



**BROWNFIELD
SOLUTIONS LTD**

GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

HOLLINS HOMES

Langley Lane, Birch

Phase II Geo-Environmental Assessment Report

JEM/C5042/11333 Rev A

November 2022

EXECUTIVE SUMMARY	
Location and Brief Site Description	The site is located off Langley Lane, Birch, M24 5LL. The site comprises a field currently used for horse storage and grazing with steep gradients down to Langley Lane along the northern boundary.
Ground Conditions	Generalised ground conditions from the ground investigation comprise (top down): • Made ground generally comprising topsoil, encountered from ground level to between 0.10m and 0.90m bgl. • Natural strata generally comprising firm to stiff clays encountered from 0.10m bgl to between 1.20m bgl and 5.45m bgl. • Solid geology was not encountered. • Groundwater recorded between 2.30m bgl and 4.79m bgl.
Human Health - Soils Contamination	Testing of the made ground at the site did not reveal any exceedances of heavy metals, PAHs and asbestos. The above are therefore not considered to pose a risk to human health and remedial measures are not required.
Controlled Waters – Surface and Groundwater Contamination	The overall risk to controlled waters is considered to be low and no further action is required.
Ground Gas	Based on the completed ground gas monitoring, the site has been classified as Green under the NHBC traffic light classification system.
Outline Remedial Strategy	No specific remedial measures are considered necessary at the site.
Foundations and Floor Slabs	Strip foundations are considered suitable. Safe bearing capacity of 150kN/m ² should be available at a minimum depth of 0.90m bgl, keeping total and differential settlement within acceptable limits. Suspended floor slabs with a 250mm void should be adopted.
Concrete Classification	DS-1 AC-1s conditions prevail.
Highways Design	Made Ground CBR – 2% Superficial Strata CBR – cohesive soils– 5% The above assumed values should be confirmed by in-situ testing at formation level by a specialist geotechnical engineer during construction.
Sustainable Drainage Systems (SUDS)	Indicative soil infiltration rates range in the order of 10 ⁻⁷ m/s to no infiltration. Therefore, drainage to soakaways is considered unsuitable for this site.
Further Work	The following further works will be required to progress to the construction phase: • Tree survey by qualified arboriculturist by qualified arboriculturist and treatment of invasive species, if confirmed to be present • Detailed foundation design by a structural engineer.

This executive summary should be read in conjunction with the full report, reference JEM/C5042/11333 Rev A and not as a standalone document.

PROJECT QUALITY CONTROL DATA SHEET

Site Name:	Langley Lane, Birch		
Document Name:	Phase II Geo-Environmental Assessment Report		
Reference:	JEM/C5042/11333 Rev A		
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C5042/01	-	Site Location Plan
C5042/02	-	Site Features Plan
C5042/03	-	Exploratory Hole Location Plan

APPENDICES	
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Appendix A	BSL Methodology and Guidance
Appendix B	Exploratory Hole Logs
Appendix C	Chemical Testing Results
Appendix D	Geotechnical Testing Results
Appendix E	Monitoring Results
Appendix F	Infiltration Testing Results
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1.0 INTRODUCTION

1.1 Context

This report describes a Phase II Geo-Environmental Assessment carried out by Brownfield Solutions Limited (BSL) for Hollins Homes on a site off Langley Lane, Birch and has been completed in general accordance with the following guidance:

-
- Environment Agency guidance - Land Contamination: Risk Management (LCRM).
 - CLR11 - Model Procedures for the Management of Land Contamination.
 - 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 10.0.

1.2 Proposed Development

The proposed development is for a residential end use, comprising the construction of 23 homes, with associated gardens, highways and infrastructure as shown on the proposed site plan, drawing No. 18-041 PL01 provided to BSL by the client.

1.3 Previous Reports

This report should be read in conjunction with REFA Phase I Geo- Environmental Desk Study Report (18070/GEDS/REV B) issued in June 2018.

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 trial pitting, 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, Hollins Homes. 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 Langley Lane, Birch, M24 5LL. It is situated approximately 2.60km north-west of Middleton Town Centre, centred on National Grid Reference SD 385217 407651 as shown on the Site Location Plan, Drawing No. C5042/01.

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. C5042/02.

Feature	Description
Site Area	Approximately 1.30 hectares.
Site Access	Access to the site is gained off Langley Lane to the north of the site.
Current Land Use and Site Features	The site comprises a field currently used for horse storage and grazing with steep gradients down to Langley Lane along the northern boundary. A highpoint exists in the northern half of the site and gentle to steep gradients of approximately 1:10, leading down to a stream (The Whittle Brook), running along the southern boundary. There is a topographic low point in approximately the centre of the site; as referenced in the Phase 1 Desk Study anecdotal evidence from a nearby resident suggests this may have been recently infilled.
Potential Sources of Gross Contamination	The low point identified within the centre of the site may represent an infilled pond.
Vegetation	The site contains numerous hedgerows, shrubs and semi/ mature trees along the site boundaries. Suspected Giant Hogweed was noted in the southwestern corner of the site.
Topography	The highest point exists at the north of the site with steep gradients down to Langley Lane to the north, with gentle to steep gradients leading down to the Whittle Brook at the south of the site.
Site Boundaries	The internal boundary of the site is denoted by agricultural electric fencing. The north, east and south site boundaries comprise hedgerows, shrubs and semi/ mature trees. The western boundary comprises fencing of the gardens of residential homes which abut the site.
Surrounding Area	The site is set within a semi-rural mixed agricultural and residential area. To the east and west there is residential housing. To the north and south are agricultural fields.

3.0 SUMMARY OF PREVIOUS REPORTS

3.0 REFA Phase I Geo-Environmental Desk Study Report

A summary of the relevant points from the Desk Study completed by REFA (reference 18070/GEDS/REV B) is presented below:

- The site has had limited previous development since 1848, having accommodated a small house on the northern boundary until 1851, and then a small building in the southwestern corner of the site from 1928 to 1955. No other development has taken place on site, which appears to have been utilised for agricultural purposes through the whole of its recorded history.
- Geology comprises glacial Till deposits (Secondary Undifferentiated) over Pennine Lower Coal Measures (Secondary A).
- The site is located within the Coal Mining Reporting Area, however the site is not located in an area which would be affected by past or present underground mining.
- There are no records of shallow mines or mine entries in and around the site.
- The nearest watercourse is the Whittle Brook, which forms the southern boundary of the site.
- The site is not located in a Zone 2 or 3 floodplain.
- The site is not located in an area requiring radon protection measures.
- The identified potential sources of contamination included naturally occurring elevated concentrations of contaminants, made ground associated with stockpiled tarmac chippings near the western boundary of the site, and potential made ground associated with the area of potentially infilled material in the approximate centre of the site.
- There are no significant potential sources of contamination or off-site sources of explosive or toxic gases affecting the site.
- The risks to human health were considered to range from very low to moderate/ low, but the overall risk was assessed as very low.
- The risk from ground gas is considered to be low and ground gas monitoring is not required.
- The risks to controlled waters were considered to range from low to moderate/ low, but the overall risk to the water environment was assessed as low.
- Recommendations were for an appropriate Phase II ground investigation to be carried out to confirm the identified risks and obtain information for preliminary design.

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 of 05/07/2022 and 07/07/2022.

Method	No.	Range Depths (m bgl)	Purpose
Trial pits – JCB 3CX.	16	2.60 – 3.80	Establish general ground conditions and gain good coverage. TP08 and TP09 located to investigate potentially infilled pond. TP13 and TP14 excavated to undertake soakaway infiltration tests.
Infiltration tests	2	2.60 – 2.65	Obtain infiltration rates for drainage design.
Hand excavated trial pit.	1	1.20	Investigate location of reported stockpile of macadam chippings.
Window sample boreholes – Tracked WS rig.	6	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. WS04 placed to target potentially infilled pond.

The approximate locations of the exploratory holes are indicated on the Exploratory Hole Location Plan, Drawing No C5042/03. The exploratory hole logs are presented in Appendix B.

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

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

4.3 Sampling

During the drilling and excavation 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.

4.4 Chemical 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 or olfactory evidence of potential hydrocarbon impactation, representative soil samples were screened for the following general suite of determinands at a UKAS approved laboratory:

Determinand	No of Samples
BSL Default Soil Suite: Arsenic, Cadmium, Chromium (III), Chromium (VI), Copper, Nickel, Mercury, Lead, Zinc, Selenium, speciated polycyclic hydrocarbons (PAH 16), water soluble sulphate (2:1 Extract), soil organic matter (SOM) and pH.	6
Asbestos Screen.	6

The Chemical Laboratory Testing Results are presented in Appendix C.

4.5 Geotechnical Laboratory Testing

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.	5
Plasticity Index Analysis.	5
pH Value.	5
Water Soluble Sulphate Contents.	5

The Geotechnical Laboratory Testing Results are presented in Appendix D.

4.6 Monitoring

Ground gas and ground water monitoring standpipes were installed in 4 boreholes and subsequently 6 monitoring visits were 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 (O₂), carbon dioxide (CO₂) and methane (CH₄) 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
WS01	35mm PVC	1.00 – 5.00	Natural clay	Ground Gas
WS03	35mm PVC	1.00 – 5.00	Natural clay	Ground Gas
WS04	35mm PVC	1.00 – 5.00	Natural clay	Ground Gas
WS06	35mm PVC	1.00 – 5.00	Natural clay	Ground Gas

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 E of this report.

5.0 GROUND CONDITIONS

5.1 Made Ground

Made Ground – Topsoil

Made Ground Topsoil was encountered across the site, in all exploratory holes, from ground level to between 0.10m bgl and 0.80m bgl, generally comprising brown sandy clay with occasional organic matter, rootlets and anthropogenic inclusions of gravel sized brick and coal alongside rare glass.

Made Ground – General

Made ground was encountered within WS04 underlying the made ground topsoil from 0.60m bgl to 0.90m bgl. It was found to comprise slightly sandy clay with anthropogenic inclusions of gravel sized brick, coal and rare glass and clinker. This is considered to be localised, representing an infilled pond.

5.2 Natural Superficial Strata

The natural strata underlying the site was generally firm to stiff clay with varying amounts of sand and gravel as minor constituents, and is interpreted to represent glacial Till. Shear vane readings in the cohesive soils indicate the clays are generally firm to stiff.

The cohesive soils were locally interbedded with slightly gravelly clayey sands which were encountered in TP03, TP14 and TP16, WS01 and WS02 as minor strata less than 1m in thickness. In TP12 no cohesive soils were encountered; slightly gravelly clayey sands and slightly gravelly sands were encountered beneath the made ground topsoil to the base of the exploratory hole at 3.05m bgl.

5.3 Solid Geology

The solid geology of the Pennine Lower Coal Measures was not encountered in this investigation.

5.4 Groundwater

The depths to groundwater and locations present are shown in the table below:

Location	Depth During Site Works (m)	Depth During Monitoring Period (range) (m)
TP03	2.30 - Small seepage	N/A
TP09	3.60 - Small seepage	N/A
WS01	N/A	3.64 – 3.87
WS03	N/A	3.83
WS04	3.50	3.39 – 3.90
WS06	N/A	4.00 – 4.79

5.5 Observations

Contamination

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

With the exception of clinker observed as a minor constituent in the made ground between 0.60m and 0.90m bgl in WS04, no other evidence of contamination was observed at the site.

Stability of Excavations/Boreholes

The sides of the trial pits were generally stable however collapsing of the natural granular strata was observed in TP12 and TP16.

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

6.0 GEOTECHNICAL ASSESSMENT

6.1 Ground Model Summary

The site is currently a field used for grazing horses with no buildings or other development present.

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

-
- Made ground generally comprising sandy from ground level to between 0.10m bgl and 0.90 m bgl.
 - Natural superficial deposits comprising slightly gravelly slightly sandy clay and less frequent bands of sand proven to depths between 1.20m bgl and 5.45 m bgl.
 - Groundwater levels ranging between 2.30m bgl and 3.60m bgl during site works.
 - Post site works monitoring levels ranging between 3.39m bgl and 4.79m bgl.
-

Evidence indicates a shallow infilled pond is situated in the centre of the site. This will need to be taken into consideration for foundation design.

6.2 Geotechnical Laboratory Test Results

Plasticity Index Analysis

Plasticity index results ranged between 11% and 28% indicating the cohesive soils to be of low to high plasticity. Associated water contents ranged between 14% and 26%.

After modification of particle size in accordance with NHBC Chapter 4.2 the modified plasticity indices are in the range 10.23% to 26.32% indicating the cohesive soils to be of low to medium volume change potential.

6.3 Aggressive Ground Conditions – Geotechnical Chemical Testing

The test results for the assessment of aggressive ground conditions are presented in Appendix D. The results are summarised and assessed within Section 7.0 of this report.

6.4 In Situ Geotechnical Testing

In Situ Hand Shear Vane Tests

Hand shear vane tests were carried out on suitable cohesive soils recovered from the trial pits where possible. 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 B.

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 B.

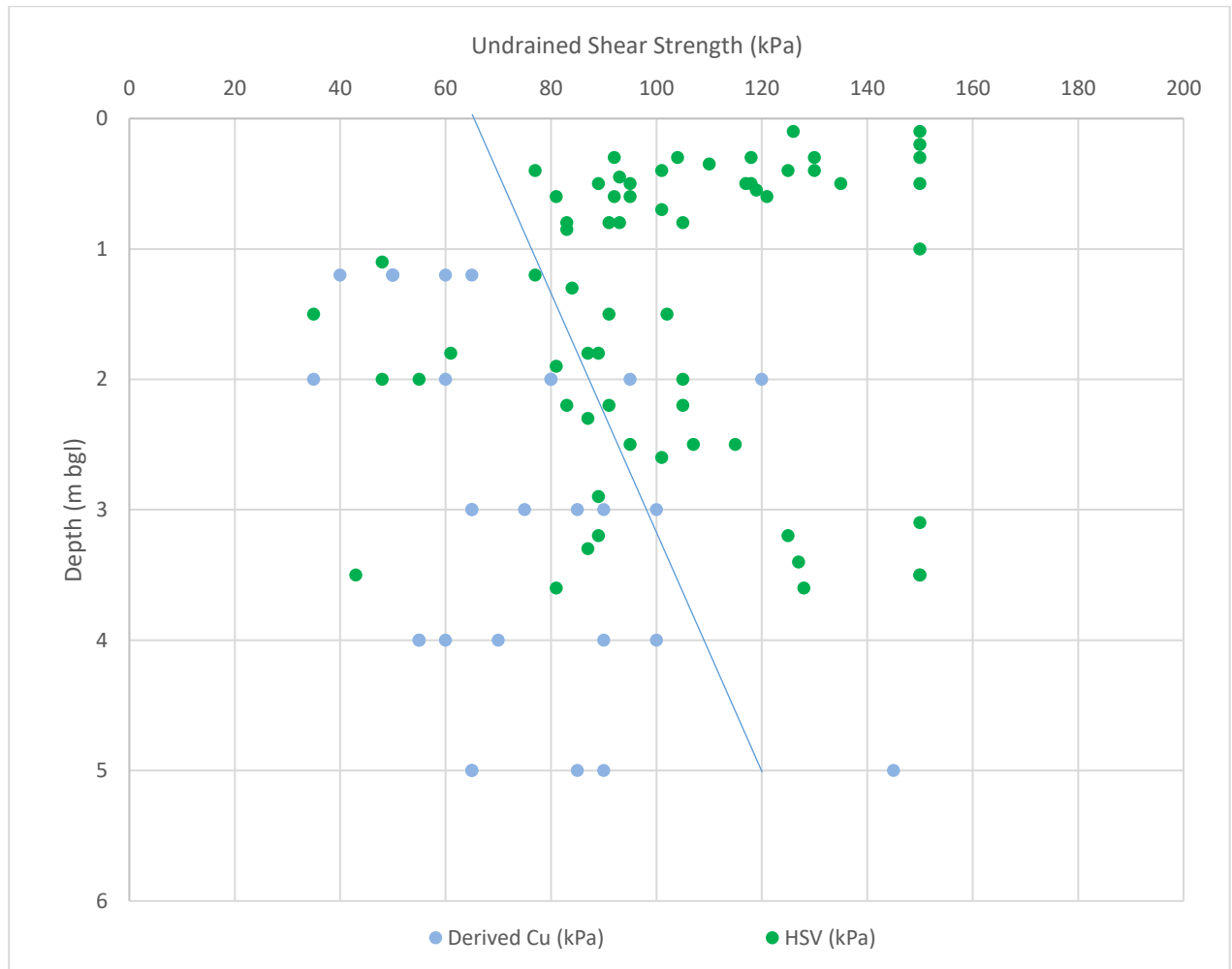
All SPT N values are uncorrected. Density and strength descriptors are reported in accordance with the guidelines stated in BS 5930:2015+A1:2020, incorporating requirements of BS EN ISO 14688-1:2002, BS EN ISO 14688-2:2004 and BS EN ISO 14689-1:2003.

6.5 Design Soil Parameters

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

For cohesive (fine) soils, the equivalent approximate undrained shear strengths (C_u) have been calculated from the recorded SPT N values, adopting an f_1 value of 5, based on the correlation of Stroud (1975) and the 'average' plasticity.

A depth (m bgl) vs derived shear strength (C_u) graph is provided below to provide a profile of the cohesive soils underlying the site.



The above graph shows a general increase in soils strengths 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.

The characteristic value for undrained shear strength (C_u) in cohesive deposits at 0.90mbgl is interpreted to be 75kN/m^2 , increasing to 90kN/m^2 at 2.00mbgl.

6.6 Foundations

The development will comprise comprising the construction of 23 homes, with associated gardens, highways and infrastructure 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.

Shallow Foundations – Strip

The most suitable foundations for the proposed residential homes are considered to be strip foundations at a minimum depth of 0.90m bgl based on the medium volume change potential clays and deepened near trees and hedges in accordance with NHBC Chapter 4.2.

At 0.90m bgl, an allowable bearing capacity not exceeding 150kN/m² may be assumed assuming a foundation breadth of 0.60m at a depth of 0.90m bgl within the firm to stiff undisturbed natural clays.

Based on the investigation data, limited thicknesses of granular soils may be present at or within influencing distance of the foundations. If foundation excavations encounter granular strata or changes between cohesive and granular strata, then BSL should be contacted for further advice. Options could include deepening to found on the same strata or reinforcing the foundation.

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.

General Advice for Shallow Foundations

The bearing stratum should be inspected for 'soft spots' within the natural clay strata, resulting for instance from localised groundwater perched within the overlying fill materials. If soft soils are encountered, then foundations will need to be deepened to found on suitable strata. The stratum should also be inspected for "hard spots" which may require removal.

If the ground conditions encountered during the construction phase differ significantly to the conditions encountered during construction, work should cease and BSL contacted for further advice.

During the construction phase supervision should be on a continuous basis to check the design assumptions are correct and construction conforms to design. Supervision should include inspections, Control Ground Investigations and monitoring.

6.7 Building Near Trees

The clay soils on site are of medium volume change potential. Where foundation excavations 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, unless it can be satisfied that the soil is not desiccated.

6.8 Floor Slabs

Given the medium volume change potential of the clays and thickness of made ground locally present (>600mm in one exploratory hole), 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.

6.9 Site Preparation and Construction

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

Instability of excavations through natural cohesive soils is not anticipated provided they are not exposed to adverse weather conditions for any substantial period of time. Instability of the made ground, and natural granular strata encountered in the far south-eastern area of the site, 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.

Potential Giant Hogweed has been identified on site and specialist advice should be sought.

Recorded post site works groundwater levels ranged between 3.39m and 4.79m bgl and therefore are unlikely to be encountered within likely excavation depths. Based on the exploratory holes logs and monitoring, it is considered that methods such as sump pumping are likely to be sufficient to deal with anticipated flows. Further guidance is provided in CIRIA C750 "Groundwater Control: Design and Practice". It should be noted that groundwater levels will vary seasonally and the timing of construction may influence requirements.

6.10 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.

Stratum	No. Samples	Characteristic SO ₄ (mg/l)	Characteristic pH	DS Class	ACEC Class
Made Ground	4	152	6.2	DS1	AC-1s
Natural Superficial Strata	7	116	6.3	DS1	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.

6.11 Highways

Based on Table 5.1 from DMRB IAN 73/06 Rev 1 equilibrium CBR values of 5% are likely to be achieved in undisturbed natural clay soils for pavement design purposes, unless proven otherwise by in-situ testing at formation level by a specialist geotechnical engineer. Equilibrium CBR values are likely to be 2% within the made ground.

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

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.

6.12 Sustainable Drainage Systems (SuDS)

The use of soakaways within the natural ground is not considered to be feasible at the site due to the very low infiltration rate obtained from one pit on the order of 10^{-7} m/s, and the other pit not draining; attributed to the presence of low permeability cohesive strata underlying the site.

The infiltration testing results are presented in full in Appendix F.

7.0 GEO-ENVIRONMENTAL RISK ASSESSMENT

7.1 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 C alongside the chemical test results. Results are discussed in detail in the sections below.

7.2 Soils Test Results and Risk Assessment – Human Health

Metals

No metals have been detected above the adopted screening criteria.

Asbestos

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

Poly Aromatic Hydrocarbons (PAHs)

No PAHs have been detected above the adopted screening criteria.

7.3 Permanent Ground Gas and Vapours Results

Six ground gas monitoring visits have been carried out between the dates of 13th July and 3rd October 2022. Results are summarised in the table below:

	CH ₄ (%)		CO ₂ (%)		O ₂ (%)		CO (ppm)		H ₂ S (ppm)		Flow (l/hr)	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Peak	0.1	0.1	0.1	3.0	18.9	20.8	0.0	0.0	0.0	0.0	-0.2	0.9
Steady	0.1	0.1	0.1	0.8	19.6	21.0					0.1	0.1

Notes: CH₄ = Methane; CO₂ = Carbon dioxide; O₂ = Oxygen; CO = Carbon Monoxide; H₂S = Hydrogen Sulphide; ppm = Parts Per Million.

The highest peak carbon dioxide concentration was recorded in WS04 (3.0% v/v). Methane was not recorded above the detection limit (0.1% v/v) in any of the exploratory holes during the initial monitoring visits. The maximum steady state flow did not exceed 0.1l/hr in any of the holes, therefore did not exceed the limit of detection of the monitoring equipment. The highest initial flow reading of 0.9l/hr was recorded in WS04 on the fifth visit, but flow rate quickly reduced to a steady state at the detection limit (0.1l/hr).

The atmospheric pressure ranged between 993mb and 1007mb over the monitoring period, of which visits were conducted over a range of falling, steady and rising atmospheric pressure trends.

Groundwater levels have not been recorded above the response zones in any of the holes on any visits.

7.4 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 low rise residential, guidance dictates that the gas monitoring results should be assessed in accordance with the Boyle and Witherington methodology.

The Boyle and Witherington uses the concept of a Gas Screening Value (GSV) which is derived using the following equation: $(\text{max gas concentration} / 100) \times \text{maximum flow}$.

A maximum positive flow of 0.9/hr has been used to derive the GSVs. The GSV’s for the site are presented below.

Gas	GSV (l/h)	Classification Based on GSV	Typical Threshold Concentration Exceeded
Methane	0.0009	NHBC Green	No
Carbon Dioxide	0.027	NHBC Green	No

The GSVs for both methane and carbon dioxide place the site the site into the NHBC Green classification of the Boyle and Witherington Traffic Light System as outlined in CIRIA C665.

7.5 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.

7.6 Qualitative Risk Assessment

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

Human Health						
Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk	Justification
On site Made Ground and Infilled Pond Metals, PAHs	Root uptake, ingestion, direct contact, inhalation of dusts	End-users	Unlikely	Medium	Low	Made ground is not present in thicknesses exceeding a maximum of 0.90m in the area of the infilled pond, and chemical testing has not yielded any exceedances of determinands when screened against a residential with homegrown produce end-use. No visual or chemical evidence of contamination was noted across the site during the ground investigation. Therefore, there is not considered to be an elevated risk to human health and the overall risk is assessed as low.
On site Made Ground Metals and organic contamination	Migration into/chemical attack of water supply pipelines	Water Pipelines / End users	Unlikely	Medium	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.
On site Made Ground and Infilled Pond Ground Gas (carbon dioxide and methane)	Migration into confined spaces, inhalation and asphyxiation/ explosion	End-users / property / structures	Unlikely	Medium	Low	As mentioned, the made ground does not exceed 0.90m and has not been found to contain putrescible/degradable materials, therefore there is no viable source of potentially harmful ground gases on site. Additionally, the gas monitoring, including the install within WS04 targeting the infilled pond, classifies the site as Green on the NHBC Traffic Light System based on the Boyle and Witherington methodology.

Controlled Waters						
Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk	Justification
Made Ground PAH's, Metals	Overland flow, / migration through saturated zone	Whittle Brook abutting Southern Boundary (Surface waters)	Unlikely	Medium	Low	It is considered contaminants associated with the limited made ground are unlikely to impact Whittle Brook. This is due to the low permeability of the clays underlying the area, which will inhibit lateral migration. No evidence of contamination was noted during the investigation and no potentially contaminative previous uses were identified as part of the desk study assessment. In addition, chemical testing of soils indicates no elevated concentrations of contaminants above residential end use screening values, as an indicator of leachability to groundwater and surface water. Therefore, a low risk is posed to the river from the highly limited made ground.
	Leaching through unsaturated zone / Migration through saturated zone	Secondary Undifferentiated Aquifer (Ground-water)	Unlikely	Medium	Low	As stated above, the made ground is not considered to be a significant source of contamination based on the investigation. A large proportion of the site will have new hardstanding in the form of roads, footpaths and driveways with a new surface water drainage system installed which will further reduce the risk to controlled waters. By virtue of the development taking place, this should contribute to an overall "betterment" of groundwater quality.
	Migration through saturated zone	Secondary A Aquifer (Ground-water)	Unlikely	Medium	Low	As stated above, the made ground is not considered to be a significant source of contamination based on the investigation There are no groundwater abstraction licences or Source Protection Zones near the site. As stated above, A large proportion of the site will have new hardstanding in the form of roads, footpaths and driveways with a new surface water drainage system installed which will further reduce the risk to controlled waters.

7.7 Outline Remedial Measures

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.

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

Ground Gas Protection Systems

Based on the ground gas monitoring results, no mitigation measures are required with respect to carbon dioxide and methane. No radon protection is required for new buildings at this location.

7.8 Health and Safety Issues

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

Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk
Made Ground (heavy metals, PAHs)	Ingestion, direct contact, inhalation of dusts.	Construction Workers	Unlikely	Medium	Low
Asbestos	Ingestion, direct contact, inhalation of dusts.	Construction Workers	No Linkage	Medium	Negligible
Ground gas	Inhalation in confined spaces/trenches	Construction Workers	Unlikely	Medium	Low

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. However, the vast majority of construction activities will take place in open air or well ventilated areas which will significantly reduce the potential for ground gases to accumulate to concentrations which could be potentially harmful to workers.

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.
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8.0 WASTE SOIL CLASSIFICATION & ASSESSMENT

8.1 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.

Wastes first need to be classified based on their total concentrations. 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.

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

Classification based on Total Concentrations ¹	PRIOR TO LEAVING SITE			
	Non-Hazardous Waste		Hazardous Waste	
WAC testing	IF SOILS CANNOT BE RE-USED ELSEWHERE AND MUST GO TO LANDFILL			
	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

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

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

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

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).

8.2 Waste Classification

Testing results have been assessed through a waste classification database (HazWasteOnline) 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").

6 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.

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

The Waste Classification Report results are presented in Appendix G.

8.3 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.

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.

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.

Alternatives, such as a U1 exemption, may also be utilised.

9.0 CONCLUSIONS

9.1 Geo-Environmental

Geo-Environmental – Human Health

Testing of the made ground at the site did not reveal any exceedances of heavy metals, PAHs or asbestos.

The above are therefore not considered to pose a risk to human health and remedial measures are not required.

Ground gas monitoring has revealed a maximum peak carbon dioxide concentration of 3.0%v/v and methane concentrations of 0.1%v/v. Following the gas monitoring period, the site is classified as NHBC Green and ground gas protection measures are not required.

Geo-Environmental – Controlled Waters

The overall risk to controlled waters is assessed as low and no further action is required.

9.2 Geotechnical

Foundations

The most suitable foundation type is considered to be strip foundations at a minimum depth of 0.90m bgl based on the medium volume change potential clays. Assuming 600mm wide strip fill foundations are adopted at a depth of 0.90m bgl within the natural firm to stiff clays, an allowable bearing capacity not exceeding 150kN/m² may be assumed for preliminary foundation design purposes. This adopts a factor of safety of 3 which should limit settlements to within acceptable limits.

Floor slabs

Suspended floor slabs are recommended with a void size beneath floor slabs of 250mm based on the medium volume change potential clays.

Concrete classification

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.

Highways

Based on Table 5.1 from DMRB IAN 73/06 Rev 1 equilibrium CBR values of 5% are likely to be achieved in undisturbed natural clay soils for pavement design purposes, unless proven otherwise by in-situ testing at formation level by a specialist geotechnical engineer. Equilibrium CBR values are likely to be 2% within the made ground.

Drainage (SuDS)

The use of soakaways within the natural ground is not considered to be feasible at the site due to the low infiltration rate obtained from one location on the order of 10⁻⁷ m/s, and the other test location exhibiting no infiltration.

9.3 Further Work

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

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- Tree survey by qualified arboriculturist and treatment of invasive species, if confirmed to be present.
 - Detailed foundation design by a structural engineer.
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10.0 ABBREVIATIONS AND DEFINITIONS

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

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

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

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DRAWINGS

LANGLEY LANE, BIRCH



general notes:
do not scale the drawing.
all dimensions to be checked on site prior to commencement of work and any discrepancy shall be immediately reported and resolved prior to work commencing.
this drawing is to be read in conjunction with all relevant drawings and specifications relating to the job whether or not indicated on the drawing.
copyright reserved to mck associates ltd. and this drawing may not be used or reproduced without prior written consent.

House Type	Storey	House Type	Garage	Sqft	No	Total Sqft
TYPE A	2	2 bed - semi-detached	N/A	842	4	3,368
TYPE B	2	3 bed - semi-detached	SG	1026	1	1,026
TYPE C	2	3 bed - semi-detached	SG	1026	1	1,026
TYPE D	2.5	5 bed - detached house	DDG	1704	1	1,704
TYPE E	2	3 bed - detached dual aspect house	DDG	1039	1	1,039
TYPE F	2	3 bed - detached house	ISG	1059	2	2,118
TYPE G	1	2 bed - detached house	ISG	1147	1	1,147
TYPE H	1	2 bed - detached house	DSG	1147	1	1,147
TYPE I	2	4 bed - detached house	ISG	1216	1	1,216
TYPE J	2	4 bed - detached house	ISG	1216	1	1,216
TYPE K	2.5	5 bed - detached house	DDG	1738	1	1,738
TYPE L	2	4 bed - detached dual aspect house	ISG	1478	2	2,956
TYPE M	2	4 bed - detached house	ISG	1395	3	4,185
TYPE N	2	4 bed - detached house	DSG	1500	1	1,500
TYPE O	2	5 bed - detached house	DDG	1780	2	3,560
Total					23	28,946

Gross Area	3.2	Acres	1.3	Hectares
Non-developable/POS	0.83	Acres	0.34	Hectares
Net	2.37	Acres	0.96	Hectares

KEY	
	Site boundary
	Existing trees to be retained
	Indicative planting
	Indicative hedging
	Denotes shared drives
	Denotes raised tables
	Denotes country road

25	18.05.22	WL	Plot 16 side door steps added. updated to engineer drawing
24	17.05.22	WL	Plot 16 path added. Type M garage wall added
23	01.03.22	AT	Updated schedule
22	15.02.22	WL	Embankment removed from layouts
21	07.02.22	WL	Removed trees removed from plan
20	03.02.22	WL	Plot 17-15 rear fence updated
19	17.01.22	WL	Hard & soft landscaping updated
18	12.01.22	WL	Embankment added behind plots 6-15.
17	10.01.22	WL	Embankment added behind plots 6-15. 17-19 moved slightly north. 14 slightly south. Steps to 16
16	20.12	CT	Landscape layout updated.
15	16.12	WL	Layout updated to match soft & hard landscaping plan
14	06.12	WL	Plot 3 garage & drive location and size enlarged
13	01.12	CT	Moved plot 14 forward and amended patio on plot 16
12	30.11	CT	Amended fencing plot, moved plot 16
11	26.11	CT	Amended adoptable highway
10	26.11	CT	Amended plot 15 and the garage to plot 1
09	23.11	CT	Plot 2.3 roof amended, amended garage plot 3 and courtyard
08	10.11	WL	POS arrow removed
07	08.11	WL	House types changed from numbers to letters. Schedule updated
06	27.10	WL	Updated to match soft landscape plan, plot 15 flipped, trees overlayed, turning head amended
05	25.10	WL	Updated to match hard landscape plan
04	13.10	CT	Addition of pump station
03	08.10	WL	Wordsworth soft updated. Schedule updated. Ne & Sh cribs updated. Types renamed
02	15.09	AT	Amendments to house types: Chu, Ni, Vic & Bru.
01	08/09	CT	Changes following comments from HH 03/09
Rev.	Date	By	Description

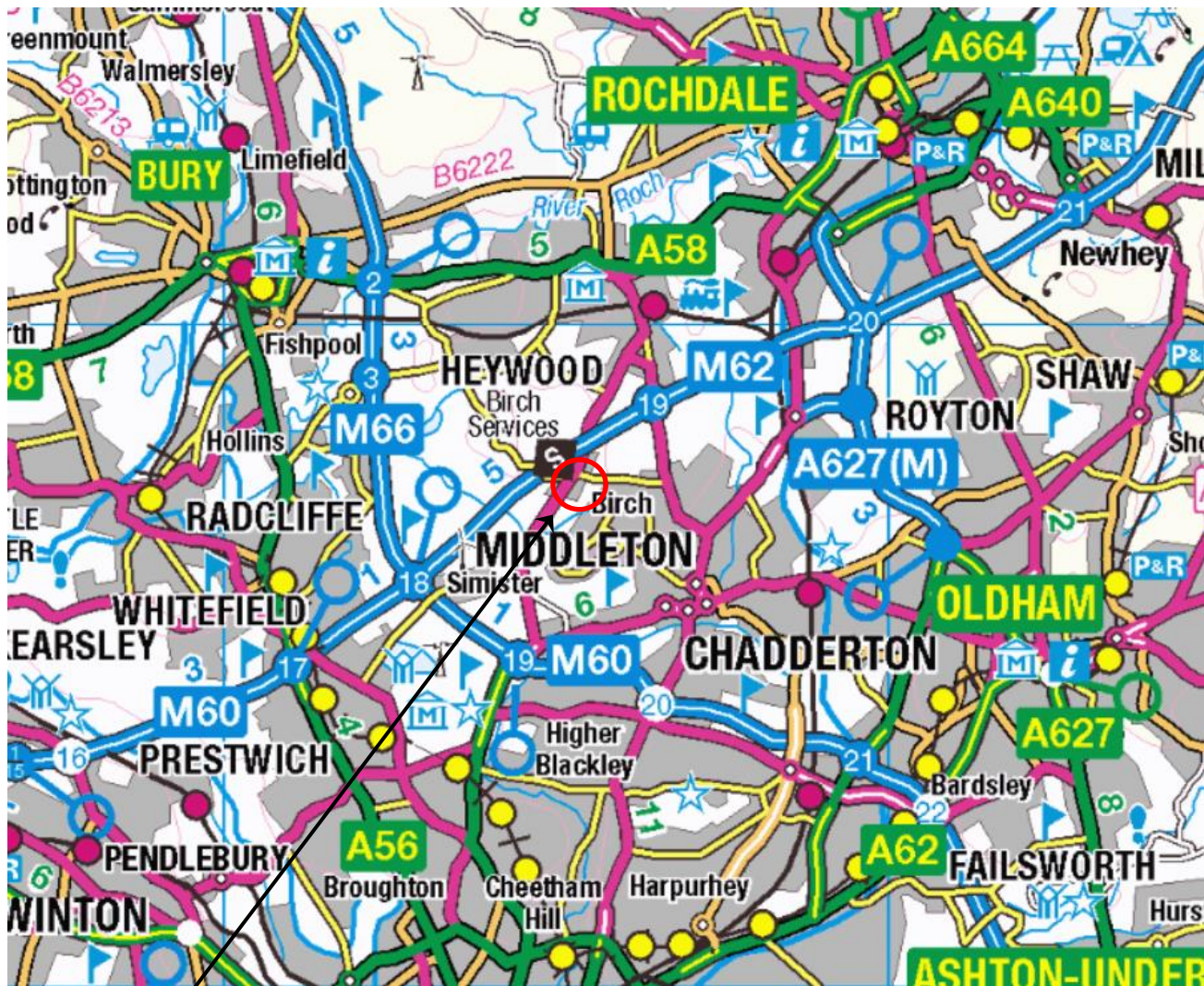
Client:
HOLLINS HOMES

mck associates limited
architecture | building surveying | urban design
burnaby villa ■ 48 watling street road ■ fulwood ■ preston ■ pr2 8bp
tel: 01772 774510 fax: 01772 774511 email mck@mckassociates.co.uk

Project:
**LANGLEY LANE, BIRCH
MIDDLETON**

Drawing Title:
PROPOSED SITE LAYOUT

Drawn: W.L.	Checked:	Scale: 1:500	Date: JULY 2021
Job No: 18-041	Drawing No: PL01	Rev: 25	



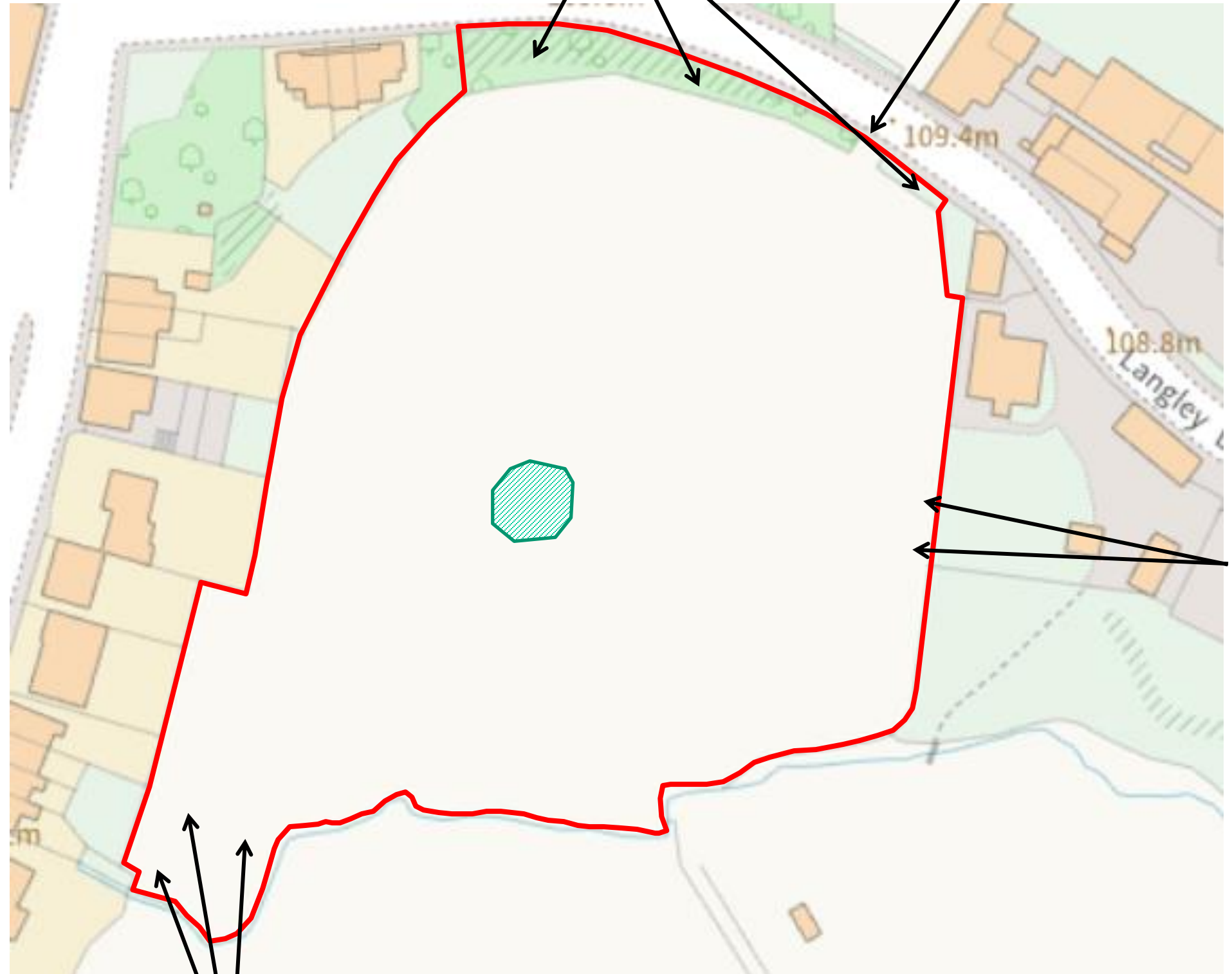
SITE LOCATION

NEAREST POSTCODE: M24 5LL

SITE ENTRANCE WHAT3WORDS: ///TOLLS.BEATS.CARING



REV	DATE	DESCRIPTION	BY	CKD
 BROWNFIELD SOLUTIONS LTD GEO ENVIRONMENTAL ENGINEERING EXCELLENCE				
CLIENT				
HOLLINS HOMES				
PROJECT TITLE				
LANGLEY LANE, BIRCH				
DRAWING TITLE				
SITE LOCATION PLAN				
DRAWING No. C5042/01	REVISION -	SCALE NTS	DATE 11/07/22	
DRAWN BY SD		CHECKED BY JEM		



POTENTIAL GIANT
HOGWEED

SEMI/ MATURE TREES
AND HEDGES

SITE ACCESS VIA
HERAS FENCING

MATURE TREES

KEY

- APPROXIMATE SITE BOUNDARY
- TOPOGRAPHIC LOW

REV	DATE	DESCRIPTION	BY	CKD



CLIENT			
HOLLINS HOMES			
PROJECT TITLE			
LANGLEY LANE, BIRCH			
DRAWING TITLE			
SITE FEATURES PLAN			
DRAWING No.	REVISION	SCALE	DATE
C5042/02	-	NTS	12/07/22
DRAWN BY		CHECKED BY	
JEM		TM	



KEY

- APPROXIMATE SITE BOUNDARY
- TRIAL PIT
TPXX
- WINDOW SAMPLE BOREHOLE
WSXX
- HAND EXCAVATED TRIAL PIT
HPXX
- SOAKAWAY TEST LOCATION
- BOREHOLE INSTALLATION

REV	DATE	DESCRIPTION	BY	CKD



CLIENT			
HOLLINS HOMES			
PROJECT TITLE			
LANGLEY LANE, BIRCH			
DRAWING TITLE			
EXPLORATORY HOLE PLAN			
DRAWING No.	REVISION	SCALE	DATE
C5042/03	-	NTS	11/07/22
DRAWN BY		CHECKED BY	
JEM		TM	

APPENDIX A

BSL Methodology and Guidance

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

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

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

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

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

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

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

Contaminated Land - Legislative Background

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

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

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

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

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

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

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

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

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

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

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

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

Relevant Guidance Documents

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

- DETR: Circular 02/2000: Environmental Protection Act 1990: Part IIA: Contaminated land. 2012.
 - Environment Agency technical advice to third parties on Pollution of Controlled Waters for Part IIA of the EPA1990, May 2002.
 - BS 10175:2011+A2:2017.
 - Environment Agency (EA) - Land Contamination Risk Management (LCRM). 2019.
-

- Groundwater Protection - <https://www.gov.uk/government/collections/groundwater-protection>.
- UK Technical Advisory Group (UKTAG) - - Water Framework Directive
- Incidents and their classification: the Common Incident Classification Scheme (CICS) – Used by the Environment Agency to classify pollution incidents.

Relevant Legislative Documents

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

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

Contaminated Land Risk Assessment Approach

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

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

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

Further information can be found at the below site:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Ground Gas Risk Assessment Guidance

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

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

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

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

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

Legislative Framework

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

Generation Potential of Sources

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

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

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

Frequency and Duration of Monitoring

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

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

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

Typical/idealised periods of monitoring

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

Typical/idealised frequency of monitoring/Number of Visits Required

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

Note

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

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

RB17 Approach

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

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

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

Unexploded Ordnance (UXO) Guidance

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

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

Contaminated Land Screening Values

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

General

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

Source-Pathway-Receptor

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

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

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

Human Health

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

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

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

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

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

Controlled Waters

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

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

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

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

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

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

Further Assessment

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

Re-Use Of Waste - Guidance Note

Definition of Waste

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

CL:AIRE: Code of Practice

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

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

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

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

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

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

In order to satisfy these requirements the following are required:

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

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

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

Waste Classification for Soils

Introduction

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

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

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

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

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

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

Background for Landfill Disposal

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

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

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

Key Points:

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

Classification

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

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

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

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

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

Waste Definitions

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

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

WAC Testing

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

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

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

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

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

Hydrocarbons in Soils

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

Known Oils

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

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

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

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

Unknown Oils

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

WM3 states that:

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

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

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

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

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

For example:

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

References

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

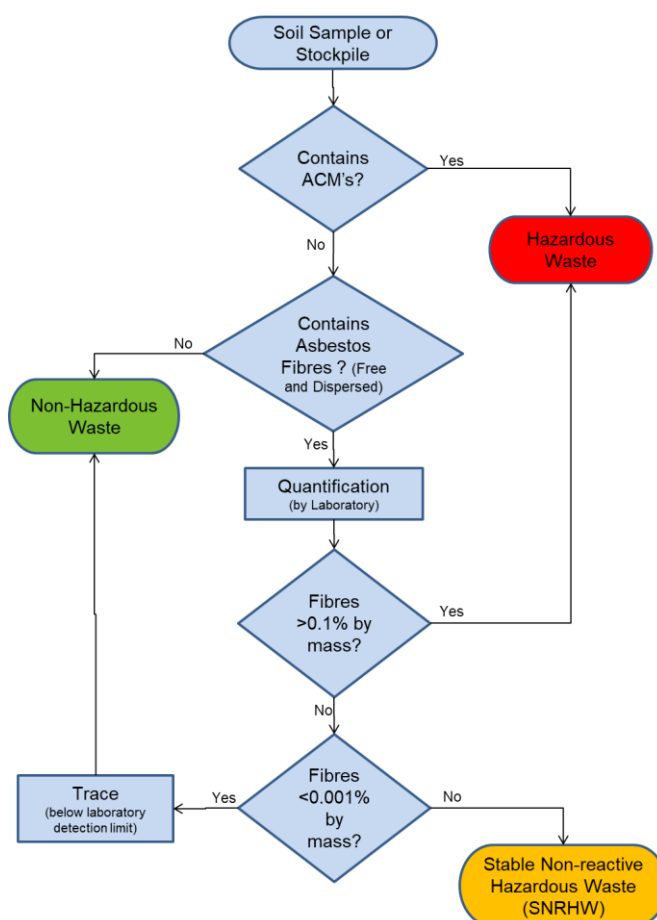
Additional Asbestos Guidance Notes

Disposal

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

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

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



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

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

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

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

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

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

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

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

Construction

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

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

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

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

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

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

End Use

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

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

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

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

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

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

Asbestos in Soil as Free Fibres

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

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

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

APPENDIX B

Exploratory Hole Logs



No.

HP01

Sheet 1 of 1

CO-ORDS:

LEVEL:

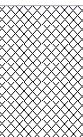
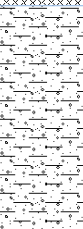
DATES: 07/07/22

Logged

Checked

JEM

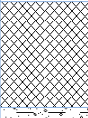
MS

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description	
	Depth (m)	Type	Results					
	0.00-0.45	ES	95kPa	0.45			MADE GROUND: Soft brown slightly gravelly sandy clay with rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, coal, mudstone and sandstone. (TOPSOIL)	1.0
	0.50-1.20 0.50 0.60	ES HSV D					Stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.	
	End of Trial Pit at 1.20m							
								2.0
								3.0
								4.0
								5.0

1. No Groundwater encountered.
2. Sides stable.
3. Hole backfilled with arisings, upon completion.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

 BROWNFIELD SOLUTIONS LTD						Trial Pit Log		No.			
TP01											
Sheet 1 of 1											
PROJECT NO: C5042						CO-ORDS:		Hole Type			
PROJECT NAME: LANGLEY LANE, BIRCH						LEVEL:		TP			
CLIENT: HOLLINS HOMES						DATES: 05/07/22		Scale			
								1:25			
								Logged		Checked	
								JEM		MS	
Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description				
	Depth (m)	Type	Results								
	0.00-0.30	ES					MADE GROUND: Soft brown slightly gravelly sandy clay with rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, coal, glass, mudstone and sandstone. (TOPSOIL) Stiff orangish brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.				
	0.30	HSV	92kPa	0.30							
	0.90	D							1.0		
	1.20	D HSV	77kPa								
	1.80	HSV	87kPa								
	2.00	D							2.0		
	2.50	HSV	95kPa								
	3.20	D							3.0		
	3.30	HSV	87kPa								
	3.70	D		3.70							
							End of Trial Pit at 3.70m		4.0		
									5.0		
Remarks		1. No Groundwater encountered. 2. Sides stable. 3. Hole backfilled with arisings, upon completion.						ES = Environmental Sample D = Disturbed Sample B = Bulk Sample LB = Large Bulk Sample U = Undisturbed Sample UT = Undisturbed Thin Wall Sample SPT = Standard Penetration Test PID = Photoionization Detector (ppm) PPM = Part Per Million HSV = Hand Shear Vane			

BROWNFIELD SOLUTIONS LTD						Trial Pit Log		No.	
								TP02	
								Sheet 1 of 1	
PROJECT NO: C5042						CO-ORDS:		Hole Type	
								TP	
PROJECT NAME: LANGLEY LANE, BIRCH						LEVEL:		Scale	
								1:25	
CLIENT: HOLLINS HOMES						DATES: 05/07/22		Logged	Checked
								JEM	MS
Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description		
	Depth (m)	Type	Results						
	0.00-0.35	ES					MADE GROUND: Soft brown slightly gravelly sandy clay with rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, coal, mudstone and sandstone. (TOPSOIL)		
	0.35 0.40	HSV D	110kPa	0.35			Stiff orangish brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.		
								1.0	
	1.30	D HSV	84kPa	1.40					
	1.50	HSV	35kPa				Soft to firm brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.		
	1.60	D							
								2.0	
	2.00	HSV	55kPa				Becoming firm from 1.90m bgl.		
				2.50			Stiff brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.		
	2.80	D					Becoming stiff from 2.50m bgl.		
	2.90	HSV	89kPa					3.0	
				3.75			End of Trial Pit at 3.75m	4.0	
								5.0	
Remarks		1. No Groundwater encountered. 2. Sides stable. 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	



No.	
TP03	
Sheet 1 of 1	
Hole Type	
TP	
Scale	
1:25	
Red	Checked
	MS

CO-ORDS:

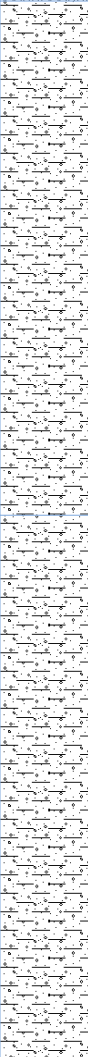
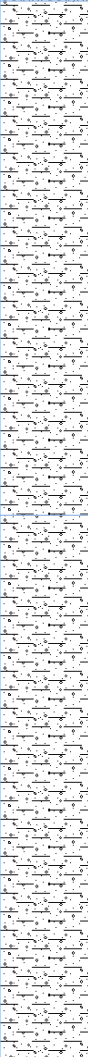
LEVEL:

DATES: 05/07/22

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

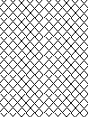
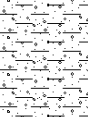
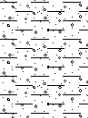
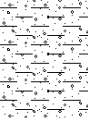
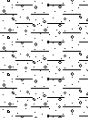
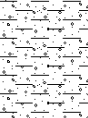
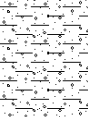
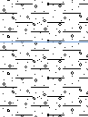
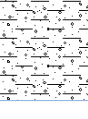
 BROWNFIELD SOLUTIONS LTD						Trial Pit Log		No. TP04 Sheet 1 of 1	
PROJECT NO: C5042						CO-ORDS:		Hole Type TP	
PROJECT NAME: LANGLEY LANE, BIRCH						LEVEL:		Scale 1:25	
CLIENT: HOLLINS HOMES						DATES: 05/07/22		Logged JEM	Checked MS
Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description		
	Depth (m)	Type	Results						
	0.10-0.30 0.10	ES HSV	150kPa				MADE GROUND: Soft brown slightly gravelly sandy clay with rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, coal, mudstone and sandstone. (TOPSOIL)		
	0.50	HSV	135kPa				Stiff yellowish brown mottled light grey slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.		
	0.70	D					Becoming friable beyond 0.50m bgl.		
	2.10	D		2.10			Stiff brown mottled grey slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.		
	3.50	D		3.65			End of Trial Pit at 3.65m		
Remarks		1. No Groundwater encountered. 2. Sides stable. 3. Hole backfilled with arisings, upon completion.						ES = Environmental Sample D = Disturbed Sample B = Bulk Sample LB = Large Bulk Sample U = Undisturbed Sample UT = Undisturbed Thin Wall Sample SPT = Standard Penetration Test PID = Photoionization Detector (ppm) PPM = Part Per Million HSV = Hand Shear Vane	

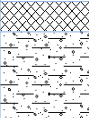
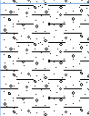
 BROWNFIELD SOLUTIONS LTD						Trial Pit Log		No. TP05 Sheet 1 of 1	
PROJECT NO: C5042						CO-ORDS:		Hole Type TP	
PROJECT NAME: LANGLEY LANE, BIRCH						LEVEL:		Scale 1:25	
CLIENT: HOLLINS HOMES						DATES: 05/07/22		Logged JEM	Checked MS
Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description		
	Depth (m)	Type	Results						
	0.00-0.20	ES							
	0.20	HSV	150kPa						
	0.60	HSV	121kPa				MADE GROUND: Soft brown slightly gravelly sandy clay with rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, coal, mudstone and sandstone. (TOPSOIL) Stiff to very stiff yellowish brown mottled light grey slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal. <i>Becoming friable beyond 0.60m bgl.</i>		
				2.15			Stiff brown mottled grey slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.		
	3.30	D		3.60			End of Trial Pit at 3.60m		
Remarks		1. No Groundwater encountered. 2. Sides stable. 3. Hole backfilled with arisings, upon completion.						ES = Environmental Sample D = Disturbed Sample B = Bulk Sample LB = Large Bulk Sample U = Undisturbed Sample UT = Undisturbed Thin Wall Sample SPT = Standard Penetration Test PID = Photoionization Detector (ppm) PPM = Part Per Million HSV = Hand Shear Vane	

BROWNFIELD SOLUTIONS LTD						Trial Pit Log		No.	
								TP06	
								Sheet 1 of 1	
PROJECT NO: C5042						CO-ORDS:		Hole Type	
								TP	
PROJECT NAME: LANGLEY LANE, BIRCH						LEVEL:		Scale	
								1:25	
CLIENT: HOLLINS HOMES						DATES: 05/07/22		Logged	Checked
								JEM	MS
Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description		
	Depth (m)	Type	Results						
	0.00-0.20	ES		0.20			MADE GROUND: Soft brown slightly gravelly sandy clay with rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, coal, mudstone and sandstone. (TOPSOIL) Stiff to very stiff yellowish brown mottled light grey slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.		
	0.30	HSV	150kPa						
	0.50	HSV	118kPa						
	1.30	D		1.90			Stiff brown mottled grey slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal. <i>Becoming very stiff from 3.00m bgl.</i>		
	1.90	HSV	81kPa						
	2.00	D							
	2.20	HSV	91kPa	3.70			End of Trial Pit at 3.70m		
	3.10	HSV	150kPa						
3.50	HSV	150kPa							
3.70	D								
Remarks		1. No Groundwater encountered. 2. Sides stable. 3. Hole backfilled with arisings, upon completion.						ES = Environmental Sample D = Disturbed Sample B = Bulk Sample LB = Large Bulk Sample U = Undisturbed Sample UT = Undisturbed Thin Wall Sample SPT = Standard Penetration Test PID = Photoionization Detector (ppm) PPM = Part Per Million HSV = Hand Shear Vane	

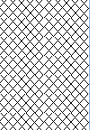
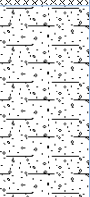
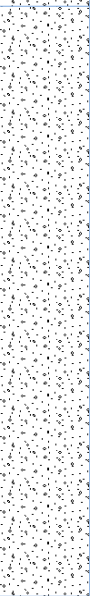
 BROWNFIELD SOLUTIONS LTD						Trial Pit Log		No.					
TP07													
Sheet 1 of 1													
PROJECT NO: C5042						CO-ORDS:				Hole Type			
PROJECT NAME: LANGLEY LANE, BIRCH						LEVEL:				TP			
										Scale			
										1:25			
CLIENT: HOLLINS HOMES						DATES: 05/07/22				Logged	Checked		
										JEM	MS		
Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description						
	Depth (m)	Type	Results										
	0.00-0.30	ES					MADE GROUND: Soft brown slightly gravelly sandy clay with rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, coal, mudstone and sandstone. (TOPSOIL) Stiff orangish brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.						
	0.30	HSV	130kPa										
	0.55	HSV	119kPa										
	0.90	D											
													1.0

BROWNFIELD SOLUTIONS LTD						Trial Pit Log		No.	
PROJECT NO: C5042						CO-ORDS:		TP08	
								Sheet 1 of 1	
PROJECT NAME: LANGLEY LANE, BIRCH						LEVEL:		Hole Type	
								TP	
CLIENT: HOLLINS HOMES						DATES: 05/07/22		Scale	
								1:25	
								Logged	Checked
								JEM	MS
Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description		
	Depth (m)	Type	Results						
	0.30-0.50 0.30	ES HSV	118kPa	0.30			MADE GROUND: Soft brown slightly gravelly sandy clay with rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, coal, mudstone and sandstone. (TOPSOIL)		
	0.80	HSV	83kPa				Stiff orangish brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.		
	1.40 1.50	D HSV	91kPa						
	2.50 2.60	D HSV	101kPa						
	3.10 3.20	D HSV	89kPa						
				3.70					
									
									
									
									
						End of Trial Pit at 3.70m			

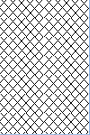
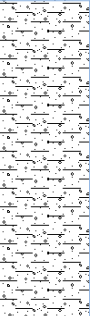
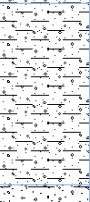
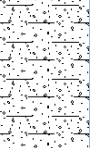
BROWNFIELD SOLUTIONS LTD						Trial Pit Log		No.
PROJECT NO: C5042						CO-ORDS:		TP09
PROJECT NAME: LANGLEY LANE, BIRCH						LEVEL:		Sheet 1 of 1
CLIENT: HOLLINS HOMES						DATES: 05/07/22		Hole Type
								TP
								Scale
								1:25
						Logged	Checked	
						JEM	MS	
Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description	
	Depth (m)	Type	Results					
	0.00-0.40	ES					MADE GROUND: Soft brown slightly gravelly sandy clay with rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, coal, mudstone and sandstone. (TOPSOIL)	
	0.40	HSV	77kPa	0.40			Stiff brownish grey mottled brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.	
	1.10	D HSV	48kPa				Becoming firm from 1.10m bgl.	1.0
	1.80	HSV	89kPa				Becoming stiff from 1.80m bgl.	2.0
	2.30 2.40	HSV D	87kPa					
				3.00				3.0
	3.20	D					Stiff brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.	
	3.40	HSV	127kPa					
				3.60			End of Trial Pit at 3.60m	4.0
								5.0
Remarks		1. Groundwater encountered at 3.60m bgl as a small seepage. 2. Sides stable. 3. Hole backfilled with arisings, upon completion.					ES = Environmental Sample D = Disturbed Sample B = Bulk Sample LB = Large Bulk Sample U = Undisturbed Sample UT = Undisturbed Thin Wall Sample SPT = Standard Penetration Test PID = Photoionization Detector (ppm) PPM = Part Per Million HSV = Hand Shear Vane	

 BROWNFIELD SOLUTIONS LTD						Trial Pit Log			No.	
PROJECT NO: C5042									TP10	
									Sheet 1 of 1	
PROJECT NAME: LANGLEY LANE, BIRCH						CO-ORDS:		Hole Type		
						LEVEL:		TP		
CLIENT: HOLLINS HOMES								DATES: 05/07/22		Scale
						1:25				
								Logged	Checked	
								JEM	MS	
Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description			
	Depth (m)	Type	Results							
	0.00-0.10	ES	104kPa	0.10			MADE GROUND: Soft brown slightly gravelly sandy clay with rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, coal, mudstone and sandstone. (TOPSOIL)			1.0
	0.30	HSV					Stiff reddish brown mottled light grey slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.			
	0.60	D								
	2.00	HSV	48kPa	1.95			Firm brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.			2.0
	2.60	D					End of Trial Pit at 3.65m			3.0
	3.50	D HSV	43kPa	3.65						4.0
										5.0
Remarks		1. No Groundwater encountered. 2. Sides stable. 3. Hole backfilled with arisings, upon completion.						ES = Environmental Sample D = Disturbed Sample B = Bulk Sample LB = Large Bulk Sample U = Undisturbed Sample UT = Undisturbed Thin Wall Sample SPT = Standard Penetration Test PID = Photoionization Detector (ppm) PPM = Part Per Million HSV = Hand Shear Vane		

BROWNFIELD SOLUTIONS LTD						Trial Pit Log		No.	
								TP11	
								Sheet 1 of 1	
PROJECT NO: C5042						CO-ORDS:		Hole Type	
								TP	
PROJECT NAME: LANGLEY LANE, BIRCH						LEVEL:		Scale	
								1:25	
CLIENT: HOLLINS HOMES						DATES: 07/07/22		Logged	Checked
								JEM	MS
Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description		
	Depth (m)	Type	Results						
	0.00-0.30	ES		0.30			MADE GROUND: Soft brown slightly gravelly sandy clay with rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, coal, mudstone and sandstone. (TOPSOIL)		
	0.50	HSV	117kPa				Stiff orangish brown mottled light grey slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.		
	0.80	D							
	1.00	HSV	150kPa	1.05			Becoming very stiff from 1.00m bgl.	1.0	
	1.40	D					Very stiff brown mottled grey slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.		
							Becoming friable from 1.10m bgl.		
								2.0	
									
									
								3.0	
									
									
									
									
									
									
									
									

 BROWNFIELD SOLUTIONS LTD					Trial Pit Log		No. TP12 Sheet 1 of 1		
PROJECT NO: C5042					CO-ORDS:		Hole Type TP		
PROJECT NAME: LANGLEY LANE, BIRCH					LEVEL:		Scale 1:25		
CLIENT: HOLLINS HOMES					DATES: 07/07/22		Logged JEM Checked MS		
Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description		
	Depth (m)	Type	Results						
	0.00-0.45	ES		0.45			MADE GROUND: Soft brown slightly gravelly sandy clay with rootlets and low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, coal, mudstone and sandstone. Cobbles are subrounded to rounded up to 125mm in diameter of sandstone. (TOPSOIL)		
				1.10			Orangish brown slightly gravelly slightly clayey fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.	1.0	
	1.45	D					Light pinkish brown slightly gravelly fine to coarse SAND. Gravel is subrounded to rounded fine to medium of sandstone.		
				3.05			End of Trial Pit at 3.05m	3.0	
								4.0	
								5.0	
Remarks		1. No Groundwater encountered. 2. Sides unstable, with constant collapsing from both walls beyond 1.50m 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	

 BROWNFIELD SOLUTIONS LTD					Trial Pit Log		No.	
TP13								
Sheet 1 of 1								
PROJECT NO: C5042					CO-ORDS:		Hole Type	
PROJECT NAME: LANGLEY LANE, BIRCH					LEVEL:		TP	
CLIENT: HOLLINS HOMES					DATES: 07/07/22		Scale	
							1:25	
							Logged	Checked
							JEM	MS
Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description	
	Depth (m)	Type	Results					
	0.00-0.30	ES		0.30			MADE GROUND: Soft brown slightly gravelly sandy clay with rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, coal, mudstone and sandstone. (TOPSOIL)	
	0.50	D HSV	150kPa				Very stiff yellowish brown mottled light grey slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.	
	0.85	HSV	83kPa	0.95			Becoming stiff from 0.85m bgl.	
	1.50	D HSV	102kPa				Stiff brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.	1.0
	2.00	HSV	105kPa					2.0
	2.50	HSV	107kPa	2.60				
							End of Trial Pit at 2.60m	3.0
								4.0
								5.0
Remarks		1. No Groundwater encountered. 2. Sides stable. 3. Trial pit used as soakaway (SA01). 4. Hole backfilled with arisings, upon completion of infiltration test.					ES = Environmental Sample D = Disturbed Sample B = Bulk Sample LB = Large Bulk Sample U = Undisturbed Sample UT = Undisturbed Thin Wall Sample SPT = Standard Penetration Test PID = Photoionization Detector (ppm) PPM = Part Per Million HSV = Hand Shear Vane	

BROWNFIELD SOLUTIONS LTD						Trial Pit Log		No.
PROJECT NO: C5042						CO-ORDS:		TP14
PROJECT NAME: LANGLEY LANE, BIRCH						LEVEL:		Sheet 1 of 1
CLIENT: HOLLINS HOMES						DATES: 07/07/22		Hole Type
								TP
								Scale
								1:25
						Logged	Checked	
						JEM	MS	
Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description	
	Depth (m)	Type	Results					
	0.00-0.45	ES					MADE GROUND: Soft brown slightly gravelly sandy clay with rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, coal, mudstone and sandstone. (TOPSOIL)	
	0.50	HSV	89kPa	0.45			Stiff yellowish brown mottled light grey slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.	1.0
	0.80	HSV	91kPa					
	0.95	D						
				1.50				
	1.80	HSV	61kPa				Stiff brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal. <i>Becoming firm from 1.80m bgl.</i>	2.0
	2.00	D		2.10				
							Brownish grey slightly gravelly clayey fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.	
	2.60	D		2.65			End of Trial Pit at 2.65m	3.0
								4.0
								5.0
Remarks		1. No Groundwater encountered. 2. Sides stable. 3. Trial pit used as soakaway (SA02). 4. Hole backfilled with arisings, upon completion of infiltration test.					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	



No.

TP15

Sheet 1 of 1

CO-ORDS:

LEVEL:

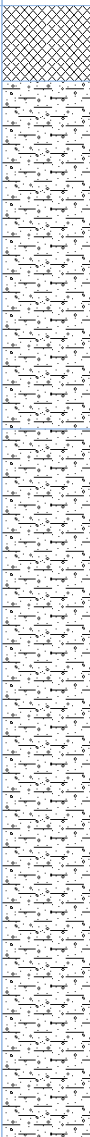
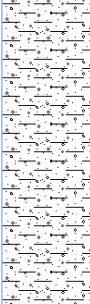
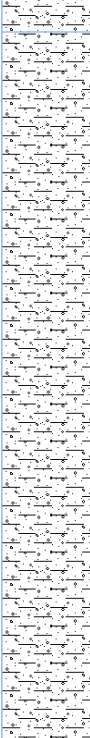
DATES: 07/07/22

Logged

Checked

JEM

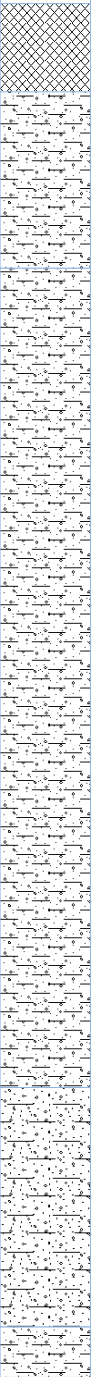
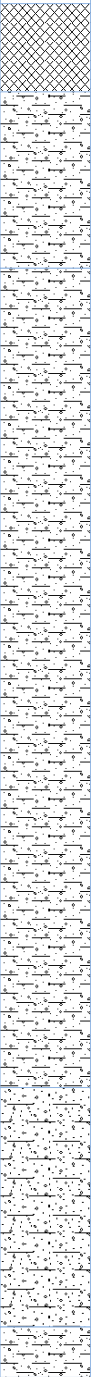
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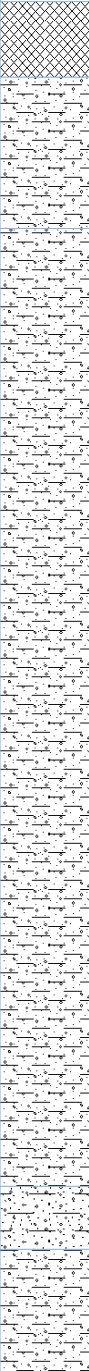
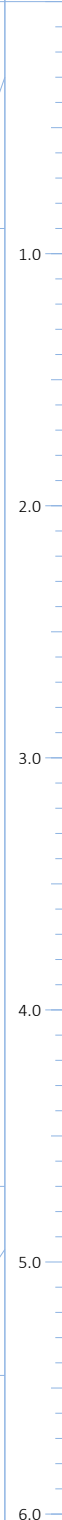
Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description	
	Depth (m)	Type	Results					
	0.00-0.20	ES	125kPa	0.25			MADE GROUND: Soft brown slightly gravelly sandy clay with rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, coal, mudstone and sandstone. (TOPSOIL)	1.0
	0.40	HSV				Stiff yellowish brown mottled light grey slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.		
	1.30	D		1.40		Stiff to very stiff brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.	2.0	
	2.00	D				105kPa	<i>Becoming very stiff and friable from 2.50m bgl.</i>	3.0
	2.20	HSV						
	2.80	D						
			3.75		End of Trial Pit at 3.75m		4.0	
								5.0

1. No Groundwater encountered.
2. Sides stable.
3. Hole backfilled with arisings, upon completion.

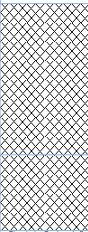
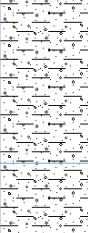
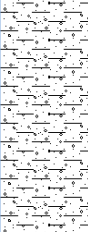
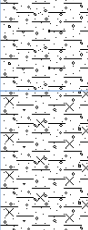
ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

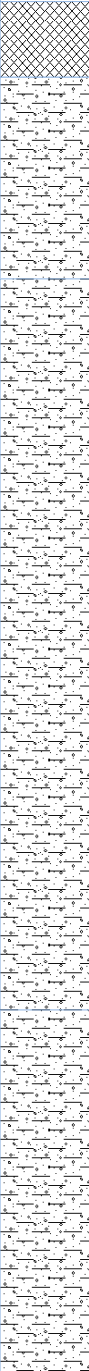
 BROWNFIELD SOLUTIONS LTD						Trial Pit Log		No. TP16 Sheet 1 of 1	
PROJECT NO: C5042						CO-ORDS:		Hole Type TP	
PROJECT NAME: LANGLEY LANE, BIRCH						LEVEL:		Scale 1:25	
CLIENT: HOLLINS HOMES						DATES: 07/07/22		Logged JEM	Checked MS
Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description		
	Depth (m)	Type	Results						
	0.00-0.80	ES					MADE GROUND: Soft brown slightly gravelly sandy clay with rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, coal, mudstone and sandstone. (TOPSOIL)		
	1.30	D					Firm orangish brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.		
	2.50	D					Light pinkish brown slightly gravelly fine to coarse SAND. Gravel is subrounded to rounded fine to medium of sandstone.		
End of Trial Pit at 3.00m									
Remarks 1. No Groundwater encountered. 2. Sides unstable, with collapsing beyond 2.30m 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									

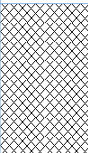
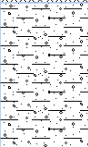
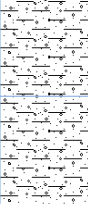
 BROWNFIELD SOLUTIONS LTD						Borehole Log		Window Sampler No.	
PROJECT NO: C5042						CO-ORDS:		WS01	
								Sheet 1 of 1	
PROJECT NAME: LANGLEY LANE, BIRCH						LEVEL:		Hole Type	
								WS	
CLIENT: HOLLINS HOMES						DATES: 06/07/22		Scale	
								1:30	
								Logged	Checked
								JEM	MS
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00-0.45	ES		0.35			MADE GROUND: Soft brown slightly gravelly sandy clay with rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, coal, mudstone and sandstone. (TOPSOIL)	Stiff yellowish brown mottled light grey slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.
		0.50-0.70	ES						
		0.60	HSV	95kPa					
		0.80	D		1.05			Firm to stiff brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.	
		1.20	SPT	N=13 (2,2/2,3,4,4)					
		1.50	D						
		2.00	SPT	N=16 (2,3/3,4,4,5)	2.0			Becoming stiff from 2.00m bgl.	
		2.40	D						
		3.00	SPT	N=17 (2,3/4,4,4,5)					
		3.70	D		4.0			Medium dense yellowish brown slightly gravelly clayey fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.	
		4.00	SPT	N=20 (3,3/4,5,5,6)					
		5.00	SPT	N=16 (2,3/4,3,4,5)					
								4.30	Stiff brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.
				5.25	End of Borehole at 5.45m				
				5.45					

BROWNFIELD SOLUTIONS LTD						Borehole Log		Window Sampler No.			
								WS02			
								Sheet 1 of 1			
PROJECT NO: C5042						CO-ORDS:		Hole Type			
								WS			
PROJECT NAME: LANGLEY LANE, BIRCH						LEVEL:		Scale			
								1:30			
CLIENT: HOLLINS HOMES						DATES: 06/07/22		Logged	Checked		
								JEM	MS		
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description			
		Depth (m)	Type	Results							
		0.00-0.30	ES					MADE GROUND: Soft brown slightly gravelly sandy clay with rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, coal, mudstone and sandstone. (TOPSOIL)			
		0.45	HSV	93kPa	0.30			Stiff yellowish brown mottled light grey slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.			
		0.80	HSV	93kPa	0.90			Firm to stiff brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.			
		1.20	D SPT	N=12 (2,2/2,3,3,4)							
		2.00	D SPT	N=19 (2,3/4,5,5,5)				Becoming stiff from 2.00m bgl.			
		3.00	D SPT	N=18 (2,3/3,4,5,6)							
		4.00	D SPT	N=18 (2,3/4,4,5,5)							
					4.70						
		5.00	D SPT	N=13 (2,3/4,3,3,3)	4.95			Yellowish brown slightly gravelly clayey fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.			
					5.45			Firm brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.			
End of Borehole at 5.45m											
Remarks		1. Hand dug inspection pit 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			

BROWNFIELD SOLUTIONS LTD						Borehole Log			Window Sampler No.	
									WS03	
									Sheet 1 of 1	
PROJECT NO: C5042						CO-ORDS:			Hole Type	
									WS	
PROJECT NAME: LANGLEY LANE, BIRCH						LEVEL:			Scale	
									1:30	
CLIENT: HOLLINS HOMES						DATES: 06/07/22			Logged	Checked
									JEM	MS
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.00-0.20	ES		0.20			MADE GROUND: Soft brown slightly gravelly sandy clay with rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, coal, mudstone and sandstone. (TOPSOIL)		
		0.60	HSV	92kPa				Stiff yellowish brown mottled light grey slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.		
		0.80	D		0.90					
		1.20	SPT	N=10 (2,2/2,2,3,3)	1.30			Firm reddish brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.	1.0	
		1.50	D					Stiff brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.		
		2.00	SPT	N=24 (2,3/5,6,6,7)					2.0	
		2.80	D							
		3.00	SPT	N=20 (2,3/4,5,5,6)					3.0	
		3.50	D							
		4.00	SPT	N=14 (2,3/4,4,3,3)				Becoming firm from 4.00m bgl.	4.0	
		4.70	D							
		5.00	SPT	N=13 (2,3/3,4,3,3)					5.0	
					5.45			End of Borehole at 5.45m		
									6.0	
Remarks		1. Hand dug inspection pit to 1.20m bgl. 2. No Groundwater encountered. 3. Installation down to 5.00m bgl: 1.00m plain 35mm PVC and 4.00m slotted 35mm PVC, upon completion.							ES = Environmental Sample D = Disturbed Sample B = Bulk Sample LB = Large Bulk Sample U = Undisturbed Sample UT = Undisturbed Thin Wall Sample SPT = Standard Penetration Test PID = Photoionization Detector (ppm) PPM = Part Per Million HSV = Hand Shear Vane	

 BROWNFIELD SOLUTIONS LTD						Borehole Log		Window Sampler No.		
PROJECT NO: C5042		CO-ORDS:		WS04						
				Sheet 1 of 1						
				Hole Type						
PROJECT NAME: LANGLEY LANE, BIRCH		LEVEL:		WS						
				Scale						
				1:30						
CLIENT: HOLLINS HOMES		DATES: 06/07/22		Logged	Checked					
				JEM	MS					
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.00-0.60	ES					MADE GROUND: Soft brown slightly gravelly sandy clay with rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, coal, glass, mudstone and sandstone. (TOPSOIL)	1.0	
		0.60-0.90	ES		0.60			MADE GROUND: Stiff brown slightly gravelly slightly sandy clay. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of brick, coal, clinker, glass, mudstone and sandstone.		
		0.70	HSV	101kPa		0.90		Soft to firm light brown mottled light grey slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal. <i>Becoming firm from 1.20m bgl.</i>	2.0	
		1.00	D							
		1.20	SPT	N=10 (2,2/2,2,3,3)						
					1.55					
		1.80	D					Stiff brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.	3.0	
		2.00	SPT	N=16 (2,3/3,4,4,5)						
		2.30	D							
		3.00	SPT	N=13 (2,3/3,3,3,4)	3.10			Firm greyish brown slightly gravelly slightly sandy slightly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.		
		3.50	D							
		4.00	SPT	N=12 (2,2/2,3,3,4)						
		5.00	SPT	N=29 (3,4/5,7,7,10)			<i>Becoming stiff from 5.00m bgl.</i>		5.0	
					5.45		End of Borehole at 5.45m			6.0
Remarks		1. Hand dug inspection pit to 1.20m bgl. 2. Groundwater encountered at 3.50m bgl. 3. Installation down to 5.00m bgl: 1.00m plain 35mm PVC and 4.00m slotted 35mm PVC, upon completion.						ES = Environmental Sample D = Disturbed Sample B = Bulk Sample LB = Large Bulk Sample U = Undisturbed Sample UT = Undisturbed Thin Wall Sample SPT = Standard Penetration Test PID = Photoionization Detector (ppm) PPM = Part Per Million HSV = Hand Shear Vane		

 BROWNFIELD SOLUTIONS LTD						Borehole Log		Window Sampler No.				
								WS05				
								Sheet 1 of 1				
PROJECT NO: C5042						CO-ORDS:		Hole Type				
								WS				
PROJECT NAME: LANGLEY LANE, BIRCH						LEVEL:		Scale				
								1:30				
CLIENT: HOLLINS HOMES						DATES: 06/07/22		Logged	Checked			
								JEM	MS			
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description				
		Depth (m)	Type	Results								
		0.00-0.30	ES		0.30			MADE GROUND: Soft brown slightly gravelly sandy clay with rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, coal, mudstone and sandstone. (TOPSOIL)		1.0		
		0.40	HSV	101kPa				Stiff yellowish brown mottled light grey slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.				
		0.80	D HSV	105kPa	1.10							
		1.20	SPT	N=10 (2,2/2,2,3,3)				Firm to stiff orangish brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.				
		1.50	D									
		2.00	SPT	N=12 (2,2/3,3,3,3)								
		2.50	D									
		3.00	SPT	N=15 (2,2/3,4,4,4)	4.00			Becoming stiff from 3.00m bgl.				
		4.00	D SPT	N=11 (2,2/2,2,3,4)				Firm to stiff brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.				
		5.00	SPT	N=17 (2,3/3,4,5,5)				Becoming stiff from 5.00m bgl.				
					5.45			End of Borehole at 5.45m		6.0		
Remarks		1. Hand dug inspection pit 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				

 BROWNFIELD SOLUTIONS LTD						Borehole Log		Window Sampler No.	
								WS06	
								Sheet 1 of 1	
PROJECT NO: C5042						CO-ORDS:		Hole Type	
								WS	
PROJECT NAME: LANGLEY LANE, BIRCH						LEVEL:		Scale	
								1:30	
CLIENT: HOLLINS HOMES						DATES: 06/07/22		Logged	Checked
								JEM	MS
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00-0.60	ES					MADE GROUND: Soft brown slightly gravelly sandy clay with rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, coal, mudstone and sandstone. (TOPSOIL)	
		0.60	HSV	81kPa	0.60				
		0.80	D					Stiff yellowish brown mottled light grey slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.	1.0
		1.20	SPT	N=8 (2,2/2,2,2,2)				Becoming firm at 1.20m bgl.	
					1.55				
		1.90	D					Firm to stiff brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone, sandstone and coal.	2.0
		2.00	SPT	N=7 (1,1/1,2,2,2)				No recovery on SPT at 2.00m bgl.	
		3.00	SPT	N=13 (2,2/2,3,4,4)					3.0
		3.60	D						
		4.00	SPT	N=11 (2,2/2,3,3,3)					4.0
		4.90	D						
		5.00	SPT	N=18 (2,3/3,4,5,6)				Becoming stiff from 5.00m bgl.	5.0
					5.45			End of Borehole at 5.45m	
									6.0
Remarks		1. Hand dug inspection pit to 1.20m bgl. 2. No Groundwater encountered. 3. Installation down to 5.00m bgl: 1.00m plain 35mm PVC and 4.00m slotted 35mm PVC, upon completion.						ES = Environmental Sample D = Disturbed Sample B = Bulk Sample LB = Large Bulk Sample U = Undisturbed Sample UT = Undisturbed Thin Wall Sample SPT = Standard Penetration Test PID = Photoionization Detector (ppm) PPM = Part Per Million HSV = Hand Shear Vane	

APPENDIX C

Chemical Testing Results



Human Health Assessment Summary			Soil Type: Location: Depth:			MGTS HP01 0.00-0.45	MGTS TP01 0.00-0.30	NAT CLAY TP04 0.10-0.30	MGTS TP06 0.00-0.20	NAT CLAY WS01 0.50-0.70	MG WS04 0.60-0.90
Contaminant	GAC (mg/kg)	No. Samples	Min. Value	Max. Value	No. Samples ≥GAC						
Moisture Content	-	6	13.00	21.00	-	13	18	18	17	14	21
Soil Organic Matter	-	6	0.50	5.70	-	4.1	5.7	1.5	5.3	0.5	4.4
pH	-	6	6.20	8.00	-	6.8	6.2	6.4	8.0	6.3	7.2
Water Soluble Sulphate (2:1 Leachate Equivalent)	-	0	0.00	<LOD	-						
Arsenic	37	6	7.70	23.00	0	23.0	21	12	20	8	21
Cadmium	11	6	< LOD	<LOD	0	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (III)	910	6	23.00	35.00	0	26.0	25	35	27	23	26
Hexavalent Chromium (VI)	6	6	< LOD	<LOD	0	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Copper	2400	6	13.00	47.00	0	41.0	47	22	42	13	41
Lead	200	6	8.10	96.00	0	96.0	78	17	77	8	71
Mercury	1.2	6	< LOD	<LOD	0	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel	130	6	13.00	24.00	0	22.0	23	24	22	13	20
Selenium	250	6	< LOD	<LOD	0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc	3700	6	34.00	150.00	0	150.0	97	53	81	34	57
Naphthalene	13.0	6	< LOD	<LOD	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	920	6	< LOD	<LOD	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	1100	6	< LOD	<LOD	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	860	6	< LOD	<LOD	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	440	6	< LOD	<LOD	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Anthracene	11000	6	< LOD	<LOD	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	890	6	< LOD	0.39	0	0.39	< 0.05	< 0.05	0.4	< 0.05	< 0.05
Pyrene	2000	6	< LOD	0.38	0	0.38	< 0.05	< 0.05	0.3	< 0.05	< 0.05
Benzo(a)anthracene	13.0	6	< LOD	0.28	0	0.28	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Chrysene	27	6	< LOD	0.29	0	0.29	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	3.7	6	< LOD	<LOD	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(k)fluoranthene	100	6	< LOD	<LOD	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)pyrene	3.0	6	< LOD	<LOD	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	41	6	< LOD	<LOD	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	0.30	6	< LOD	<LOD	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	350	6	< LOD	<LOD	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Asbestos Detected (Detected or Not-Detected)	Y	6	-	0.00	0	N	N	N	N	N	N
Mean Average SOM			3.6								
Mean Average pH			6.8								
			Residential with Homegrown Produce 6% SOM			Values in RED are > the relevant GAC (Generic Assessment Criteria).					
Job Number: C5042											
Client: HOLLINS HOMES											
Site: LANGLEY LANE, BIRCH											
Soil Group Type COMBINED MADE GROUND AND NATURAL STRATA											

**Joel Massey**

Brownfield Solutions Ltd
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Herts,
WD18 8YS

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e: reception@i2analytical.com

Analytical Report Number : 22-71081

Project / Site name:	Langley Lane Birch	Samples received on:	14/07/2022
Your job number:	C5042	Samples instructed on/ Analysis started on:	14/07/2022
Your order number:	3270	Analysis completed by:	22/07/2022
Report Issue Number:	1	Report issued on:	22/07/2022
Samples Analysed:	6 soil samples		

Signed:

Izabela Wójcik

Izabela Wójcik
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

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

Analytical Report Number: 22-71081
Project / Site name: Langley Lane Birch
Your Order No: 3270

Lab Sample Number				2348462	2348463	2348464	2348465	2348466
Sample Reference				HP01	TP01	TP04	TP06	WS01
Sample Number				ES1 (MG)	ES (MG)	ES (NAT)	ES (MG)	ES2 (NAT)
Depth (m)				0.00-0.45	0.00-0.30	0.10-0.30	0.00-0.20	0.50-0.70
Date Sampled				07/07/2022	05/07/2022	05/07/2022	05/07/2022	06/07/2022
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	13	18	18	17	14
Total mass of sample received	kg	0.001	NONE	0.8	0.8	0.8	0.8	0.8

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	MWI	MWI	MWI	MWI	MWI

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	6.8	6.2	6.4	8	6.3
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	23	300	360	46	33
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.012	0.15	0.18	0.023	0.017
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	11.5	152	182	23.2	16.5
Organic Matter (automated)	%	0.1	MCERTS	4.1	5.7	1.5	5.3	0.5

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.39	< 0.05	< 0.05	0.36	< 0.05
Pyrene	mg/kg	0.05	MCERTS	0.38	< 0.05	< 0.05	0.34	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.28	< 0.05	< 0.05	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	0.29	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	1.34	< 0.80	< 0.80	< 0.80	< 0.80
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	23	21	12	20	7.7
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	NONE	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	26	25	35	27	23
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	26	25	35	27	23
Copper (aqua regia extractable)	mg/kg	1	MCERTS	41	47	22	42	13
Lead (aqua regia extractable)	mg/kg	1	MCERTS	96	78	17	77	8.1
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	23	24	22	13
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	150	97	53	81	34

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

Analytical Report Number: 22-71081
Project / Site name: Langley Lane Birch
Your Order No: 3270

Lab Sample Number				2348467
Sample Reference				WS04
Sample Number				ES2 (MG)
Depth (m)				0.60-0.90
Date Sampled				06/07/2022
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	21
Total mass of sample received	kg	0.001	NONE	0.8

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

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.2
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	74
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.037
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	37.2
Organic Matter (automated)	%	0.1	MCERTS	4.4

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05

Total PAH

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

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	21
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2
Chromium (hexavalent)	mg/kg	1.2	NONE	< 1.2
Chromium (III)	mg/kg	1	NONE	26
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	26
Copper (aqua regia extractable)	mg/kg	1	MCERTS	41
Lead (aqua regia extractable)	mg/kg	1	MCERTS	71
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	20
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	57

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

Analytical Report Number : 22-71081
Project / Site name: Langley Lane Birch

* 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 *
2348462	HP01	ES1 (MG)	0.00-0.45	Brown clay and loam with gravel and vegetation.
2348463	TP01	ES (MG)	0.00-0.30	Brown clay and loam with gravel and vegetation.
2348464	TP04	ES (NAT)	0.10-0.30	Brown clay and sand with vegetation.
2348465	TP06	ES (MG)	0.00-0.20	Brown loam and sand with gravel and vegetation.
2348466	WS01	ES2 (NAT)	0.50-0.70	Brown clay and sand with vegetation.
2348467	WS04	ES2 (MG)	0.60-0.90	Brown clay and loam with gravel and vegetation.

Analytical Report Number : 22-71081
Project / Site name: Langley Lane Birch

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 dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	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
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	NONE
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK' 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 D

Geotechnical Testing Results

**Joel Massey**

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Analytical Report Number : 22-71227

Project / Site name:	Langley Lane Birch	Samples received on:	14/07/2022
Your job number:	C5042	Samples instructed on/ Analysis started on:	14/07/2022
Your order number:	3271	Analysis completed by:	25/07/2022
Report Issue Number:	1	Report issued on:	25/07/2022
Samples Analysed:	5 soil samples		

Martyna Langer

Signed:

Martyna Langer
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

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

Analytical Report Number: 22-71227
 Project / Site name: Langley Lane Birch
 Your Order No: 3271

Lab Sample Number				2349488	2349489	2349490	2349491	2349492
Sample Reference				TP01	TP08	TP10	TP11	WS02
Sample Number				1	2	1	1	2
Depth (m)				0.40	2.50	0.60	0.80	2.00
Date Sampled				05/07/2022	05/07/2022	05/07/2022	05/07/2022	05/07/2022
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	14	10	15	17	13
Total mass of sample received	kg	0.001	NONE	0.1	0.2	0.2	0.2	0.3

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.4	7.1	6.3	6.8	8.3
Water Soluble SO ₄ 16ml extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.016	0.02	0.041	0.05	0.024

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

Analytical Report Number : 22-71227

Project / Site name: Langley Lane Birch

* 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 *
2349488	TP01	1	0.4	Brown clay and sand with vegetation.
2349489	TP08	2	2.5	Brown clay and sand with gravel.
2349490	TP10	1	0.6	Brown clay and sand with vegetation.
2349491	TP11	1	0.8	Brown clay and sand.
2349492	WS02	2	2	Brown clay.

Analytical Report Number : 22-71227
Project / Site name: Langley Lane Birch

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.

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

Contact: Joel Massey
Site Address: Langley Lane Birch

Client Reference: C5042
Job Number: 22-71225
Date Sampled: 05/07/2022
Date Received: 14/07/2022
Date Tested: 19/07/2022
Sampled By: Not Given

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

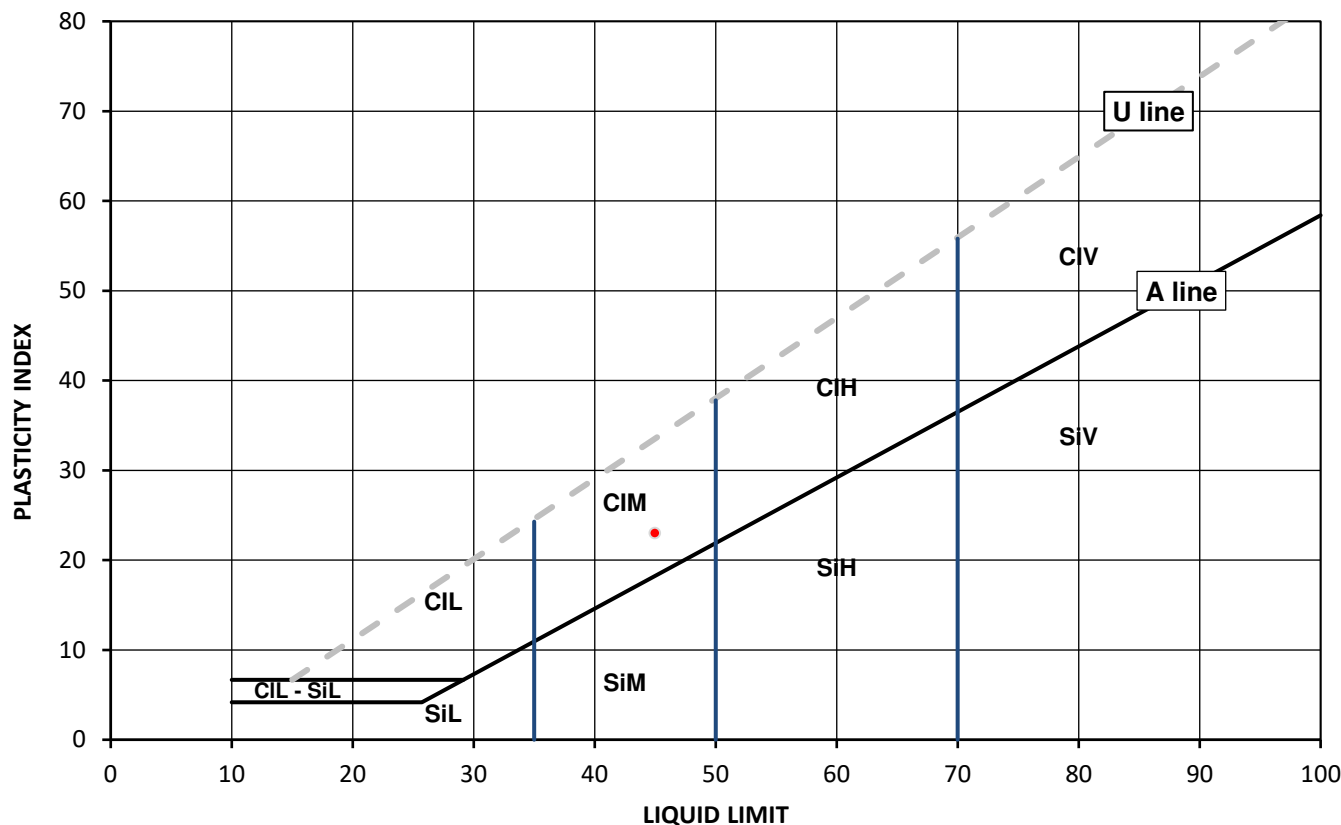
Test Results:

Laboratory Reference: 2349481
Hole No.: TP01
Sample Reference: 1
Sample Description: Yellowish brown slightly gravelly slightly sandy CLAY

Depth Top [m]: 0.40
Depth Base [m]: Not Given
Sample Type: D

Sample Preparation: Tested after >425um removed by hand

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
18	45	22	23	86



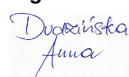
Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

Cl	Clay	Plasticity	L	Low	Liquid Limit	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 CIHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:



Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

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

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS 1377-2:1990: Clause 4.4 and 5

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

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

Client Reference: C5042
Job Number: 22-71225
Date Sampled: 05/07/2022
Date Received: 14/07/2022
Date Tested: 19/07/2022
Sampled By: Not Given

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

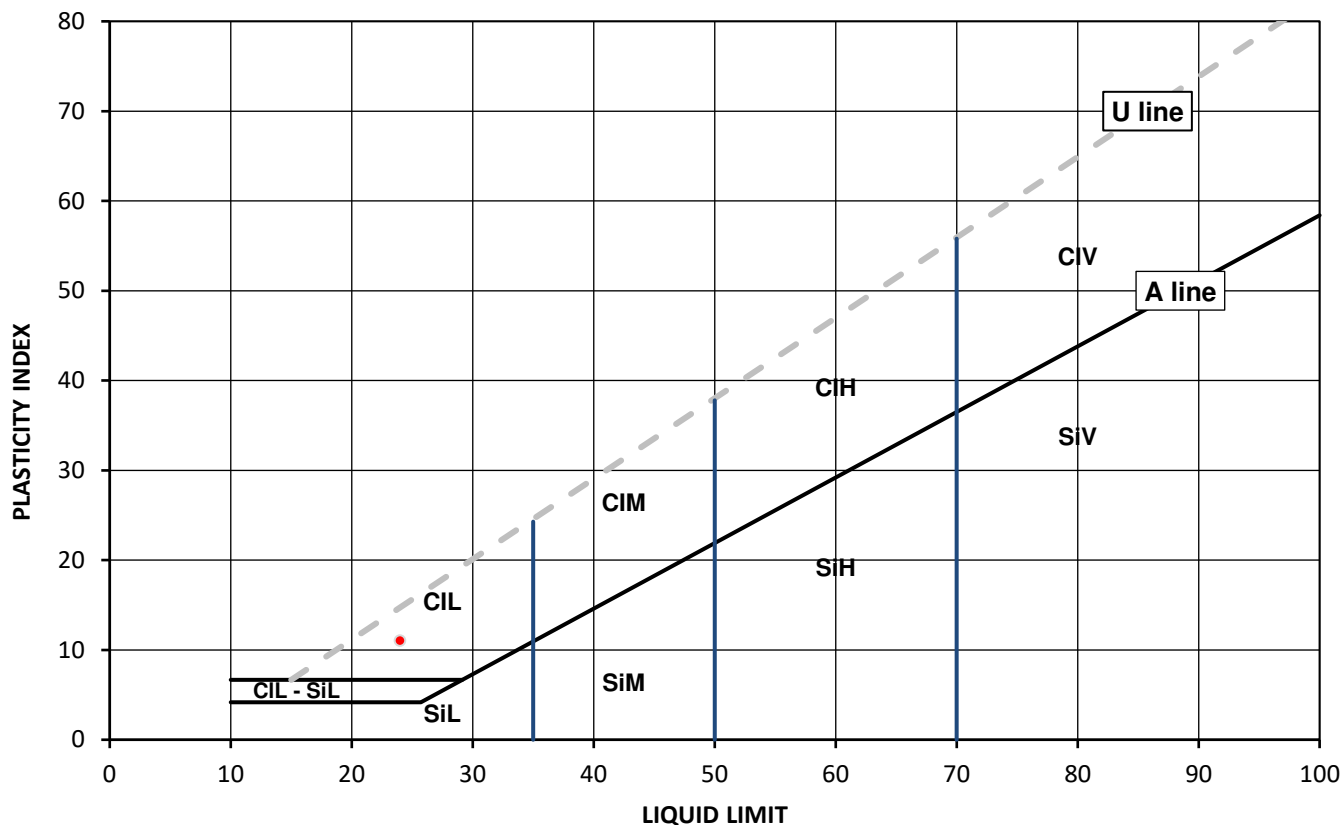
Test Results:

Laboratory Reference: 2349482
Hole No.: TP08
Sample Reference: 2
Sample Description: Brown slightly gravelly clayey SAND

Depth Top [m]: 2.50
Depth Base [m]: Not Given
Sample Type: D

Sample Preparation: Tested after >425um removed by hand

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
14	24	13	11	93



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

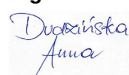
	Plasticity	Liquid Limit
Cl	Clay	below 35
Si	Silt	35 to 50
	L	Low
	M	Medium
	H	High
	V	Very high
	O	Organic
		append to classification for organic material (eg CIHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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:



Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

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

Contact: Joel Massey
Site Address: Langley Lane Birch

Client Reference: C5042
Job Number: 22-71225
Date Sampled: 05/07/2022
Date Received: 14/07/2022
Date Tested: 19/07/2022
Sampled By: Not Given

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

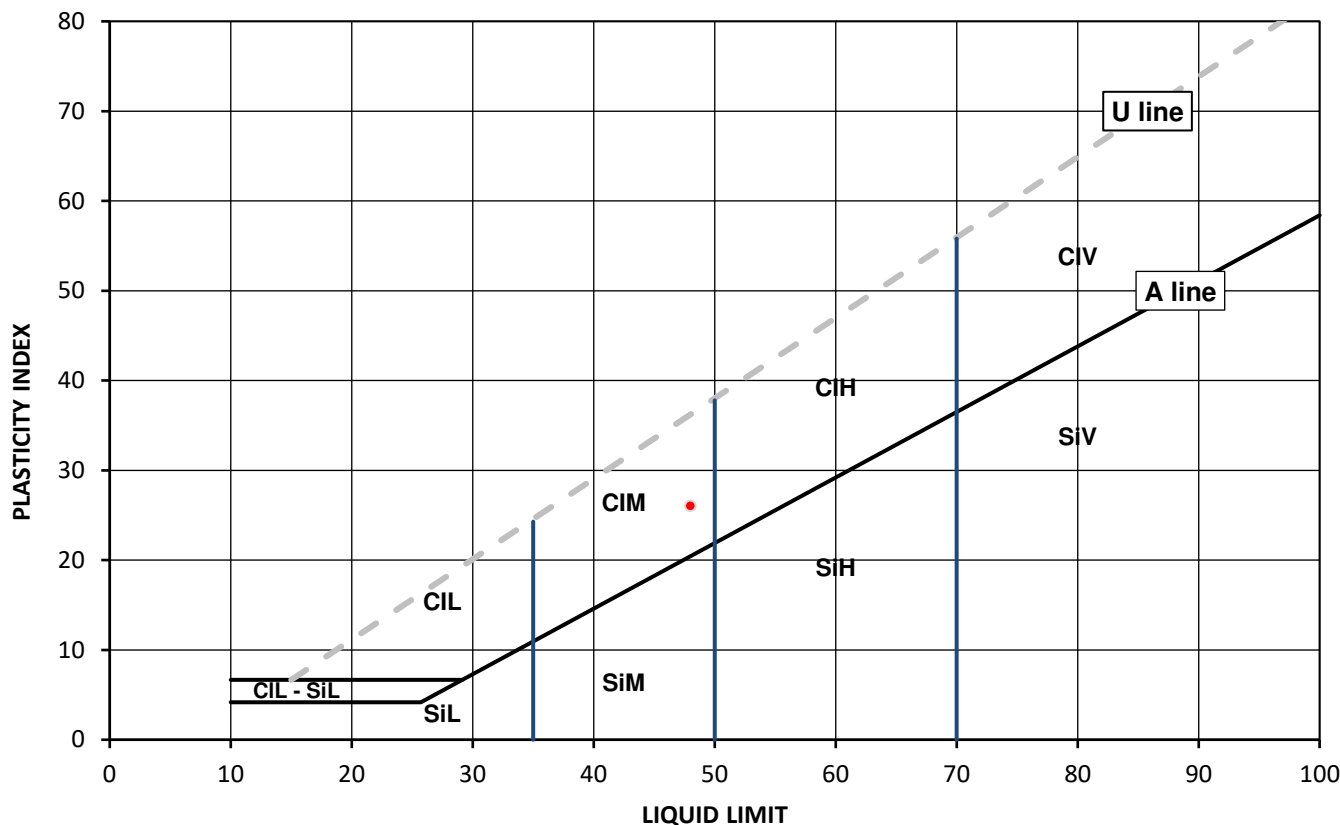
Test Results:

Laboratory Reference: 2349483
Hole No.: TP10
Sample Reference: 1
Sample Description: Yellowish brown slightly gravelly slightly sandy CLAY

Depth Top [m]: 0.60
Depth Base [m]: Not Given
Sample Type: D

Sample Preparation: Tested after >425um removed by hand

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
22	48	22	26	97



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

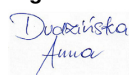
	Plasticity	Liquid Limit
Cl Clay	L Low	below 35
Si Silt	M Medium	35 to 50
	H High	50 to 70
	V Very high	exceeding 70
	O Organic	append to classification for organic material (eg CIHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Signed:



Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

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

Contact: Joel Massey
Site Address: Langley Lane Birch

Client Reference: C5042
Job Number: 22-71225
Date Sampled: 05/07/2022
Date Received: 14/07/2022
Date Tested: 19/07/2022
Sampled By: Not Given

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

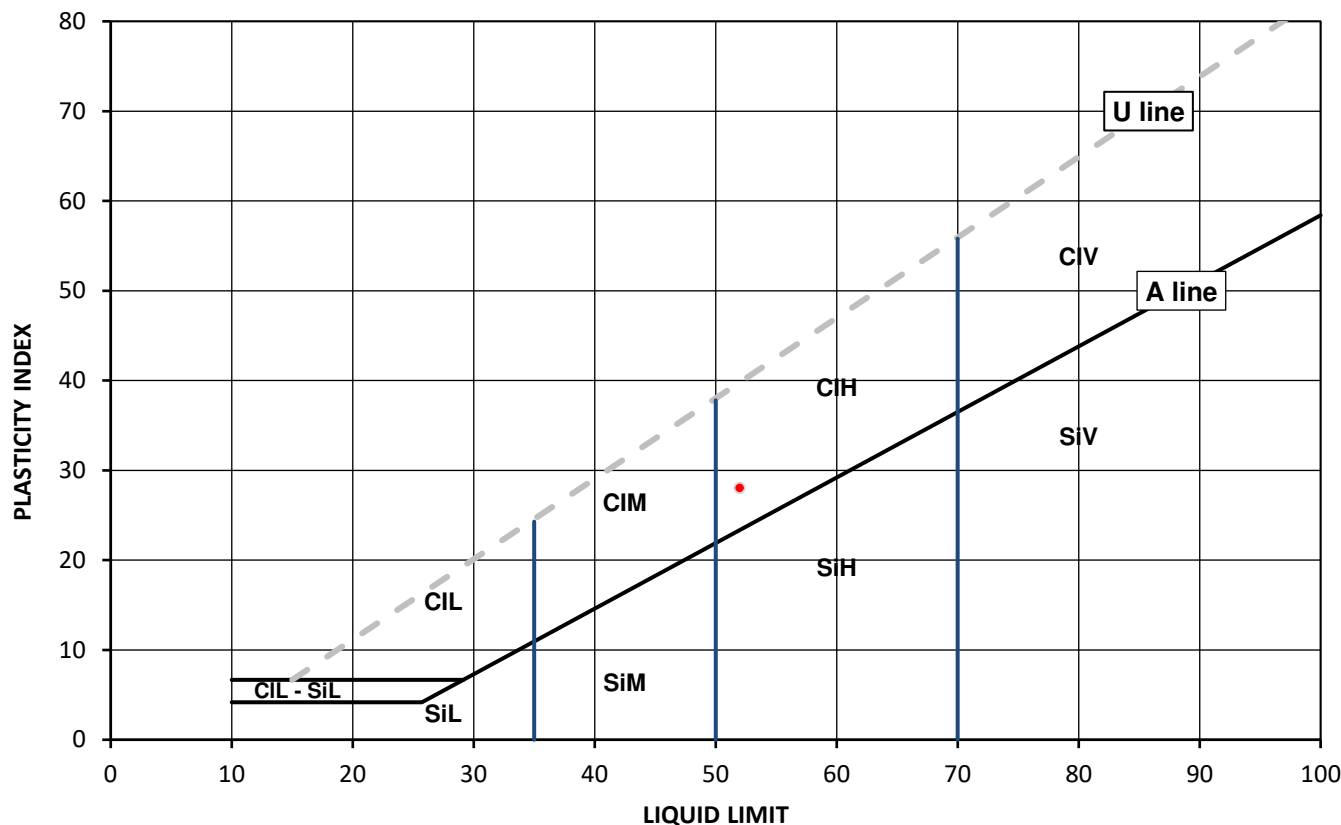
Test Results:

Laboratory Reference: 2349484
Hole No.: TP11
Sample Reference: 1
Sample Description: Yellowish brown slightly gravelly slightly sandy CLAY

Depth Top [m]: 0.80
Depth Base [m]: Not Given
Sample Type: D

Sample Preparation: Tested after >425um removed by hand

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
26	52	24	28	94



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

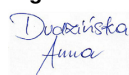
	Plasticity	Liquid Limit
Cl	Clay	below 35
Si	Silt	35 to 50
	L	Low
	M	Medium
	H	High
	V	Very high
	O	Organic
		append to classification for organic material (eg CIHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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CW9 5LP
Contact: Joel Massey
Site Address: Langley Lane Birch

Client Reference: C5042
Job Number: 22-71225
Date Sampled: 05/07/2022
Date Received: 14/07/2022
Date Tested: 19/07/2022
Sampled By: Not Given

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

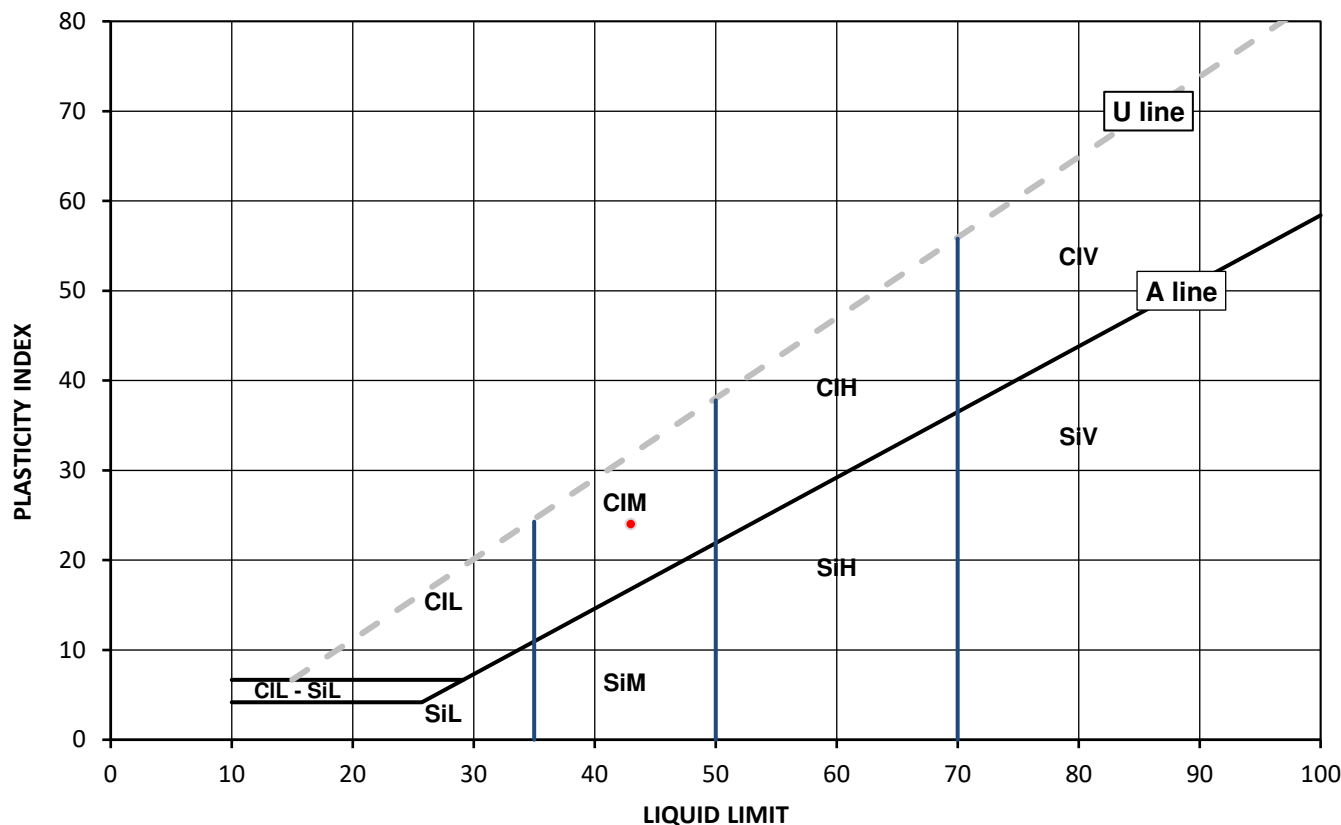
Test Results:

Laboratory Reference: 2349485
Hole No.: WS02
Sample Reference: 2
Sample Description: Brown sandy CLAY

Depth Top [m]: 2.00
Depth Base [m]: Not Given
Sample Type: D

Sample Preparation: Tested in natural condition

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
15	43	19	24	100



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

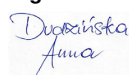
	Clay	Silt	Plasticity	Liquid Limit
Cl	Clay		L Low	below 35
Si	Silt		M Medium	35 to 50
			H High	50 to 70
			V Very high	exceeding 70
			O Organic	append to classification for organic material (eg CIHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Signed:



Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd



SUMMARY REPORT

SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with:

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



Environmental Science

4041

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

Water Content by BS 1377-2:1990: Clause 3.2; Atterberg by BS 1377-2: 1990:
Clause 4.3 (4 Point Test), Clause 4.4 (1 Point Test) and 5; PD by BS 1377-2:
1990: Clause 8.2

Client Reference: C5042
Job Number: 22-71225
Date Sampled: 05/07/2022
Date Received: 14/07/2022
Date Tested: 19/07/2022
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	Water Content BS 1377-2 [W] %	Water Content BS EN ISO 17892-1 [W] %	Atterberg				Density			Total Porosity# %		
		Reference	Depth Top m	Depth Base m	Type					% Passing 425um	WL %	Wp %	Ip %	bulk Mg/m3	dry Mg/m3	PD Mg/m3			
2349481	TP01	1	0.40	Not Given	D	Yellowish brown slightly gravelly slightly sandy CLAY	Atterberg 1 Point	18		86	45	22	23						
2349482	TP08	2	2.50	Not Given	D	Brown slightly gravelly clayey SAND	Atterberg 1 Point	14		93	24	13	11						
2349483	TP10	1	0.60	Not Given	D	Yellowish brown slightly gravelly slightly sandy CLAY	Atterberg 1 Point	22		97	48	22	26						
2349484	TP11	1	0.80	Not Given	D	Yellowish brown slightly gravelly slightly sandy CLAY	Atterberg 1 Point	26		94	52	24	28						
2349485	WS02	2	2.00	Not Given	D	Brown sandy CLAY	Atterberg 1 Point	15		100	43	19	24						

Note: # Non accredited; NP - Non plastic

Comments:

Signed:

Anna Dudzinska

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

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4041

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

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

SUMMARY REPORT

DETERMINATION OF WATER CONTENT

Tested in Accordance with: BS 1377-2: 1990: Clause 3.2

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



Environmental Science

Client Reference: C5042
 Job Number: 22-71225
 Date Sampled: 05/07/2022
 Date Received: 14/07/2022
 Date Tested: 19/07/2022
 Sampled By: Not Given

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	WC	Sample preparation / Oven temperature at the time of testing			
		Reference	Depth Top m	Depth Base m	Type							
2349481	TP01	1	0.40	Not Given	D	Yellowish brown slightly gravelly slightly sandy CLAY		18	Sample was quartered, oven dried at 108.9 °C			
2349482	TP08	2	2.50	Not Given	D	Brown slightly gravelly clayey SAND		14	Sample was quartered, oven dried at 108.9 °C			
2349483	TP10	1	0.60	Not Given	D	Yellowish brown slightly gravelly slightly sandy CLAY		22	Sample was quartered, oven dried at 108.9 °C			
2349484	TP11	1	0.80	Not Given	D	Yellowish brown slightly gravelly slightly sandy CLAY		26	Sample was quartered, oven dried at 108.9 °C			
2349485	WS02	2	2.00	Not Given	D	Brown sandy CLAY		15	Sample was quartered, oven dried at 108.9 °C			

Comments:

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Signed:

Dudzinska Anna

Anna Dudzinska
 PL Deputy Head of Reporting Team
 for and on behalf of i2 Analytical Ltd

APPENDIX E

Monitoring Results

Ground Gas Monitoring Results



CLIENT:	Date	Operator	Analysyer	Weather Observations			Temp (°C)	Pressure Trend	Min Barometric Pressure (mb)	Notes
HOLLINS HOMES	13/07/2022	PG	GFM436	Sunny	Light breeze	Warm	22	Steady	1007	
JOB NO.	25/07/2022	PG	GFM436	Overcast	Windy	Cool	15	Falling	994	
C5042	16/08/2022	AN	GFM436	Sunny	Light breeze	Cool	22	Rising	993	
SITE:	05/09/2022	CGM	GFM436	Sunny	Light breeze	Warm	26	Falling	1001	
LANGLEY LANE BIRCH	22/09/2022	CGM	GFM436	Overcast	Light breeze	Cool	13	Rising	1002	
	03/10/2022	CGM	GFM436	Sunny	No wind	Cool	11	Rising	1007	

Notes: mb = milibars; CH₄ = methane; LEL = lower explosive limit = 5%v/v; CO₂ = carbon dioxide; O₂ = oxygen; CO=carbon monoxide; H₂S = 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 available 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 ₂ S	TVOC (PID)						
				Summary Statistics																				
Max. values:				1009	0.0	0.9	0.1	0.1	0.1	2.0	2.0	3.0	0.8	20.8	21.0	0.0	0.0	-	4.79	5.00	0.000	0.003		
Min. values:				993	0.0	-0.2	0.1	0.1	0.1	2.0	2.0	0.1	0.1	18.9	19.6	0.0	0.0	-	3.39	4.47	0.000	0.000		
				Worst-case GSVs based on maximum recorded steady flow and maximum individual peak concentrations:																		0.000	0.003	
13/07/2022	AM	Ambient		1007				0.1		2.0		0.1		21.2		0.0	0.0	NA						
		WS01	1.00 - 5.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	0.9	0.6	20.1	20.6	0.0	0.0	NA	3.64	4.56	0.000	0.001		
		WS03	1.00 - 5.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	0.6	0.2	20.5	20.9	0.0	0.0	NA	NGW	4.97	0.000	0.001		
		WS04	1.00 - 5.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	1.9	0.8	19.4	20.3	0.0	0.0	NA	3.39	4.94	0.000	0.002		
		WS06	1.00 - 5.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	0.4	0.3	20.2	20.8	0.0	0.0	NA	4.53	5.00	0.000	0.000		
13/07/2022	AM	Ambient		1009				0.1		2.0		0.1		21.2		0.0	0.0	NA						
25/07/2022	AM	Ambient		994				0.1		2.0		0.1		20.7		0.0	0.0	NA						
		WS01	1.00 - 5.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	0.7	0.2	20.2	20.6	0.0	0.0	NA	3.72	4.54	0.000	0.001		
		WS03	1.00 - 5.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	0.1	0.2	20.6	20.7	0.0	0.0	NA	NGW	4.96	0.000	0.000		
		WS04	1.00 - 5.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	0.1	0.1	20.7	20.6	0.0	0.0	NA	3.49	4.93	0.000	0.000		
		WS06	1.00 - 5.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	0.1	0.1	20.7	20.8	0.0	0.0	NA	4.45	4.92	0.000	0.000		
25/07/2022	AM	Ambient		994				0.1		2.0		0.1		20.7		0.0	0.0	NA						
16/08/2022	PM	Ambient		993										21.0										
		WS01	1.00 - 5.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	1.2	0.5	20.3	20.5	0.0	0.0	NA	3.87	4.48	0.000	0.001		
		WS03	1.00 - 5.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	0.6	0.3	20.5	20.8	0.0	0.0	NA	NGW	4.95	0.000	0.001		
		WS04	1.00 - 5.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	3.0	0.8	18.9	19.6	0.0	0.0	NA	3.71	4.93	0.000	0.003		
		WS06	1.00 - 5.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	0.1	0.1	20.8	21.0	0.0	0.0	NA	4.79	4.95	0.000	0.000		
16/08/2022	PM	Ambient		993										21.0										
05/09/2022	PM	Ambient		1001		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.6	20.6	0.0	0.0	/			0.000	0.000		
		WS01	1.00 - 5.00			0.1	0.1	0.1	0.1	2.0	2.0	0.9	0.7	20.3	20.4	0.0	0.0	/	DRY	4.95	0.000	0.001		
		WS03	1.00 - 5.00			0.1	0.1	0.1	0.1	2.0	2.0	0.1	0.1	20.4	20.8	0.0	0.0	/	DRY	4.93	0.000	0.000		
		WS04	1.00 - 5.00			0.1	0.1	0.1	0.1	2.0	2.0	0.9	0.7	20.2	20.3	0.0	0.0	/	3.80	4.94	0.000	0.001		
		WS06	1.00 - 5.00			-0.2	0.1	0.1	0.1	2.0	2.0	0.1	0.1	20.8	20.8	0.0	0.0	/	DRY	4.95	0.000	0.000		
05/09/2022	PM	Ambient		1000																				

Ground Gas Monitoring Results



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 ₂ S	TVOC (PID)					
22/09/2022	PM	Ambient		1002																			
		WS01	1.00 - 5.00			0.1	0.1	0.1	0.1	2.0	2.0	0.3	0.1	20.3	20.5	0.0	0.0	/	DRY	5.00	0.000	0.000	
		WS03	1.00 - 5.00			0.1	0.1	0.1	0.1	2.0	2.0	0.6	0.5	20.1	20.2	0.0	0.0	/	DRY	5.00	0.000	0.001	
		WS04	1.00 - 5.00			0.9	0.1	0.1	0.1	2.0	2.0	1.1	0.4	20.0	20.1	0.0	0.0	/	3.90	4.90	0.000	0.001	
		WS06	1.00 - 5.00			0.1	0.1	0.1	0.1	2.0	2.0	1.3	0.5	19.6	20.1	0.0	0.0	/	4.00	4.50	0.000	0.001	
22/09/2022	PM	Ambient		1003																			
03/10/2022	PM	Ambient		1007				0.0		0.0		0.0		20.2		0.0	0.0						
		WS01	1.00 - 5.00			0.1	0.1	0.1	0.1	2.0	2.0	0.2	0.1	20.2	20.3	0.0	0.0	/	DRY	5.00	0.000	0.000	
		WS03	1.00 - 5.00			0.1	0.1	0.1	0.1	2.0	2.0	0.8	0.3	19.9	20.1	0.0	0.0	/	3.83	4.96	0.000	0.001	
		WS04	1.00 - 5.00			0.1	0.1	0.1	0.1	2.0	2.0	0.2	0.1	20.5	20.5	0.0	0.0	/	DRY	4.95	0.000	0.000	
		WS06	1.00 - 5.00			0.1	0.1	0.1	0.1	2.0	2.0	1.3	0.3	19.3	19.9	0.0	0.0	/	4.05	4.47	0.000	0.001	
03/10/2022	PM	Ambient		1007																			

TEST DATE AND CONDITIONS		
Date	15.7.22	
Atmospheric Pressure	1005	mB
Ambient Temperature	21.9	°C
EnviroNics Serial No.	3039	

GAS DATA LTD Unit 4 Fairfield Court Seven Stars Estate Coventry CV3 4LJ UK +44 (0)24 7630 3311	 GAS DATA LISTEN · ANALYSE · INFORM
--	--

GFM436-1 OUTWARD INSPECTION & QUALITY CHECK SHEET

INSTRUMENT DETAILS			
SO Number	Instrument Type	Instrument Serial Number + SW Version	Job Number(s)
331635	GFM436	13361 G436-27/10	123351

Calibration Technician *[Signature]*

Date 15.7.22

Inspection Technician *[Signature]*

Date 18.7.22

INSTRUMENT CHECKS		Pass (P), Fail (F) or not applicable (NA)		INSTRUMENT PACKING LIST		Tick if included
Function Tests	Dust Caps Fitted	P		Instrument		✓
	Keyboard Test (All Keys)	P		Leather Case		✓
	Backlight	P		Instrument Strap		✓
	Clock Set / Running	P		AC Battery Charger (UK)		✓
	Comms Test	P		AC Battery Charger (EURO)		X
	Pump Flow Test (In & Out)	P		AC Battery Charger (US)		X
	Overall Leak Test (30mB)	n/a		AC Battery Charger (AUS)		X
	Battery Charge Test	P		Gas Sample Pipe - (new issue)		✓
	Service Date set to?	15-7-23		Flow Sample Pipe - (new issue)		✓
Channel Tests	Data Logging Enabled?	P		Hard Carry Case		✓
	Verify CH4/LEL/Hexane/PID	P		Spares Pot		✓
	Verify CO2	P		Allen Key		✓
	Verify O2	P		Temperature Probe		X
	Verify H2S	P		Vane Anemometer		X
	Verify CO	P		USB Cable		✓
	Verify LEL	P		USB Memory stick		✓
	Verify 1 st Option Gas	N/A		SM V5 Software	Ver 6.05	✓
	Verify Atmospheric pressure	P		Internal Filter Pack	Qty	X
	Verify differential pressure	P		External Filter Pack	Qty	X
	Verify flow	P		Field Guide		X
	Verify temperature probe input	P		Extra Items: Sample tubes		
	Verify vane anemometer input	P				
DataBase Checks	Jobcard(s) completed and signed	P		Comments:		
	Jobcard(s) booked off database	P				
	Calibration certificate completed	P				
	Complete & print QI record	n/a				
Label Checks	No. of Calibration label fitted	GDC	11502			
	MCERTS label displayed	P/A				
	Warranty label fitted					
H2S Range	H2S Range from Sales Order	2000	ppm			
	H2S Range from Cal Cert	5000	ppm			
	Over-range value correct?	P				

TEST DATE AND CONDITIONS			
Date		15/07/2022	
Atmospheric Pressure		1005	mB
Ambient Temperature		21.9	°C
EnviroNics Serial No.		5089	

**GFM436 Final Inspection & Calibration
Check Certificate**

GAS DATA LTD

Unit 4, Fairfield Court

Seven Stars Estate

Wheler Rd

Coventry

CV3 4LJ

Tel 02476303311



Fax 02476307711

Customer	Brownfield Solutions
Certificate Number	123351
Order Number	331630

Serial Number	13361
Software Version	G436-00.0027/0010

Recalibration DUE Date
15/07/23

Instrument Checks					
Keyboard	✓		Display Contrast	✓	
Pump Flow In	500	Accept > 200 cc/min	Pump Flow @ -200mB	250	Accept > 200 cc/min
Clock Set / Running	✓		Labels Fitted	✓	

Gas Checks						
Sensor	CH ₄		CO ₂		O ₂	
	Instrument Gas	True Gas Value %	Instrument Gas	True Gas Value %	Instrument Gas	True Gas Value %
	Readings %		Readings %		Readings %	
	59.8	60	39.5	40	20.9	20.9
	Accept ±3.0		Accept ±3.0		Accept ±0.5	
	5.0	5	5.0	5	6.0	6
	Accept ±0.3		Accept ±0.3		Accept ±0.3	
Zero Reading 100% N2	0.0	0	0.0	0	0.0	0
	Accept ±0.0		Accept ±0.0		Accept ±0.1	

Optional Gas Checks						
Applied Gas & Range		Concentration Tested @ (ppm)	Instrument Readings (ppm)			
Gas Type	Range (ppm)		Zero Reading		Instrument Gas Reading	
H2S	5000	1500	0	Accept ±0.0	1500	Accept ±5.0
CO	2000	1000	0	Accept ±0.0	998	Accept ±5.0
Hexane	2.0%	2.0%	0	Accept ±0.0	1.99	Accept ±10.0

Cross Gas Effects									
Applied Gas (ppm)		Instrument Readings (ppm)							
Gas Type	Concentration	Toxic 1:	H2S	Toxic 2:	CO	Toxic 3:	HEX		
H2S	1500	1500		0		0			
CO	1000	90		998		0			
Hexane	2.0%	0		0		1.99			

Pressure Checks			
Atmospheric Pressure [AP] (mB)			
Current Atmospheric Pressure (mB)		Instrument Atmospheric Pressure Reading (mB)	
AP Open Ports		1005	Accept ± 2.0
AP Port (Internal)	+800 mB	800	Accept ± 5.0
	+1200mb	1200	Accept ± 5.0

Flow Checks					
Borehole Flow			Differential Pressure		
Applied Reading (l/h)	Instrument Reading (l/h)		Applied Pressure (Pa)	Instrument Reading (Pa)	
-30	-30.3	Accept ± 3.0	-325	-329	Accept ± 50
-3	-3.0	Accept ± 1.0	-16	-16	Accept ± 6.0
0	0.0	Accept ± 0.0	0	0	Accept ± 0.5
3	3.0	Accept ± 0.5	15	15	Accept ± 3.0
30	30.5	Accept ± 3.0	314	324	Accept ± 50
60	60.2	Accept ± 6.0	941	947	Accept ± 130
90	90.3	Accept ± 9.0	1846	1884	Accept ± 250

Temperature Checks		
Calibration Temperature	Instrument Temperature Reading $^{\circ}\text{C}$	
Applied Temperature $^{\circ}\text{C}$		
-10	-10.0	Accept ± 2.0
0	0.0	Accept ± 1.0
30	30.0	Accept ± 1.0
60	60.0	Accept ± 1.0
100	100.0	Accept ± 1.0

Technician:
<i>Jack Rutland</i>

Date Tested:
<i>15/07/2022</i>

The instrument identified by the serial number stated above has been tested by Gas Data personnel for calibration accuracy on the date and under the ambient conditions stated. Gas Data Ltd internal BS EN ISO9001:2015, BS EN ISO14001:2015, BS EN ISO45001:2018 compliant workshop procedures were followed to apply known calibration test gases, gas flow rates, pressures and temperatures of the values stated.

The results displayed on the instrument at each stage are recorded above.

APPENDIX F

Infiltration Testing Results

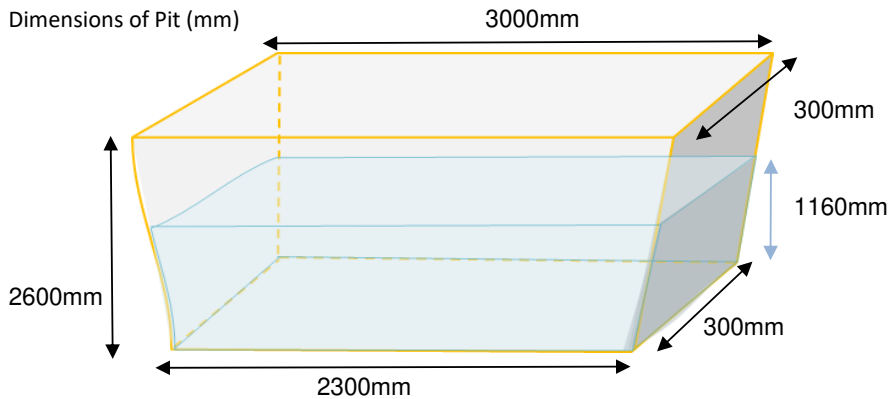
Percolation Test

HOLLINS HOMES**SA01**

Test 1

LANGLEY LANE, BIRCH

C5042


**BROWNFIELD
SOLUTIONS LTD**
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE
Test Pit Construction
 Date of Test:
 07/07/2022

 Logged By:
 PG

 Checked By:
 JM

Strata Description	Stiff brown slightly gravelly slightly sandy CLAY.		
Depth of Pit	2600mm		
Depth of Water (start)	1160mm		
Pit Details	Open with no stone filling See Associated Log for Stratum Details		
Void Ratio	1	Volume of Pit (m ³)	0.922
Infill Volume (m ³)	N/A	Water Volume (m ³)	0.922

Site Recorded Data

Time (mins)	Depth to water (mm)	Depth of water (mm)	Time (mins)	Depth to water (mm)	Depth of water (mm)
0.00	1440	1160	9.0	1440	1160
0.10	1440	1160	10.0	1440	1160
0.20	1440	1160	15.0	1440	1160
0.30	1440	1160	20.0	1440	1160
0.40	1440	1160	25.0	1440	1160
0.50	1440	1160	30.0	1440	1160
1.00	1440	1160	40.0	1440	1160
1.50	1440	1160	50.0	1440	1160
2.00	1440	1160	60.0	1440	1160
2.50	1440	1160	90.0	1440	1160
3.00	1440	1160	120.0	1440	1160
3.50	1440	1160	150.0	1440	1160
4.00	1440	1160	180.0	1440	1160
4.50	1440	1160	210.0	1440	1160
5.00	1440	1160	End of Test	End of Test	End of Test
6.00	1440	1160			
7.00	1440	1160			
8.00	1440	1160			

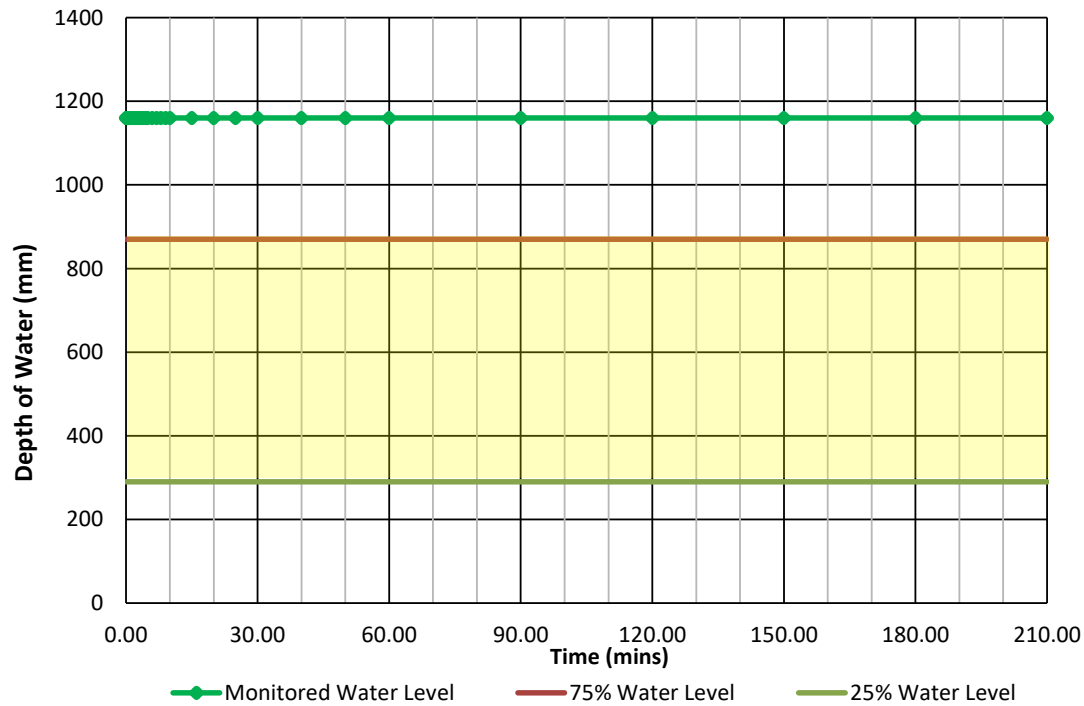
Percolation Test

HOLLINS HOMES**SA01**

Test 1

LANGLEY LANE, BIRCH

C5042


**BROWNFIELD
SOLUTIONS LTD**
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE
Data Analysis**Graph of Depth vs Time****Soil Infiltration Rate Calculation**

Water Level 1 (mm)	1160
Water Level 2 (mm)	1160
Time to Drain from Level 1 to Level 2 (mins)	210
Volume of water discharged (m ³)	0
Discharge Area (m ²)	7.534
Soil Infiltration Rate (m/min)	0
Soil Infiltration Rate (m/sec)	0.00E+00

Compliance Check

Water Level at 75% effective depth (mm)	870
Water Level at 25% effective depth (mm)	290

Test not BRE 365 compliant - insufficient time to drain past 25% effective depth

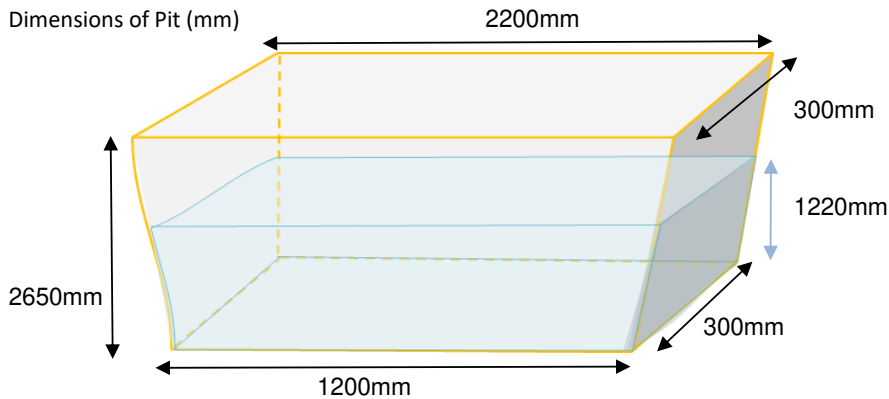
Percolation Test

HOLLINS HOMES**SA02**

Test 1

LANGLEY LANE, BIRCH

C5042


**BROWNFIELD
SOLUTIONS LTD**
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE
Test Pit Construction
 Date of Test:
 07/07/2022

 Logged By:
 PG

 Checked By:
 JM

Strata Description	Brownish grey slightly gravelly clayey fine to coarse SAND.		
Depth of Pit	2650mm		
Depth of Water (start)	1220mm		
Pit Details	Open with no stone filling See Associated Log for Stratum Details		
Void Ratio	1	Volume of Pit (m ³)	0.622
Infill Volume (m ³)	N/A	Water Volume (m ³)	0.622

Site Recorded Data

Time (mins)	Depth to water (mm)	Depth of water (mm)	Time (mins)	Depth to water (mm)	Depth of water (mm)
0.00	1430	1220	9.0	1460	1190
0.10	1435	1215	10.0	1460	1190
0.20	1435	1215	15.0	1470	1180
0.30	1440	1210	20.0	1470	1180
0.40	1440	1210	25.0	1480	1170
0.50	1450	1200	30.0	1480	1170
1.00	1450	1200	40.0	1485	1165
1.50	1450	1200	50.0	1490	1160
2.00	1450	1200	60.0	1495	1155
2.50	1455	1195	75.0	1500	1150
3.00	1455	1195	90.0	1510	1140
3.50	1458	1192	105.0	1520	1130
4.00	1458	1192	120.0	1525	1125
4.50	1458	1192	150.0	1525	1125
5.00	1460	1190	180.0	1525	1125
6.00	1460	1190	End of Test	End of Test	End of Test
7.00	1460	1190			
8.00	1460	1190			

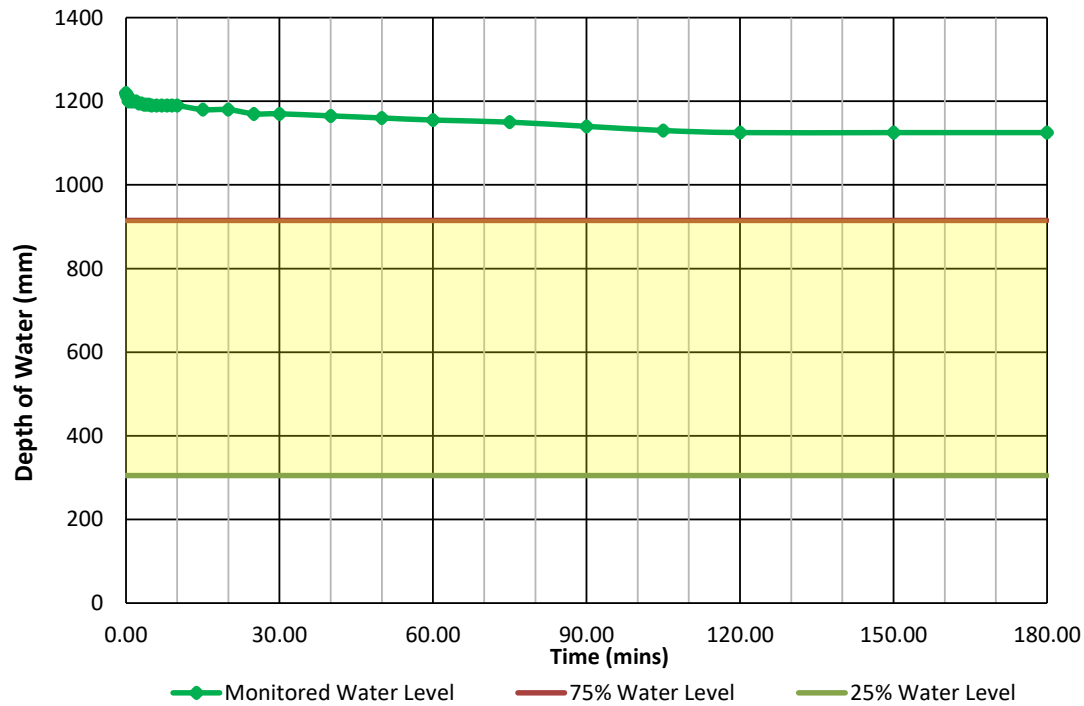
Percolation Test

HOLLINS HOMES**SA02**

Test 1

LANGLEY LANE, BIRCH

C5042


**BROWNFIELD
SOLUTIONS LTD**
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE
Data Analysis**Graph of Depth vs Time****Soil Infiltration Rate Calculation**

Water Level 1 (mm)	1220
Water Level 2 (mm)	1125
Time to Drain from Level 1 to Level 2 (mins)	180
Volume of water discharged (m ³)	0.04845
Discharge Area (m ²)	5.05
Soil Infiltration Rate (m/min)	5.33003E-05
Soil Infiltration Rate (m/sec)	8.88E-07

Compliance Check

Water Level at 75% effective depth (mm)	915
Water Level at 25% effective depth (mm)	305

Test not BRE 365 compliant - insufficient time to drain past 25% effective depth

APPENDIX G

Waste Assessment Report

Waste Classification Report

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

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



KEOBR-03EDY-VRSIW

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

Job name

Langley Lane, Birch

Description/Comments

Project

C5042

Site

Langley Lane, Birch

Classified by

Name:
Matthew Shore
Date:
18 Aug 2022 13:50 GMT
Telephone:
01606334844

Company:
Brownfield Solutions Limited
Brownfield Solutions Ltd
173-183 Witton Street
Northwich
CW9 5LP

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

HazWasteOnline™ Certification:

CERTIFIED

Course
Hazardous Waste Classification

Date
07 Oct 2021

Next 3 year Refresher due by Oct 2024

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	HP01	0.00-0.45	Non Hazardous		2
2	TP01	0.00-0.30	Non Hazardous		4
3	TP04	0.10-0.30	Non Hazardous		6
4	TP06	0.00-0.20	Non Hazardous		8
5	WS01	0.50-0.70	Non Hazardous		10
6	WS04	0.60-0.90	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: 18 Aug 2022 13:50 GMT

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



Classification of sample: HP01

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

Sample details

Sample name:	LoW Code:
HP01	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.00-0.45 m	
Moisture content:	
13%	
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 13% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
1	pH		PH		6.8 pH		6.8	pH	6.8 pH		
2	arsenic { arsenic trioxide }				23 mg/kg	1.32	26.42	mg/kg	0.00264 %	✓	
	033-003-00-0	215-481-4	1327-53-3								
3	cadmium { cadmium sulfide }			1	<0.2 mg/kg	1.285	<0.257	mg/kg	<0.00002 %		<LOD
	048-010-00-4	215-147-8	1306-23-6								
4	chromium in chromium(VI) compounds { chromium(VI) oxide }				<1.2 mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<LOD
	024-001-00-0	215-607-8	1333-82-0								
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				26 mg/kg	1.462	33.06	mg/kg	0.00331 %	✓	
		215-160-9	1308-38-9								
6	copper { dicopper oxide; copper (I) oxide }				41 mg/kg	1.126	40.16	mg/kg	0.00402 %	✓	
	029-002-00-X	215-270-7	1317-39-1								
7	lead { lead chromate }			1	96 mg/kg	1.56	130.276	mg/kg	0.00835 %	✓	
	082-004-00-2	231-846-0	7758-97-6								
8	mercury { mercury dichloride }				<0.3 mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		<LOD
	080-010-00-X	231-299-8	7487-94-7								
9	nickel { nickel dihydroxide }				22 mg/kg	1.579	30.232	mg/kg	0.00302 %	✓	
	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]								
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				<1 mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<LOD
	034-002-00-8										
11	zinc { zinc chromate }				150 mg/kg	2.774	362.026	mg/kg	0.0362 %	✓	
	024-007-00-3	236-878-9	13530-65-9								
12	naphthalene				<0.05 mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
	601-052-00-2	202-049-5	91-20-3								
13	acenaphthylene				<0.05 mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		205-917-1	208-96-8								
14	acenaphthene				<0.05 mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		201-469-6	83-32-9								
15	fluorene				<0.05 mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		201-695-5	86-73-7								



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
16	phenanthrene	201-581-5	85-01-8		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
17	anthracene	204-371-1	120-12-7		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
18	fluoranthene	205-912-4	206-44-0		0.39 mg/kg		0.339 mg/kg	0.0000339 %	✓	
19	pyrene	204-927-3	129-00-0		0.38 mg/kg		0.331 mg/kg	0.0000331 %	✓	
20	benzo[a]anthracene	601-033-00-9	200-280-6		0.28 mg/kg		0.244 mg/kg	0.0000244 %	✓	
21	chrysene	601-048-00-0	205-923-4		0.29 mg/kg		0.252 mg/kg	0.0000252 %	✓	
22	benzo[b]fluoranthene	601-034-00-4	205-911-9		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
23	benzo[k]fluoranthene	601-036-00-5	205-916-6		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
25	indeno[123-cd]pyrene	205-893-2	193-39-5		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
27	benzo[ghi]perylene	205-883-8	191-24-2		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
Total:								0.0582 %		

Key

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



Classification of sample: TP01



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

Sample details

Sample name:	LoW Code:
TP01	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.00-0.30 m	
Moisture content:	
18%	
(wet weight correction)	

Hazard properties

None identified

Determinands

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

#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number									
1	pH				6.2	pH		6.2	pH	6.2 pH		
2	arsenic { arsenic trioxide }				21	mg/kg	1.32	22.736	mg/kg	0.00227 %	✓	
	033-003-00-0	215-481-4	1327-53-3									
3	cadmium { cadmium sulfide }			1	<0.2	mg/kg	1.285	<0.257	mg/kg	<0.00002 %		<LOD
	048-010-00-4	215-147-8	1306-23-6									
4	chromium in chromium(VI) compounds { chromium(VI) oxide }				<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<LOD
	024-001-00-0	215-607-8	1333-82-0									
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				25	mg/kg	1.462	29.962	mg/kg	0.003 %	✓	
		215-160-9	1308-38-9									
6	copper { dicopper oxide; copper (I) oxide }				47	mg/kg	1.126	43.392	mg/kg	0.00434 %	✓	
	029-002-00-X	215-270-7	1317-39-1									
7	lead { lead chromate }			1	78	mg/kg	1.56	99.766	mg/kg	0.0064 %	✓	
	082-004-00-2	231-846-0	7758-97-6									
8	mercury { mercury dichloride }				<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		<LOD
	080-010-00-X	231-299-8	7487-94-7									
9	nickel { nickel dihydroxide }				23	mg/kg	1.579	29.789	mg/kg	0.00298 %	✓	
	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]									
10	selenium { selenium compounds with the exception of cadmium selenide and those specified elsewhere in this Annex }				<1	mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<LOD
	034-002-00-8											
11	zinc { zinc chromate }				97	mg/kg	2.774	220.656	mg/kg	0.0221 %	✓	
	024-007-00-3	236-878-9	13530-65-9									
12	naphthalene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
	601-052-00-2	202-049-5	91-20-3									
13	acenaphthylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		205-917-1	208-96-8									
14	acenaphthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		201-469-6	83-32-9									
15	fluorene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		201-695-5	86-73-7									



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
16	phenanthrene	201-581-5	85-01-8		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
17	anthracene	204-371-1	120-12-7		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
18	fluoranthene	205-912-4	206-44-0		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
19	pyrene	204-927-3	129-00-0		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
20	benzo[a]anthracene	601-033-00-9	200-280-6		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
21	chrysene	601-048-00-0	205-923-4		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
22	benzo[b]fluoranthene	601-034-00-4	205-911-9		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
23	benzo[k]fluoranthene	601-036-00-5	205-916-6		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
25	indeno[123-cd]pyrene	205-893-2	193-39-5		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
27	benzo[ghi]perylene	205-883-8	191-24-2		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
Total:								0.0416 %		

Key

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



Classification of sample: TP04



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

Sample details

Sample name:	LoW Code:
TP04	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.10-0.30 m	
Moisture content:	
18%	
(wet weight correction)	

Hazard properties

None identified

Determinands

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

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
1	pH				6.4 pH		6.4	pH	6.4 pH		
2	arsenic { arsenic trioxide }				12 mg/kg	1.32	12.992	mg/kg	0.0013 %	✓	
	033-003-00-0	215-481-4	1327-53-3								
3	cadmium { cadmium sulfide }			1	<0.2 mg/kg	1.285	<0.257	mg/kg	<0.00002 %		<LOD
	048-010-00-4	215-147-8	1306-23-6								
4	chromium in chromium(VI) compounds { chromium(VI) oxide }				<1.2 mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<LOD
	024-001-00-0	215-607-8	1333-82-0								
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				35 mg/kg	1.462	41.947	mg/kg	0.00419 %	✓	
		215-160-9	1308-38-9								
6	copper { dicopper oxide; copper (I) oxide }				22 mg/kg	1.126	20.311	mg/kg	0.00203 %	✓	
	029-002-00-X	215-270-7	1317-39-1								
7	lead { lead chromate }			1	17 mg/kg	1.56	21.744	mg/kg	0.00139 %	✓	
	082-004-00-2	231-846-0	7758-97-6								
8	mercury { mercury dichloride }				<0.3 mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		<LOD
	080-010-00-X	231-299-8	7487-94-7								
9	nickel { nickel dihydroxide }				24 mg/kg	1.579	31.085	mg/kg	0.00311 %	✓	
	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]								
10	selenium { selenium compounds with the exception of cadmium selenosulfide and those specified elsewhere in this Annex }				<1 mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<LOD
	034-002-00-8										
11	zinc { zinc chromate }				53 mg/kg	2.774	120.564	mg/kg	0.0121 %	✓	
	024-007-00-3	236-878-9	13530-65-9								
12	naphthalene				<0.05 mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
	601-052-00-2	202-049-5	91-20-3								
13	acenaphthylene				<0.05 mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		205-917-1	208-96-8								
14	acenaphthene				<0.05 mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		201-469-6	83-32-9								
15	fluorene				<0.05 mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		201-695-5	86-73-7								



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
16	phenanthrene	201-581-5	85-01-8		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
17	anthracene	204-371-1	120-12-7		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
18	fluoranthene	205-912-4	206-44-0		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
19	pyrene	204-927-3	129-00-0		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
20	benzo[a]anthracene	601-033-00-9	200-280-6		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
21	chrysene	601-048-00-0	205-923-4		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
22	benzo[b]fluoranthene	601-034-00-4	205-911-9		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
23	benzo[k]fluoranthene	601-036-00-5	205-916-6		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
25	indeno[123-cd]pyrene	205-893-2	193-39-5		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
27	benzo[ghi]perylene	205-883-8	191-24-2		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
Total:								0.0246 %		

Key

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



Classification of sample: TP06

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

Sample details

Sample name:	LoW Code:
TP06	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.00-0.20 m	
Moisture content:	
17%	
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 17% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
1	pH				8 pH		8 pH	8pH		
2	arsenic { arsenic trioxide }				20 mg/kg	1.32	21.917 mg/kg	0.00219 %	✓	
	033-003-00-0	215-481-4	1327-53-3							
3	cadmium { cadmium sulfide }			1	<0.2 mg/kg	1.285	<0.257 mg/kg	<0.00002 %		<LOD
	048-010-00-4	215-147-8	1306-23-6							
4	chromium in chromium(VI) compounds { chromium(VI) oxide }				<1.2 mg/kg	1.923	<2.308 mg/kg	<0.000231 %		<LOD
	024-001-00-0	215-607-8	1333-82-0							
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				27 mg/kg	1.462	32.753 mg/kg	0.00328 %	✓	
		215-160-9	1308-38-9							
6	copper { dicopper oxide; copper (I) oxide }				42 mg/kg	1.126	39.248 mg/kg	0.00392 %	✓	
	029-002-00-X	215-270-7	1317-39-1							
7	lead { lead chromate }			1	77 mg/kg	1.56	99.688 mg/kg	0.00639 %	✓	
	082-004-00-2	231-846-0	7758-97-6							
8	mercury { mercury dichloride }				<0.3 mg/kg	1.353	<0.406 mg/kg	<0.0000406 %		<LOD
	080-010-00-X	231-299-8	7487-94-7							
9	nickel { nickel dihydroxide }				22 mg/kg	1.579	28.842 mg/kg	0.00288 %	✓	
	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]							
10	selenium { selenium compounds with the exception of cadmium selenide and those specified elsewhere in this Annex }				<1 mg/kg	1.405	<1.405 mg/kg	<0.000141 %		<LOD
	034-002-00-8									
11	zinc { zinc chromate }				81 mg/kg	2.774	186.506 mg/kg	0.0187 %	✓	
	024-007-00-3	236-878-9	13530-65-9							
12	naphthalene				<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
	601-052-00-2	202-049-5	91-20-3							
13	acenaphthylene				<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
		205-917-1	208-96-8							
14	acenaphthene				<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
		201-469-6	83-32-9							
15	fluorene				<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
		201-695-5	86-73-7							



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
16	phenanthrene	201-581-5	85-01-8		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
17	anthracene	204-371-1	120-12-7		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
18	fluoranthene	205-912-4	206-44-0		0.36 mg/kg		0.299 mg/kg	0.0000299 %	✓	
19	pyrene	204-927-3	129-00-0		0.34 mg/kg		0.282 mg/kg	0.0000282 %	✓	
20	benzo[a]anthracene	601-033-00-9	200-280-6		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
21	chrysene	601-048-00-0	205-923-4		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
22	benzo[b]fluoranthene	601-034-00-4	205-911-9		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
23	benzo[k]fluoranthene	601-036-00-5	205-916-6		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
25	indeno[123-cd]pyrene	205-893-2	193-39-5		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
27	benzo[ghi]perylene	205-883-8	191-24-2		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
Total:								0.0379 %		

Key

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



Classification of sample: WS01

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

Sample details

Sample name:	LoW Code:
WS01	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.50-0.70 m	
Moisture content:	
14%	
(wet weight correction)	

Hazard properties

None identified

Determinands

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

#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number									
1	pH				6.3	pH		6.3	pH	6.3 pH		
2	arsenic { arsenic trioxide }				7.7	mg/kg	1.32	8.743	mg/kg	0.000874 %	✓	
	033-003-00-0	215-481-4	1327-53-3									
3	cadmium { cadmium sulfide }			1	<0.2	mg/kg	1.285	<0.257	mg/kg	<0.00002 %		<LOD
	048-010-00-4	215-147-8	1306-23-6									
4	chromium in chromium(VI) compounds { chromium(VI) oxide }				<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<LOD
	024-001-00-0	215-607-8	1333-82-0									
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				23	mg/kg	1.462	28.91	mg/kg	0.00289 %	✓	
		215-160-9	1308-38-9									
6	copper { dicopper oxide; copper (I) oxide }				13	mg/kg	1.126	12.587	mg/kg	0.00126 %	✓	
	029-002-00-X	215-270-7	1317-39-1									
7	lead { lead chromate }			1	8.1	mg/kg	1.56	10.866	mg/kg	0.000697 %	✓	
	082-004-00-2	231-846-0	7758-97-6									
8	mercury { mercury dichloride }				<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		<LOD
	080-010-00-X	231-299-8	7487-94-7									
9	nickel { nickel dihydroxide }				13	mg/kg	1.579	17.659	mg/kg	0.00177 %	✓	
	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]									
10	selenium { selenium compounds with the exception of cadmium selenosulfide and those specified elsewhere in this Annex }				<1	mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<LOD
	034-002-00-8											
11	zinc { zinc chromate }				34	mg/kg	2.774	81.116	mg/kg	0.00811 %	✓	
	024-007-00-3	236-878-9	13530-65-9									
12	naphthalene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
	601-052-00-2	202-049-5	91-20-3									
13	acenaphthylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		205-917-1	208-96-8									
14	acenaphthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		201-469-6	83-32-9									
15	fluorene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		201-695-5	86-73-7									



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
16	phenanthrene	201-581-5	85-01-8		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
17	anthracene	204-371-1	120-12-7		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
18	fluoranthene	205-912-4	206-44-0		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
19	pyrene	204-927-3	129-00-0		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
20	benzo[a]anthracene	601-033-00-9	200-280-6		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
21	chrysene	601-048-00-0	205-923-4		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
22	benzo[b]fluoranthene	601-034-00-4	205-911-9		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
23	benzo[k]fluoranthene	601-036-00-5	205-916-6		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
25	indeno[123-cd]pyrene	205-893-2	193-39-5		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
27	benzo[ghi]perylene	205-883-8	191-24-2		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
Total:								0.0161 %		

Key

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



Classification of sample: WS04

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

Sample details

Sample name:	LoW Code:
WS04	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.60-0.90 m	
Moisture content:	
21%	
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 21% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number									
1	pH				7.2	pH		7.2	pH	7.2 pH		
2	arsenic { arsenic trioxide }				21	mg/kg	1.32	21.904	mg/kg	0.00219 %	✓	
	033-003-00-0	215-481-4	1327-53-3									
3	cadmium { cadmium sulfide }			1	<0.2	mg/kg	1.285	<0.257	mg/kg	<0.00002 %		<LOD
	048-010-00-4	215-147-8	1306-23-6									
4	chromium in chromium(VI) compounds { chromium(VI) oxide }				<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<LOD
	024-001-00-0	215-607-8	1333-82-0									
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				26	mg/kg	1.462	30.02	mg/kg	0.003 %	✓	
		215-160-9	1308-38-9									
6	copper { dicopper oxide; copper (I) oxide }				41	mg/kg	1.126	36.468	mg/kg	0.00365 %	✓	
	029-002-00-X	215-270-7	1317-39-1									
7	lead { lead chromate }			1	71	mg/kg	1.56	87.49	mg/kg	0.00561 %	✓	
	082-004-00-2	231-846-0	7758-97-6									
8	mercury { mercury dichloride }				<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		<LOD
	080-010-00-X	231-299-8	7487-94-7									
9	nickel { nickel dihydroxide }				20	mg/kg	1.579	24.956	mg/kg	0.0025 %	✓	
	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]									
10	selenium { selenium compounds with the exception of cadmium selenide and those specified elsewhere in this Annex }				<1	mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<LOD
	034-002-00-8											
11	zinc { zinc chromate }				57	mg/kg	2.774	124.92	mg/kg	0.0125 %	✓	
	024-007-00-3	236-878-9	13530-65-9									
12	naphthalene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
	601-052-00-2	202-049-5	91-20-3									
13	acenaphthylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		205-917-1	208-96-8									
14	acenaphthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		201-469-6	83-32-9									
15	fluorene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		201-695-5	86-73-7									



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
16	phenanthrene	201-581-5	85-01-8		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
17	anthracene	204-371-1	120-12-7		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
18	fluoranthene	205-912-4	206-44-0		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
19	pyrene	204-927-3	129-00-0		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
20	benzo[a]anthracene	601-033-00-9	200-280-6		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
21	chrysene	601-048-00-0	205-923-4		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
22	benzo[b]fluoranthene	601-034-00-4	205-911-9		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
23	benzo[k]fluoranthene	601-036-00-5	205-916-6		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
25	indeno[123-cd]pyrene	205-893-2	193-39-5		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
27	benzo[ghi]perylene	205-883-8	191-24-2		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
Total:								0.0299 %		

Key

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



Appendix A: Classifier defined and non GB MCL determinands

■ pH (CAS Number: PH)

Description/Comments: Appendix C4

Data source: WM3 1st Edition 2015

Data source date: 25 May 2015

Hazard Statements: None.

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

Description/Comments: Data from C&L Inventory Database

Data source: <https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/33806>

Data source date: 17 Jul 2015

Hazard Statements: Acute Tox. 4; H332 , Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Resp. Sens. 1; H334 , Skin Sens. 1; H317 , Repr. 1B; H360FD , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

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

Description/Comments: Data from C&L Inventory Database

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

Data source date: 17 Jul 2015

Hazard Statements: Acute Tox. 4; H302 , Acute Tox. 1; H330 , Acute Tox. 1; H310 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315

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

Description/Comments: Data from C&L Inventory Database

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

Data source date: 17 Jul 2015

Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Aquatic Chronic 2; H411

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

Description/Comments: Data from C&L Inventory Database

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

Data source date: 06 Aug 2015

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

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

Description/Comments: Data from C&L Inventory Database

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

Data source date: 06 Aug 2015

Hazard Statements: Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Carc. 2; H351 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Skin Irrit. 2; H315

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

Description/Comments: Data from C&L Inventory Database

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

Data source date: 17 Jul 2015

Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

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

Description/Comments: Data from C&L Inventory Database

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

Data source date: 21 Aug 2015

Hazard Statements: Acute Tox. 4; H302 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

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

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014

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

Data source date: 21 Aug 2015

Hazard Statements: Skin Irrit. 2; H315 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

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

Description/Comments: Data from C&L Inventory Database

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

Data source date: 06 Aug 2015

Hazard Statements: Carc. 2; H351



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

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Acute 1; H400, Aquatic Chronic 1; H410

Appendix B: Rationale for selection of metal species

arsenic {arsenic trioxide}

Worst case species based on hazard statements

cadmium {cadmium sulfide}

Worst case species based on hazard statements

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

Worst case species based on hazard statements

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

Worst case species based on hazard statements

copper {dicopper oxide; copper (I) oxide}

Most likely common species

lead {lead chromate}

Worst case species based on hazard statements

mercury {mercury dichloride}

Worst case species based on hazard statements

nickel {nickel dihydroxide}

Worst case species based on hazard statements

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

Worst case species based on hazard statements

zinc {zinc chromate}

Worst case species based on hazard statements

Appendix C: Version

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

HazWasteOnline Classification Engine Version: 2022.222.5292.9906 (10 Aug 2022)

HazWasteOnline Database: 2022.220.5285.9900 (08 Aug 2022)

This classification utilises the following guidance and legislation:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1540 of 16th December 2020

GB MCL List - version 1.1 of 09 June 2021

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