
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.011	0.051	0.093

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

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number : 21-29712
Project / Site name: Parkmount Road 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 *
2119989	WS02	None Supplied	1.2	Brown clay and sand.
2119990	WS07	None Supplied	2.4	Brown clay.
2119991	WS12	None Supplied	2	Brown clay.

Analytical Report Number : 21-29712
Project / Site name: Parkmount Road 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
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

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

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.

WS02 Test 1	MSV HOUSING PARKMOUNT ROAD, MANCHESTER C4657	BROWNFIELD SOLUTIONS LTD GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

Falling Head Permeability Test

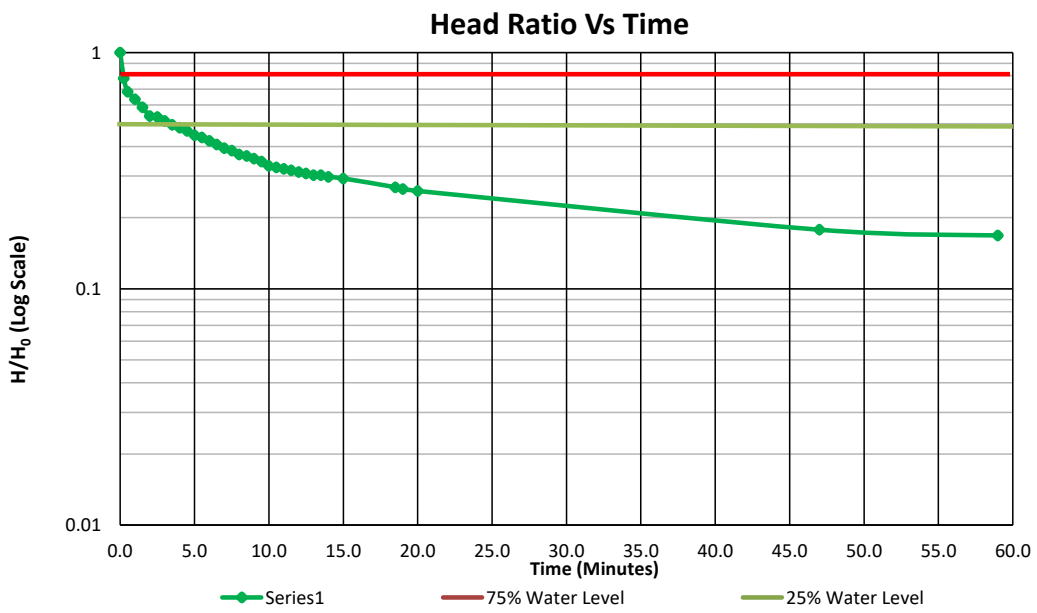
(a) bottom of borehole:	4.08	m
(b) bottom of casing:	4.08	m
(c) top of filter material:	1.50	m
(d) initial groundwater level or base of hole:	2.08	m
(e) centre of piezometer tip:		m
Height of casing/standpipe above surface	0.00	m
Diameter of casing/standpipe	100	mm
Length of filter (above GW table or base of hole)	0.58	m

Date of Test:	22/12/2021
Logged By:	MS
Checked By:	AJS

Site Recorded Data

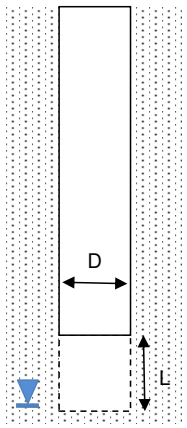
Time (mm:ss.0)	Depth to water (m)	Head of water (m)	Head Ratio H/H_0	Time (mm:ss.0)	Depth to water (mm)	Head of water (m)	Head Ratio H/H_0
00:00.0	0.00	2.08	1.00	10:00.0	1.39	0.69	0.33
00:15.0	0.46	1.62	0.78	10:30.0	1.40	0.68	0.33
00:30.0	0.66	1.42	0.68	11:00.0	1.41	0.67	0.32
00:45.0	0.76	1.32	0.63	11:30.0	1.42	0.66	0.32
01:00.0	0.86	1.22	0.59	12:00.0	1.43	0.65	0.31
01:30.0	0.96	1.12	0.54	12:30.0	1.44	0.64	0.31
02:00.0	0.97	1.11	0.53	13:00.0	1.45	0.63	0.30
02:30.0	1.01	1.07	0.51	13:30.0	1.45	0.63	0.30
03:00.0	1.05	1.03	0.50	14:00.0	1.46	0.62	0.30
03:30.0	1.08	1.00	0.48	15:00.0	1.47	0.61	0.29
04:00.0	1.11	0.97	0.47	18:30.0	1.52	0.56	0.27
04:30.0	1.15	0.93	0.45	19:00.0	1.53	0.55	0.26
05:00.0	1.17	0.91	0.44	20:00.0	1.54	0.54	0.26
05:30.0	1.20	0.88	0.42	47:00.0	1.71	0.37	0.18
06:00.0	1.23	0.85	0.41	59:00.0	1.73	0.35	0.17
06:30.0	1.26	0.82	0.39	END			
07:00.0	1.28	0.80	0.38				
07:30.0	1.31	0.77	0.37				
08:00.0	1.32	0.76	0.37				
08:30.0	1.34	0.74	0.36				
09:00.0	1.36	0.72	0.35				

Data Analysis



WS02 Test 1	MSV HOUSING PARKMOUNT ROAD, MANCHESTER C4657	BROWNFIELD SOLUTIONS LTD GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

Calculation of Intake Factor (F)



X-sectional area of base

A = 0.007853982 m^2

Diameter

D = 0.1 m

Length

L = 0.58 m

$$F = \frac{2\pi L}{\ln\left(2\frac{L}{D}\right)}$$

$$Cylindrical\ Cavity\ with\ \frac{L}{D} < 10$$

$$F = \frac{2\pi L}{\ln\left(\left(\frac{L}{D}\right) + \sqrt{\left(\frac{L}{D}\right)^2 + 1}\right)}$$

F = 3.644 / 1.942

F = 1.877

Calculation

	Head (m)	Depth (m bgl)	Time (s)
75% effective level	1.560	0.520	30.0
25% effective level	0.520	1.560	210.0

At time (t_1) Depth to water =	0.520	t_1 =	30.0	sec
Initial groundwater level =	2.08			
Depth of Water (H_1) =	1.560			
At time (t_2) Depth to water =	1.560	t_2 =	210.0	sec
Initial groundwater level =	2.08			
Depth of Water (H_2) =	0.520			

$$Permeability = k = \frac{A}{F(t_2 - t_1)} Log_e \frac{H_1}{H_2}$$

k = 0.0079 / 337.78 ln 1.560 / 0.520

k = 2.55E-05 m/s

WS12 Test 1	MSV HOUSING PARKMOUNT ROAD, MANCHESTER C4657	BROWNFIELD SOLUTIONS LTD GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

Falling Head Permeability Test

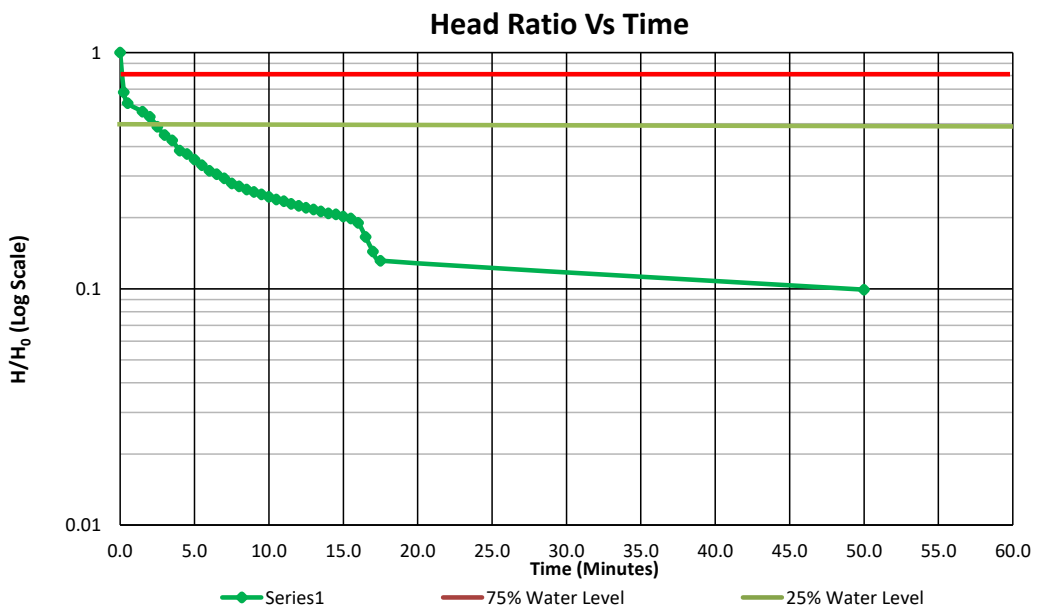
(a) bottom of borehole:	4.94	m
(b) bottom of casing:	4.94	m
(c) top of filter material:	3.00	m
(d) initial groundwater level or base of hole:	4.94	m
(e) centre of piezometer tip:		m
Height of casing/standpipe above surface	0.00	m
Diameter of casing/standpipe	100	mm
Length of filter (above GW table or base of hole)	1.94	m

Date of Test:	22/12/2021
Logged By:	MS
Checked By:	AJS

Site Recorded Data

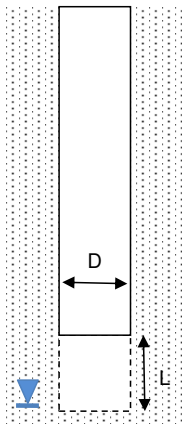
Time (mm:ss.0)	Depth to water (m)	Head of water (m)	Head Ratio H/H_0	Time (mm:ss.0)	Depth to water (mm)	Head of water (m)	Head Ratio H/H_0
00:00.0	0.00	4.94	1.00	10:00.0	3.78	1.16	0.23
00:15.0	1.58	3.36	0.68	10:30.0	3.81	1.13	0.23
00:30.0	1.92	3.02	0.61	11:00.0	3.83	1.11	0.22
00:45.0	2.16	2.78	0.56	11:30.0	3.85	1.09	0.22
01:00.0	2.30	2.64	0.53	12:00.0	3.87	1.07	0.22
01:30.0	2.54	2.40	0.49	12:30.0	3.89	1.05	0.21
02:00.0	2.73	2.21	0.45	13:00.0	3.91	1.03	0.21
02:30.0	2.84	2.10	0.43	13:30.0	3.92	1.02	0.21
03:00.0	3.04	1.90	0.38	14:00.0	3.94	1.00	0.20
03:30.0	3.10	1.84	0.37	15:00.0	3.96	0.98	0.20
04:00.0	3.20	1.74	0.35	16:00.0	4.00	0.94	0.19
04:30.0	3.29	1.65	0.33	22:00.0	4.12	0.82	0.17
05:00.0	3.38	1.56	0.32	30:00.0	4.23	0.71	0.14
05:30.0	3.43	1.51	0.31	35:00.0	4.29	0.65	0.13
06:00.0	3.49	1.45	0.29	50:00.0	4.45	0.49	0.10
06:30.0	3.56	1.38	0.28	END			
07:00.0	3.60	1.34	0.27				
07:30.0	3.64	1.30	0.26				
08:30.0	3.67	1.27	0.26				
09:00.0	3.70	1.24	0.25				
09:30.0	3.73	1.21	0.24				

Data Analysis



WS12 Test 1	MSV HOUSING PARKMOUNT ROAD, MANCHESTER C4657	BROWNFIELD SOLUTIONS LTD GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

Calculation of Intake Factor (F)



X-sectional area of base

A = 0.007853982 m^2

Diameter

D = 0.1 m

Length

L = 1.94 m

$$F = \frac{2\pi L}{\ln\left(2\frac{L}{D}\right)}$$

$$Cylindrical\ Cavity\ with\ \frac{L}{D} < 10$$

$$F = \frac{2\pi L}{\ln\left(\left(\frac{L}{D}\right) + \sqrt{\left(\frac{L}{D}\right)^2 + 1}\right)}$$

F = $\frac{12.189}{3.018}$

F = 4.039

Calculation

	Head (m)	Depth (m bgl)	Time (s)
75% effective level	3.705	1.235	30.0
25% effective level	1.235	3.705	150.0

At time (t_1) Depth to water =	1.235	t_1 =	30.0	sec
Initial groundwater level =	4.94			
Depth of Water (H_1) =	3.705			
At time (t_2) Depth to water =	3.705	t_2 =	150.0	sec
Initial groundwater level =	4.94			
Depth of Water (H_2) =	1.235			

$$Permeability = k = \frac{A}{F(t_2 - t_1)} Log_e \frac{H_1}{H_2}$$

k = $\frac{0.0079}{484.66}$ ln $\frac{3.705}{1.235}$

k = 1.78E-05 m/s

APPENDIX F

Monitoring Results

Ground Gas Monitoring Results

BROWNFIELD SOLUTIONS LTD

CLIENT:	Date	Operator	Analsyer	Weather Observations			Temp (°C)	Pressure Trend	Min Barometric Pressure (mb)	Notes
MOSSCARE ST VINCENT'S HOUSING GROUP	13/12/2021	PG	GFM436	Overcast	No wind	Cool	8	Rising	1008	
JOB NO.	22/12/2021	PG	GFM436	Overcast	No wind	Cold	2	Falling	1006	
C4657	10/01/2022	PG	GFM436	Overcast	No wind	Cool	8	Rising	1003	
SITE:	20/01/2022	PG	GFM436	Sunny	Light breeze	Cold	5	Steady	1026	**Pressure data from time and date .com**
PARKMOUNT ROAD, MANCHESTER	10/02/2022	PG	GFM436	Sunny	Windy	Cool	7	Steady	1007	
	22/02/2022	PG	GFM436	Heavy rain	Windy	Cool	9	Falling	997	

Notes: mb = milibars; CH_4 = methane; LEL = lower explosive limit = 5%v/v; CO_2 = carbon dioxide; O_2 = oxygen; CO=carbon monoxide; H_2S = hydrogen sulphide; TVOC= Total volatile organic compounds; PPM = parts per million. Where the flow is less than the limit of detection of the instrument, the detection limit is reported (Highlighted in green). Gas Screening Values (GSVs) are rounded to 3 decimal places. Calibration Records for analysers used availble on request.

Date	Time	Location	Response zone (m)	Pressures (mb)		Gas flows (l/hr)		CH_4 (%v/v)		CH_4 (%LEL)		CO_2 (%v/v)		O_2 (%v/v)		Other Gases (PPM)			Depth to Water (m)	Well Base (m)	Gas Screening Value (CH_4) (l/hr)	Gas Screening Value (CO_2) (l/hr)	Notes
				Atmospheric Pressure	Relative Well Pressure	Initial	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	CO	H_2S	TVOC (PID)					
				Summary Statistcs																			
			Max. values:	1026	1.0	0.3	0.4	0.1	0.1	2.0	2.0	7.6	5.1	20.5	20.8	0.0	0.0	0.0	4.8	4.9	0.000	0.024	
			Min. values:	995	-2.0	0.1	-0.4	0.1	0.1	2.0	2.0	0.1	0.1	8.0	14.2	0.0	0.0	0.0	1.7	1.9	0.000	0.000	
				Worst-case GSVs based on maximum recorded steady flow and maximum individual peak concentrations:																	0.000	0.030	
13/12/2021	AM	Ambient	X.00 - X.00	1009				0.1		2.0		0.1		20.5		0.0	0.0	NA					
		WS02	1.50 - 4.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	1.8	0.5	13.3	18.9	0.0	0.0	NA	1.92	4.13	0.000	0.002	
		WS07	1.00 - 2.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	2.4	1.2	15.1	18.3	0.0	0.0	NA	NGW	1.94	0.000	0.002	
		WS09	1.00 - 2.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	0.3	0.2	20.5	20.7	0.0	0.0	NA	1.86	2.05	0.000	0.000	
		WS12	3.00 - 5.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	7.6	5.1	14.1	15.8	0.0	0.0	NA	4.84	4.94	0.000	0.008	
13/12/2021	AM	Ambient	X.00 - X.00	1008				0.1		2.0		0.1		20.5		0.0	0.0	NA					
22/12/2021	AM	Ambient	X.00 - X.00	1006				0.1		2.0		0.1		20.5		0.0	0.0	NA					
		WS02	1.50 - 4.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	3.9	1.4	13.0	17.6	0.0	0.0	NA	2.08	4.05	0.000	0.004	
		WS07	1.00 - 2.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	6.5	0.9	8.0	18.4	0.0	0.0	NA	NGW	1.94	0.000	0.007	
		WS09	1.00 - 2.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	0.3	0.2	20.2	20.5	0.0	0.0	NA	1.70	2.05	0.000	0.000	
		WS12	3.00 - 5.00		1.0	0.3	0.4	0.1	0.1	2.0	2.0	4.8	1.7	15.5	18.6	0.0	0.0	NA	4.84	4.94	0.000	0.019	
22/12/2021	AM	Ambient	X.00 - X.00	1005				0.1		2.0		0.1		20.5		0.0	0.0	NA					
10/01/2022	PM	Ambient	X.00 - X.00	1003				0.1		2.0		0.1		20.5		0.0	0.0	NA					
		WS02	1.50 - 4.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	4.4	0.9	11.4	18.5	0.0	0.0	NA	1.91	4.05	0.000	0.004	
		WS07	1.00 - 2.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	4.2	0.9	17.6	18.9	0.0	0.0	NA	NGW	2.94	0.000	0.004	
		WS09	1.00 - 2.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	0.2	0.2	20.5	20.8	0.0	0.0	NA	1.70	2.04	0.000	0.000	
		WS12	3.00 - 5.00		-2.0	0.1	-0.4	0.1	0.1	2.0	2.0	6.0	0.6	14.1	19.8	0.0	0.0	NA	4.78	4.89	0.000	0.024	
10/01/2022	PM	Ambient	X.00 - X.00	1003				0.1		2.0		0.1		20.5		0.0	0.0	NA					
20/01/2022	PM	Ambient	X.00 - X.00	1026				0.1		2.0		0.1		20.5		0.0	0.0	NA					
		WS02	1.50 - 4.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	4.6	1.3	11.7	17.9	0.0	0.0	NA	2.15	4.04	0.000	0.005	
		WS07	1.00 - 2.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	5.3	0.4	9.2	19.3	0.0	0.0	NA	NGW	1.95	0.000	0.005	
		WS09	1.00 - 2.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	0.2	0.1	20.0	20.3	0.0	0.0	NA	1.73	2.04	0.000	0.000	
		WS12	3.00 - 5.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	6.4	0.9	12.2	18.8	0.0	0.0	NA	4.82	4.86	0.000	0.006	
20/01/2022	PM	Ambient	X.00 - X.00	1026				0.1		2.0		0.1		20.5		0.0	0.0	NA					
10/02/2022	PM	Ambient	X.00 - X.00	1026				0.1		2.0		0.1		20.0		0.0	0.0	NA					
		WS02	1.50 - 4.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	4.6	0.8	12.5	18.4	0.0	0.0	NA	1.93	4.01	0.000	0.005	
		WS07	1.00 - 2.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	5.8	0.1	9.8	19.4	0.0	0.0	NA	1.87	1.92	0.000	0.006	
		WS09	1.00 - 2.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	0.3	0.1	19.7	20.1	0.0	0.0	NA	1.69	2.03	0.000	0.000	
		WS12	3.00 - 5.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	5.4	1.5	14.6	18.7	0.0	0.0	NA	NGW	4.88	0.000	0.005	
10/02/2022	PM	Ambient	X.00 - X.00	1026				0.1		2.0		0.1		20.0		0.0	0.0	NA					
22/02/2022	PM	Ambient	X.00 - X.00	997				0.1		2.0		0.1		19.9		0.0	0.0	NA					
		WS02	1.50 - 4.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	4.0	3.9	11.9	17.9	0.0	0.0	NA	1.86	4.02	0.000	0.004	
		WS07	1.00 - 2.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	5.2	2.0	11.4	14.2	0.0	0.0	NA	1.88	1.94	0.000	0.005	
		WS09	1.00 - 2.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	0.2	0.1	19.7	20.0	0.0	0.0	NA	1.70	2.05	0.000	0.000	

Ground Gas Monitoring Results

BROWNFIELD SOLUTIONS LTD

Date	Time	Location	Response zone (m)	Pressures (mb)		Gas flows (l/hr)		CH_4 (%v/v)		CH_4 (%LEL)		CO_2 (%v/v)		O_2 (%v/v)		Other Gases (PPM)			Depth to Water (m)	Well Base (m)	Gas Screening Value (CH_4) (l/hr)	Gas Screening Value (CO_2) (l/hr)	Notes
				Atmospheric Pressure	Relative Well Pressure	Initial	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	CO	H_2S	TVOC (PID)					
		WS12	3.00 - 5.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	5.2	1.7	14.7	18.4	0.0	0.0	NA	NG	4.88	0.000	0.005	
22/02/2022	PM	Ambient	X.00 - X.00	995				0.1		2.0		0.1		19.9		0.0	0.0	NA					

APPENDIX G

Waste Assessment Report

BROWNFIELD SOLUTIONS LTD

HazWasteOnline™

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:

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

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

RWLE2-A3ADX-WW9BT

Job name

Parkmount Road, Manchester

Description/Comments

Project

C4657

Site

Parkmount Road, Manchester

Classified by

Name:
Matthew Shore
Date:
05 Jan 2022 07:57 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	Date
Hazardous Waste Classification	07 Oct 2021

Next 3 year Refresher due by Oct 2024

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	WS01	0.30-0.60	Non Hazardous		2
2	WS04	0.30-0.60	Non Hazardous		4
3	WS06	0.30-0.60	Non Hazardous		6
4	WS08	0.00-0.20	Non Hazardous		8
5	WS10	1.00-1.30	Non Hazardous		10
6	WS12	0.30-0.60	Non Hazardous		12

Related documents

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

Report

Created by: Matthew Shore

Created date: 05 Jan 2022 07:57 GMT

Appendices	Page
Appendix A: Classifier defined and non EU CLP determinands	14
Appendix B: Rationale for selection of metal species	15
Appendix C: Version	15

Classification of sample: WS01

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

Sample details

Sample name:
WS01
Sample Depth:
0.30-0.60 m
Moisture content:
18%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 18% Wet Weight Moisture Correction applied (MC)

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		pH			PH		8	pH		8	pH	8pH		
2		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		18	mg/kg	1.32	19.488	mg/kg	0.00195 %	✓	
3		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	0.2	mg/kg	1.285	0.211	mg/kg	0.0000164 %	✓	
4		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		1.2	mg/kg	1.923	1.892	mg/kg	0.000189 %	✓	
5		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		24	mg/kg	1.462	28.763	mg/kg	0.00288 %	✓	
6		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		58	mg/kg	1.126	53.547	mg/kg	0.00535 %	✓	
7		lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	210	mg/kg	1.56	268.6	mg/kg	0.0172 %	✓	
8		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.3	mg/kg	1.353	0.333	mg/kg	0.0000333 %	✓	
9		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		22	mg/kg	1.579	28.494	mg/kg	0.00285 %	✓	
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				1	mg/kg	1.405	1.152	mg/kg	0.000115 %	✓	
11		zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		170	mg/kg	2.774	386.716	mg/kg	0.0387 %	✓	
12		naphthalene	601-052-00-2	202-049-5	91-20-3		0.34	mg/kg		0.279	mg/kg	0.0000279 %	✓	
13		acenaphthylene		205-917-1	208-96-8		0.05	mg/kg		0.041	mg/kg	0.0000041 %	✓	
14		acenaphthene		201-469-6	83-32-9		0.93	mg/kg		0.763	mg/kg	0.0000763 %	✓	
15		fluorene		201-695-5	86-73-7		0.65	mg/kg		0.533	mg/kg	0.0000533 %	✓	

#		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				6.8	mg/kg		5.576	mg/kg	0.000558 %	✓	
			201-581-5	85-01-8									
17	●	anthracene				1.3	mg/kg		1.066	mg/kg	0.000107 %	✓	
			204-371-1	120-12-7									
18	●	fluoranthene				9.6	mg/kg		7.872	mg/kg	0.000787 %	✓	
			205-912-4	206-44-0									
19	●	pyrene				8.9	mg/kg		7.298	mg/kg	0.00073 %	✓	
			204-927-3	129-00-0									
20		benzo[a]anthracene				4.9	mg/kg		4.018	mg/kg	0.000402 %	✓	
		601-033-00-9	200-280-6	56-55-3									
21		chrysene				3.5	mg/kg		2.87	mg/kg	0.000287 %	✓	
		601-048-00-0	205-923-4	218-01-9									
22		benzo[b]fluoranthene				3.7	mg/kg		3.034	mg/kg	0.000303 %	✓	
		601-034-00-4	205-911-9	205-99-2									
23		benzo[k]fluoranthene				1.6	mg/kg		1.312	mg/kg	0.000131 %	✓	
		601-036-00-5	205-916-6	207-08-9									
24		benzo[a]pyrene; benzo[def]chrysene				3.6	mg/kg		2.952	mg/kg	0.000295 %	✓	
		601-032-00-3	200-028-5	50-32-8									
25	●	indeno[123-cd]pyrene				1.9	mg/kg		1.558	mg/kg	0.000156 %	✓	
			205-893-2	193-39-5									
26		dibenz[a,h]anthracene				0.57	mg/kg		0.467	mg/kg	0.0000467 %	✓	
		601-041-00-2	200-181-8	53-70-3									
27	●	benzo[ghi]perylene				2.3	mg/kg		1.886	mg/kg	0.000189 %	✓	
			205-883-8	191-24-2									
28	●	confirm TPH has NOT arisen from diesel or petrol				☑							
										Total:	0.0734 %		

Key

	User supplied data
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 2: Oxidizing "waste which may, generally by providing oxygen, cause or contribute to the combustion of other materials"
Force this Hazardous property to non hazardous because All results below LOD of 1.2mg/kg

Hazard Statements hit:

Ox. Sol. 1; H271 "May cause fire or explosion; strong oxidiser."

Because of determinand:

chromium(VI) oxide: (compound conc.: 0.00018%)

Classification of sample: WS04

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

Sample details

Sample name:
WS04
Sample Depth:
0.30-0.60 m
Moisture content:
14%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 14% Wet Weight Moisture Correction applied (MC)

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		pH			PH		7.9	pH		7.9	pH	7.9 pH		
2		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		13	mg/kg	1.32	14.761	mg/kg	0.00148 %	✓	
3		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	0.9	mg/kg	1.285	0.995	mg/kg	0.0000774 %	✓	
4		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		1.2	mg/kg	1.923	1.985	mg/kg	0.000198 %	✓	
5		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		17	mg/kg	1.462	21.368	mg/kg	0.00214 %	✓	
6		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		52	mg/kg	1.126	50.35	mg/kg	0.00503 %	✓	
7		lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	130	mg/kg	1.56	174.387	mg/kg	0.0112 %	✓	
8		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.3	mg/kg	1.353	0.349	mg/kg	0.0000349 %	✓	
9		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		22	mg/kg	1.579	29.884	mg/kg	0.00299 %	✓	
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				1	mg/kg	1.405	1.208	mg/kg	0.000121 %	✓	
11		zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		120	mg/kg	2.774	286.292	mg/kg	0.0286 %	✓	
12		naphthalene	601-052-00-2	202-049-5	91-20-3		0.05	mg/kg		0.043	mg/kg	0.0000043 %	✓	
13		acenaphthylene		205-917-1	208-96-8		0.05	mg/kg		0.043	mg/kg	0.0000043 %	✓	
14		acenaphthene		201-469-6	83-32-9		0.05	mg/kg		0.043	mg/kg	0.0000043 %	✓	
15		fluorene		201-695-5	86-73-7		0.05	mg/kg		0.043	mg/kg	0.0000043 %	✓	

#		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				1.4	mg/kg		1.204	mg/kg	0.00012 %	✓	
			201-581-5	85-01-8									
17	●	anthracene				0.37	mg/kg		0.318	mg/kg	0.0000318 %	✓	
			204-371-1	120-12-7									
18	●	fluoranthene				2.9	mg/kg		2.494	mg/kg	0.000249 %	✓	
			205-912-4	206-44-0									
19	●	pyrene				2.9	mg/kg		2.494	mg/kg	0.000249 %	✓	
			204-927-3	129-00-0									
20		benzo[a]anthracene				1.9	mg/kg		1.634	mg/kg	0.000163 %	✓	
		601-033-00-9	200-280-6	56-55-3									
21		chrysene				1.3	mg/kg		1.118	mg/kg	0.000112 %	✓	
		601-048-00-0	205-923-4	218-01-9									
22		benzo[b]fluoranthene				1.7	mg/kg		1.462	mg/kg	0.000146 %	✓	
		601-034-00-4	205-911-9	205-99-2									
23		benzo[k]fluoranthene				0.64	mg/kg		0.55	mg/kg	0.000055 %	✓	
		601-036-00-5	205-916-6	207-08-9									
24		benzo[a]pyrene; benzo[def]chrysene				1.5	mg/kg		1.29	mg/kg	0.000129 %	✓	
		601-032-00-3	200-028-5	50-32-8									
25	●	indeno[123-cd]pyrene				0.94	mg/kg		0.808	mg/kg	0.0000808 %	✓	
			205-893-2	193-39-5									
26		dibenz[a,h]anthracene				0.22	mg/kg		0.189	mg/kg	0.0000189 %	✓	
		601-041-00-2	200-181-8	53-70-3									
27	●	benzo[ghi]perylene				1	mg/kg		0.86	mg/kg	0.000086 %	✓	
			205-883-8	191-24-2									
28	●	confirm TPH has NOT arisen from diesel or petrol				☑							
										Total:	0.0533 %		

Key

	User supplied data
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 2: Oxidizing "waste which may, generally by providing oxygen, cause or contribute to the combustion of other materials"
Force this Hazardous property to non hazardous because All results below LOD of 1.2mg/kg

Hazard Statements hit:

Ox. Sol. 1; H271 "May cause fire or explosion; strong oxidiser."

Because of determinand:

chromium(VI) oxide: (compound conc.: 0.00019%)

Classification of sample: WS06

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

Sample details

Sample name:
WS06
Sample Depth:
0.30-0.60 m
Moisture content:
15%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

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

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		pH			PH		8.2	pH		8.2	pH	8.2 pH		
2		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		13	mg/kg	1.32	14.59	mg/kg	0.00146 %	✓	
3		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	0.2	mg/kg	1.285	0.218	mg/kg	0.000017 %	✓	
4		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		1.2	mg/kg	1.923	1.962	mg/kg	0.000196 %	✓	
5		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		19	mg/kg	1.462	23.604	mg/kg	0.00236 %	✓	
6		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		43	mg/kg	1.126	41.151	mg/kg	0.00412 %	✓	
7		lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	120	mg/kg	1.56	159.101	mg/kg	0.0102 %	✓	
8		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.3	mg/kg	1.353	0.345	mg/kg	0.0000345 %	✓	
9		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		20	mg/kg	1.579	26.851	mg/kg	0.00269 %	✓	
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				1	mg/kg	1.405	1.194	mg/kg	0.000119 %	✓	
11		zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		100	mg/kg	2.774	235.802	mg/kg	0.0236 %	✓	
12		naphthalene	601-052-00-2	202-049-5	91-20-3		0.29	mg/kg		0.247	mg/kg	0.0000246 %	✓	
13		acenaphthylene		205-917-1	208-96-8		0.05	mg/kg		0.0425	mg/kg	0.00000425 %	✓	
14		acenaphthene		201-469-6	83-32-9		1.7	mg/kg		1.445	mg/kg	0.000145 %	✓	
15		fluorene		201-695-5	86-73-7		1.1	mg/kg		0.935	mg/kg	0.0000935 %	✓	

#		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				11	mg/kg		9.35	mg/kg	0.000935 %	✓	
			201-581-5	85-01-8									
17	●	anthracene				2.7	mg/kg		2.295	mg/kg	0.00023 %	✓	
			204-371-1	120-12-7									
18	●	fluoranthene				18	mg/kg		15.3	mg/kg	0.00153 %	✓	
			205-912-4	206-44-0									
19	●	pyrene				16	mg/kg		13.6	mg/kg	0.00136 %	✓	
			204-927-3	129-00-0									
20		benzo[a]anthracene				8.9	mg/kg		7.565	mg/kg	0.000757 %	✓	
		601-033-00-9	200-280-6	56-55-3									
21		chrysene				6	mg/kg		5.1	mg/kg	0.00051 %	✓	
		601-048-00-0	205-923-4	218-01-9									
22		benzo[b]fluoranthene				7.3	mg/kg		6.205	mg/kg	0.00062 %	✓	
		601-034-00-4	205-911-9	205-99-2									
23		benzo[k]fluoranthene				2.9	mg/kg		2.465	mg/kg	0.000246 %	✓	
		601-036-00-5	205-916-6	207-08-9									
24		benzo[a]pyrene; benzo[def]chrysene				7.1	mg/kg		6.035	mg/kg	0.000603 %	✓	
		601-032-00-3	200-028-5	50-32-8									
25	●	indeno[123-cd]pyrene				3.8	mg/kg		3.23	mg/kg	0.000323 %	✓	
			205-893-2	193-39-5									
26		dibenz[a,h]anthracene				0.99	mg/kg		0.842	mg/kg	0.0000841 %	✓	
		601-041-00-2	200-181-8	53-70-3									
27	●	benzo[ghi]perylene				4.4	mg/kg		3.74	mg/kg	0.000374 %	✓	
			205-883-8	191-24-2									
28	●	confirm TPH has NOT arisen from diesel or petrol				☑							
										Total:	0.0526 %		

Key

	User supplied data
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 2: Oxidizing "waste which may, generally by providing oxygen, cause or contribute to the combustion of other materials"
Force this Hazardous property to non hazardous because All results below LOD of 1.2mg/kg

Hazard Statements hit:

Ox. Sol. 1; H271 "May cause fire or explosion; strong oxidiser."

Because of determinand:

chromium(VI) oxide: (compound conc.: 0.00019%)

Classification of sample: WS08

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

Sample details

Sample name:
WS08
Sample Depth:
0.00-0.20 m
Moisture content:
32%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 32% Wet Weight Moisture Correction applied (MC)

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		pH			PH		6.7	pH		6.7	pH	6.7 pH		
2		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		11	mg/kg	1.32	9.876	mg/kg	0.000988 %	✓	
3		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	0.5	mg/kg	1.285	0.437	mg/kg	0.000034 %	✓	
4		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		1.2	mg/kg	1.923	1.569	mg/kg	0.000157 %	✓	
5		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		15	mg/kg	1.462	14.908	mg/kg	0.00149 %	✓	
6		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		46	mg/kg	1.126	35.218	mg/kg	0.00352 %	✓	
7		lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	170	mg/kg	1.56	180.315	mg/kg	0.0116 %	✓	
8		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.3	mg/kg	1.353	0.276	mg/kg	0.0000276 %	✓	
9		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		16	mg/kg	1.579	17.185	mg/kg	0.00172 %	✓	
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				1	mg/kg	1.405	0.955	mg/kg	0.0000955 %	✓	
11		zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		120	mg/kg	2.774	226.37	mg/kg	0.0226 %	✓	
12		naphthalene	601-052-00-2	202-049-5	91-20-3		0.26	mg/kg		0.177	mg/kg	0.0000177 %	✓	
13		acenaphthylene		205-917-1	208-96-8		0.05	mg/kg		0.034	mg/kg	0.0000034 %	✓	
14		acenaphthene		201-469-6	83-32-9		0.29	mg/kg		0.197	mg/kg	0.0000197 %	✓	
15		fluorene		201-695-5	86-73-7		0.22	mg/kg		0.15	mg/kg	0.000015 %	✓	

#		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				2.9	mg/kg		1.972	mg/kg	0.000197 %	✓	
			201-581-5	85-01-8									
17	●	anthracene				0.73	mg/kg		0.496	mg/kg	0.0000496 %	✓	
			204-371-1	120-12-7									
18	●	fluoranthene				7	mg/kg		4.76	mg/kg	0.000476 %	✓	
			205-912-4	206-44-0									
19	●	pyrene				6.8	mg/kg		4.624	mg/kg	0.000462 %	✓	
			204-927-3	129-00-0									
20		benzo[a]anthracene				3.7	mg/kg		2.516	mg/kg	0.000252 %	✓	
		601-033-00-9	200-280-6	56-55-3									
21		chrysene				3.5	mg/kg		2.38	mg/kg	0.000238 %	✓	
		601-048-00-0	205-923-4	218-01-9									
22		benzo[b]fluoranthene				3.8	mg/kg		2.584	mg/kg	0.000258 %	✓	
		601-034-00-4	205-911-9	205-99-2									
23		benzo[k]fluoranthene				1.4	mg/kg		0.952	mg/kg	0.0000952 %	✓	
		601-036-00-5	205-916-6	207-08-9									
24		benzo[a]pyrene; benzo[def]chrysene				3.6	mg/kg		2.448	mg/kg	0.000245 %	✓	
		601-032-00-3	200-028-5	50-32-8									
25	●	indeno[123-cd]pyrene				1.9	mg/kg		1.292	mg/kg	0.000129 %	✓	
			205-893-2	193-39-5									
26		dibenz[a,h]anthracene				0.5	mg/kg		0.34	mg/kg	0.000034 %	✓	
		601-041-00-2	200-181-8	53-70-3									
27	●	benzo[ghi]perylene				2.2	mg/kg		1.496	mg/kg	0.00015 %	✓	
			205-883-8	191-24-2									
28	●	confirm TPH has NOT arisen from diesel or petrol				☑							
										Total:	0.0449 %		

Key

	User supplied data
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 2: Oxidizing "waste which may, generally by providing oxygen, cause or contribute to the combustion of other materials"
Force this Hazardous property to non hazardous because All results below LOD of 1.2mg/kg

Hazard Statements hit:

Ox. Sol. 1; H271 "May cause fire or explosion; strong oxidiser."

Because of determinand:

chromium(VI) oxide: (compound conc.: 0.00015%)

Classification of sample: WS10

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

Sample details

Sample name:
WS10
Sample Depth:
1.00-1.30 m
Moisture content:
22%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 22% Wet Weight Moisture Correction applied (MC)

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		pH			PH		7.9	pH		7.9	pH	7.9 pH		
2		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		19	mg/kg	1.32	19.567	mg/kg	0.00196 %	✓	
3		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	1.6	mg/kg	1.285	1.604	mg/kg	0.000125 %	✓	
4		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		1.2	mg/kg	1.923	1.8	mg/kg	0.00018 %	✓	
5		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		19	mg/kg	1.462	21.66	mg/kg	0.00217 %	✓	
6		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		90	mg/kg	1.126	79.037	mg/kg	0.0079 %	✓	
7		lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	1200	mg/kg	1.56	1459.987	mg/kg	0.0936 %	✓	
8		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.3	mg/kg	1.353	0.317	mg/kg	0.0000317 %	✓	
9		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		27	mg/kg	1.579	33.264	mg/kg	0.00333 %	✓	
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				1	mg/kg	1.405	1.096	mg/kg	0.00011 %	✓	
11		zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		420	mg/kg	2.774	908.81	mg/kg	0.0909 %	✓	
12		naphthalene	601-052-00-2	202-049-5	91-20-3		0.56	mg/kg		0.437	mg/kg	0.0000437 %	✓	
13		acenaphthylene		205-917-1	208-96-8		0.05	mg/kg		0.039	mg/kg	0.0000039 %	✓	
14		acenaphthene		201-469-6	83-32-9		0.23	mg/kg		0.179	mg/kg	0.0000179 %	✓	
15		fluorene		201-695-5	86-73-7		0.22	mg/kg		0.172	mg/kg	0.0000172 %	✓	

#		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				2.4	mg/kg		1.872	mg/kg	0.000187 %	✓	
			201-581-5	85-01-8									
17	●	anthracene				0.53	mg/kg		0.413	mg/kg	0.0000413 %	✓	
			204-371-1	120-12-7									
18	●	fluoranthene				3.6	mg/kg		2.808	mg/kg	0.000281 %	✓	
			205-912-4	206-44-0									
19	●	pyrene				3.2	mg/kg		2.496	mg/kg	0.00025 %	✓	
			204-927-3	129-00-0									
20		benzo[a]anthracene				2.3	mg/kg		1.794	mg/kg	0.000179 %	✓	
		601-033-00-9	200-280-6	56-55-3									
21		chrysene				1.6	mg/kg		1.248	mg/kg	0.000125 %	✓	
		601-048-00-0	205-923-4	218-01-9									
22		benzo[b]fluoranthene				1.9	mg/kg		1.482	mg/kg	0.000148 %	✓	
		601-034-00-4	205-911-9	205-99-2									
23		benzo[k]fluoranthene				0.69	mg/kg		0.538	mg/kg	0.0000538 %	✓	
		601-036-00-5	205-916-6	207-08-9									
24		benzo[a]pyrene; benzo[def]chrysene				1.5	mg/kg		1.17	mg/kg	0.000117 %	✓	
		601-032-00-3	200-028-5	50-32-8									
25	●	indeno[123-cd]pyrene				0.99	mg/kg		0.772	mg/kg	0.0000772 %	✓	
			205-893-2	193-39-5									
26		dibenz[a,h]anthracene				0.32	mg/kg		0.25	mg/kg	0.000025 %	✓	
		601-041-00-2	200-181-8	53-70-3									
27	●	benzo[ghi]perylene				1.2	mg/kg		0.936	mg/kg	0.0000936 %	✓	
			205-883-8	191-24-2									
28	●	confirm TPH has NOT arisen from diesel or petrol				☑							
										Total:	0.202 %		

Key

	User supplied data
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 2: Oxidizing "waste which may, generally by providing oxygen, cause or contribute to the combustion of other materials"
Force this Hazardous property to non hazardous because All results below LOD of 1.2mg/kg

Hazard Statements hit:

Ox. Sol. 1; H271 "May cause fire or explosion; strong oxidiser."

Because of determinand:

chromium(VI) oxide: (compound conc.: 0.00018%)

Classification of sample: WS12

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

Sample details

Sample name:
WS12
Sample Depth:
0.30-0.60 m
Moisture content:
22%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 22% Wet Weight Moisture Correction applied (MC)

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		pH			PH		9.3	pH		9.3	pH	9.3 pH		
2		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		14	mg/kg	1.32	14.418	mg/kg	0.00144 %	✓	
3		cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	0.2	mg/kg	1.285	0.2	mg/kg	0.0000156 %	✓	
4		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		1.2	mg/kg	1.923	1.8	mg/kg	0.00018 %	✓	
5		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		19	mg/kg	1.462	21.66	mg/kg	0.00217 %	✓	
6		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		54	mg/kg	1.126	47.422	mg/kg	0.00474 %	✓	
7		lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	130	mg/kg	1.56	158.165	mg/kg	0.0101 %	✓	
8		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.3	mg/kg	1.353	0.317	mg/kg	0.0000317 %	✓	
9		nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		18	mg/kg	1.579	22.176	mg/kg	0.00222 %	✓	
10		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				1	mg/kg	1.405	1.096	mg/kg	0.00011 %	✓	
11		zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		110	mg/kg	2.774	238.022	mg/kg	0.0238 %	✓	
12		naphthalene	601-052-00-2	202-049-5	91-20-3		0.05	mg/kg		0.039	mg/kg	0.0000039 %	✓	
13		acenaphthylene		205-917-1	208-96-8		0.05	mg/kg		0.039	mg/kg	0.0000039 %	✓	
14		acenaphthene		201-469-6	83-32-9		0.52	mg/kg		0.406	mg/kg	0.0000406 %	✓	
15		fluorene		201-695-5	86-73-7		0.37	mg/kg		0.289	mg/kg	0.0000289 %	✓	

#		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				3	mg/kg		2.34	mg/kg	0.000234 %	✓	
			201-581-5	85-01-8									
17	●	anthracene				0.71	mg/kg		0.554	mg/kg	0.0000554 %	✓	
			204-371-1	120-12-7									
18	●	fluoranthene				4.9	mg/kg		3.822	mg/kg	0.000382 %	✓	
			205-912-4	206-44-0									
19	●	pyrene				4.6	mg/kg		3.588	mg/kg	0.000359 %	✓	
			204-927-3	129-00-0									
20		benzo[a]anthracene				2.8	mg/kg		2.184	mg/kg	0.000218 %	✓	
		601-033-00-9	200-280-6	56-55-3									
21		chrysene				1.8	mg/kg		1.404	mg/kg	0.00014 %	✓	
		601-048-00-0	205-923-4	218-01-9									
22		benzo[b]fluoranthene				2.3	mg/kg		1.794	mg/kg	0.000179 %	✓	
		601-034-00-4	205-911-9	205-99-2									
23		benzo[k]fluoranthene				0.88	mg/kg		0.686	mg/kg	0.0000686 %	✓	
		601-036-00-5	205-916-6	207-08-9									
24		benzo[a]pyrene; benzo[def]chrysene				2.1	mg/kg		1.638	mg/kg	0.000164 %	✓	
		601-032-00-3	200-028-5	50-32-8									
25	●	indeno[123-cd]pyrene				1.2	mg/kg		0.936	mg/kg	0.0000936 %	✓	
			205-893-2	193-39-5									
26		dibenz[a,h]anthracene				0.32	mg/kg		0.25	mg/kg	0.000025 %	✓	
		601-041-00-2	200-181-8	53-70-3									
27	●	benzo[ghi]perylene				1.4	mg/kg		1.092	mg/kg	0.000109 %	✓	
			205-883-8	191-24-2									
28	●	confirm TPH has NOT arisen from diesel or petrol				☑							
										Total:	0.047 %		

Key

	User supplied data
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 2: Oxidizing "waste which may, generally by providing oxygen, cause or contribute to the combustion of other materials"
Force this Hazardous property to non hazardous because All results below LOD of 1.2mg/kg

Hazard Statements hit:

Ox. Sol. 1; H271 "May cause fire or explosion; strong oxidiser."

Because of determinand:

chromium(VI) oxide: (compound conc.: 0.00018%)

Appendix A: Classifier defined and non EU CLP 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

confirm TPH has NOT arisen from diesel or petrol

Description/Comments: Chapter 3, section 4b requires a positive confirmation for benzo[a]pyrene to be used as a marker in evaluating Carc. 1B; H350 (HP 7) and Muta. 1B; H340 (HP 11)
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

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 v1.1, May 2018
HazWasteOnline Classification Engine Version: 2021.347.4961.9421 (13 Dec 2021)
HazWasteOnline Database: 2022.4.4967.9426 (04 Jan 2022)

This classification utilises the following guidance and legislation:
WM3 v1.1 - Waste Classification - 1st Edition v1.1 - May 2018
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 2019 - UK: 2019 No. 720 of 27th March 2019
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
17th ATP - Regulation (EU) 2021/849 of 11 March 2021

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