BROWNFIELD SOLUTIONS LTD

GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

MODULEK

Wrexham FC Training Ground

Phase II Geo-Environmental Assessment Report

JL/C6579/15586

May 2026

EXECUTIVE SUMMARY	
Location and Brief Site Description	The site is currently occupied by Colliers Park sports complex, with associated commercial buildings, hard standing car parks, storage compounds, and soft landscaped land. A number of manholes/drains are present at the surface. Street lights are present cross cutting the site east to west. A large shipping container is present towards the south of the site.
Ground Conditions	Generalised ground conditions from the ground investigation comprise made ground encountered within every hole from ground level to between 3.90m and 5.45m bgl.
Concrete Classification	DS-3 AC-3 conditions prevail.
Site Drainage	Drainage to soakaways is considered potentially suitable for this site. Indicative soil infiltration rates range from $1.05x10^{-3}$m/s to $4.02x10^{-5}$m/s
Human Health - Soils Contamination	Based on the testing and assessment undertaken, no further action is required in respect to human health risks from soils contamination, based on the intended end use.
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 monitoring program and ground gas risk assessment , the site is classified as CS1 – No protection is required (excluding Radon).
Outline Remedial Strategy	• Full radon protective measures are necessary according to current guidance. • Verification of the above with validation reports produced.
Waste	Based on the waste classification database assessment, the majority of the made ground soils have been classified as non-hazardous, however the made ground soils associated with the shallow gravel in WS103 have been classified as hazardous.
Further Work	The following further works will be required to progress to the construction phase: • Detailed foundation design by a structural engineer. • Production of Ground Gas Protection Measures Verification Plan for radon protection. • Production of Materials Management Plan (MMP) under the CL:AIRE DoWCoP, if required.

This executive summary should be read in conjunction with the full report, reference JL/C6579/15586 and not as a standalone document. Report template version 4.12.

PROJECT QUALITY CONTROL DATA SHEET

Site Name:	Wrexham FC Training Ground		
Document Name:	Ground Investigation Report		
Reference:	JL/C6579/15586		
Status:	-	01/06/2026	Final.

Issued By:	**Client:**	
Brownfield Solutions Ltd William Smith House 173 – 183 Witton Street Northwich Cheshire CW9 5LP Tel: 01606 334 844 brownfield-solutions.com	Modulek 19 Bessemer Cl Verwood BH31 6AZ	
	Contact:	Contact:

Original Issue – 01/06/2026

	Checked by:	Approved by:
[redacted]	[redacted]	[redacted]
J J Lloyd BSc (Hons) FGS Graduate Geo-Environmental Consultant	**J Mather** BSc (Hons) MIEnvSc FGS Principal Geo-Environmental Consultant	**J Mather** BSc (Hons) MIEnvSc FGS Principal Geo-Environmental Consultant

QUALITY ISO CERTIFIED isoassured 9001
ENVIRONMENTAL ISO CERTIFIED isoassured 14001
MEMBER OF THE AGS WWW.AGS.ORG.UK
Constructionline Gold Member
Connect with us on LinkedIn

CONTENTS

1.0 INTRODUCTION 1
1.1 Context 1
1.2 Proposed Development 1
1.3 Previous Reports 1
1.4 Objectives 1
1.5 Scope 1
1.6 Limitations 1
2.0 THE SITE 4
2.1 Location 4
2.2 Site Description 4
3.0 SUMMARY OF PREVIOUS REPORTS 5
4.0 METHOD OF INVESTIGATION 6
4.1 Objectives 6
4.2 Site Works 6
4.3 Sampling Strategy 6
4.4 Laboratory Testing 7
4.5 Monitoring 7
5.0 GROUND CONDITIONS 8
5.1 Summary 8
5.2 Made Ground 8
5.3 Natural Superficial Strata 8
5.4 Solid Geology 8
5.5 Groundwater 9
5.6 Observations 9
6.0 TEST RESULTS 10
6.1 In Situ Geotechnical Testing 10
6.2 Aggressive Ground Conditions – Geotechnical Chemical Testing 10
6.3 Geo-Environmental Testing 10
7.0 GEOTECHNICAL ASSESSMENT 11
7.1 Ground Model 11
7.2 Concrete Classification 11
7.3 Site Drainage 11
8.0 GEO-ENVIRONMENTAL RISK ASSESSMENT 13
8.1 Introduction 13
8.2 Soils Test Results and Risk Assessment – Human Health 13
8.3 Summary – Human Health Risk Assessment 13
8.4 Soil Test Results – Controlled Waters 13
8.5 Controlled Waters Risk Assessment 13
8.6 Permanent Ground Gas and Vapours Results 14
8.7 Ground Gas Risk Assessment 14
8.8 Qualitative Risk Assessment 16
8.9 Outline Remedial Measures 20
8.10 Health and Safety Issues 20
9.0 WASTE SOIL CLASSIFICATION & ASSESSMENT 22
9.1 Summary 22
9.2 Soils Waste Classification Procedure 22

CONTENTS

9.3 WASTE CLASSIFICATION AND WASTE ACCEPTANCE CRITERIA (WAC) 23
9.4 RE-USE OF SOILS 24
10.0 CONCLUSIONS 26
10.1 GEO-ENVIRONMENTAL 26
10.2 GEOTECHNICAL 26
10.3 FURTHER WORK 26
11.0 ABBREVIATIONS AND DEFINITIONS 27
12.0 REFERENCES 30

DRAWINGS

Drawing Number	Rev	Title
3284-MLK-XX-ZZ-DR-Y-1	2	Proposed Plans
C6579/01	-	Site Location Plan
C6579/02	-	Exploratory Hole Location Plan
C6579/03	-	Site Features Plan

APPENDICES

Appendix	Title
Appendix A	BSL Methodology and Guidance
Appendix B	Exploratory Hole Logs
Appendix C	Geotechnical Testing Results
Appendix D	Chemical Testing Results
Appendix E	Monitoring Results
Appendix F	Waste Assessment Report
Appendix G	CON29M Coal Mining Search
Appendix H	Environment Search

1.0 INTRODUCTION

1.1 Context

This report describes a Phase II Geo-Environmental Assessment carried out by Brownfield Solutions Limited (BSL) for Modulek on a site off Chester Road, Gresford, Wrexham, and has been completed in general accordance with the following guidance:

- Environment Agency guidance - Land Contamination: Risk Management (LCRM).
- BS 10175:2026 Investigation of Potentially Contaminated Sites.
- BS5930: 2015+A1:2020 Code of Practice for Ground Investigations.
- BS EN 1997-1:2004+A1:2013 Eurocode 7. Geotechnical design. General rules plus UK National Annex.
- BS EN 1997-2:2007 Eurocode 7 Geotechnical design. Ground investigation and testing plus UK National Annex.

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

1.2 Proposed Development

The proposed development is for a new first team pavilion, for which two potential locations have been proposed, as shown on the Proposed Plans, drawing No. 3284-MLK-XX-ZZ-DR-Y-1 Rev 2, provided to BSL by the client.

1.3 Previous Reports

This report should be read in conjunction with BSL Geotechnical Letter Report (JL/C6579/15383 Rev A) issued in March 2026.

1.4 Objectives

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.

The factual and interpretive Phase II sections of this report are 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.

1.5 Scope

Following the previous round of investigation and associated Geotechnical Letter Report, a supplementary intrusive investigation was undertaken to confirm the findings of the preliminary environmental risk assessment. The supplementary investigation was undertaken using trial pitting, window sampling, ground gas and groundwater monitoring, and laboratory chemical testing, with reporting on the findings.

A summary of previous investigations carried out at the site has also been undertaken.

1.6 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, Modulek. 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. This report may not be relied upon by the client or submitted to a third party for their reliance for the purposes of valuation, mortgage, insurance and regulatory approval, until all invoices have been settled in full.

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.

Asbestos in structures was not covered in this report. It should be noted that an asbestos demolition survey will be required prior to any demolition of structures. If asbestos is present in soils, these will need to be dealt with in accordance with the Control of Asbestos Regulations (CAR) 2012.

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. Please note that whilst every effort has been made to pre-empt the likely requirements of the Local Authority, Environment Agency and warranty providers, they may have specific requirements that will need to be discussed and addressed at a later date.

Site specific limitations listed in section 4.2.

2.0 THE SITE

2.1 Location

The site is located off Chester Road, Gresford, Wrexham, LL12 8PW, centred on National Grid Reference 334403, 354204 as shown on the Site Location Plan, Drawing No. C6579/01.

2.2 Site Description

A site reconnaissance survey was carried out at the site on 26th February 2026. The main site features and potential issues identified are detailed below and are shown on the Site Features Plan, Drawing No. C6579/02.

Feature	Description
Site Area	Approximately 0.1 hectares.
Site Access	Access to the site is gained off Chester Road to the east.
Current Land Use and Site Features	The site is currently occupied by Colliers Park sports complex, with associated commercial buildings, hard standing car parks, storage compounds, and soft landscaped land. A number of manholes/drains are present at the surface. Street lights are present cross cutting the site east to west. A large shipping container is present towards the south of the site.
Potential Sources of Gross Contamination	No evidence of visual or olfactory contamination was noted.
Vegetation / Ecology	No vegetation was noted on site other than a small area of soft landscaping cross cutting the site from east to west.
Topography	The site is generally flat.
Site Boundaries	The site is bound by Colliers park sports complex, the sports complex is bound by mature trees and hedgerows to the north, east, south, and west.
Surrounding Area	The site is set within a mixed commercial and agricultural area, bordered by farmland to the north, east, and west, and a hotel/restaurant to the south.

3.0 SUMMARY OF PREVIOUS REPORTS

A summary of the relevant points from the Geotechnical Letter Report completed by BSL (JL/C6579/15383) issues March 2026 is presented below:

- The client was looking to re-use a potential existing concrete slab and required further information, including slab thickness/geometry, reinforcement details, sub-base material, depth, and bearing strata geology.
- This slab was not encountered during the site works and therefore a standard programme of site investigation was undertaken.
- The site is generally underlain by deep granular made ground, encountered to the base of all exploratory holes to a maximum depth of 5.45m bgl.
- In situ plate load testing indicated equivalent CBR values ranging from 1.4% to 10.9%.
- Laboratory CBR results indicated CBR values ranging from 24.8% to 31.8%.
- Two PSD tests were undertaken on samples of the made ground and indicated it consisted of primarily granular material and varies between a silty sandy gravel and a silty very sandy gravel.
- Particle size distribution testing indicates that the samples generally fell within the grading limits for Class 1B and also within the limits for Classes 6F1/6F2 of the Specification for Highway Works (Series 601).
- Compaction testing carried out on samples of the made ground indicate Optimum Moisture Contents (OMC) of between 7.6% and 8.9%, with corresponding Maximum Dry Density (MDD) values between 2.02 Mg/m^3 and 2.10 Mg/m^3.
- Foundation recommendations were for pad foundations within the granular made ground, for which a minimum founding depth of 0.75m was suggested. An allowable bearing capacity not exceeding 130kN/m^2 should be assumed for pad footings of 1m width if it is deemed no groundwater is present.
- An allowable bearing capacity not exceeding 100kN/m^2 should be assumed for pad footings of 1m width if it is deemed groundwater is present.
- The most suitable foundations for the proposed structure at the site are likely to be pad foundations placed within the made ground sandy gravel strata The minimum founding depth in granular soils is typically 0.45m bgl. However, due to the more heterogeneous nature of the made ground across the site, and the higher nature of the provided structural loads, a more conservative minimum founding depth of 1.00m bgl has been adopted. Where footings are taken below the minimum founding depths, they should extend a minimum of 100mm into the specified bearing stratum. At this depth, for a pad footing of approximately 1.50m width and breadth, above the groundwater table, an allowable bearing capacity not exceeding 265kN/m2 should be assumed for the made ground sandy gravel. This adopts a factor of safety of 3 which should limit settlements to within acceptable limits. If subsequent groundwater monitoring determines that the groundwater table lies shallower than this depth, an allowable bearing capacity not exceeding 205kN/m2 should be assumed for the made ground sandy gravel. In this instance, the foundation would have to be deepened, or the pad width increased, to meet the required load capacity.
- For granular soils, a minimum ventilation void of 150mm should be provided below the underside of precast concrete suspended floors.

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 geo-environmental risks, an appropriate intrusive investigation was undertaken, designed with consideration of the site history and the proposed development.

The aim of the fieldwork was to:

- Further investigate the ground conditions on site.
- Install standpipes to allow future gas and groundwater 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 on the 30th March 2026.

Method	No.	Range Depths (m bgl)	Purpose
Trial pits – JCB 3CX Mini excavator	2	0.20 – 0.50	Undertaken in order to facilitate plate load testing.
Plate load tests	2	0.15	Obtain CBR values for foundation/highways/pavement design.
Window sample boreholes – Tracked WS rig	3	4.60 – 5.00	Establish general ground conditions on site. Obtain samples for contamination testing. Installation of ground gas and water monitoring wells.
Infiltration tests (in Boreholes)	3	N/A	Obtain indicative infiltration rates for drainage design comprising 3no. falling head tests.

The approximate locations of the exploratory holes are indicated on the Exploratory Hole Location Plan, Drawing No C6579/02. The exploratory hole logs are presented in Appendix B.

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

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

4.3 Sampling Strategy

Representative samples were taken from exploratory holes at regular intervals to assist in the identification of the soils and to allow subsequent laboratory testing. They were stored and transported in general accordance with BS 10175:2026.

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

Investigatory hole locations were determined by reference to the conditions identified in the preliminary risk assessment and previous ground investigation. An even spacing was used across the site. No specific sampling statistics or grid were utilised in this instance.

4.4 Laboratory Testing

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

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

Determinand	No of Samples
BSL Default Soil Suite: Arsenic, Cadmium, Chromium (III), Chromium (VI), Copper, Nickel, Mercury, Lead, Zinc, Selenium, speciated polycyclic hydrocarbons (PAH 16), water soluble sulphate (2:1 Extract), soil organic matter (SOM) and pH.	4
Petroleum Hydrocarbons (TPH CWG) inc BTEX and MTBE.	3
Asbestos Screen.	3
Waste Acceptance Criteria (WAC).	1

The Chemical Laboratory Testing Results are presented in Appendix D.

4.5 Monitoring

Ground gas and ground water monitoring standpipes were installed in a number of boreholes as detailed in the table further below.

A total of 4 monitoring visit has been undertaken out of 4 proposed as part of the current scope, in line with the recommendations of BS8485.

All gas monitoring was undertaken using either a GA5000 or GFM436 infrared gas meter with integral electronic flow analyser.

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

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

Location	Internal Diameter Pipe	Response Zone (m bgl)	Targeted Strata	Purpose
WS101	35mm PVC	1.00 – 5.00	Made Ground	Ground Gas & Groundwater
WS102	35mm PVC	1.00 – 4.60	Made Ground	Ground Gas & Groundwater
WS103	35mm PVC	1.00 – 5.00	Made Ground	Ground Gas & Groundwater

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 Summary

A brief summary of the ground conditions encountered by BSL during the two phases of ground investigation within is presented in the table below:

Stratum	Range Depths - Top (m bgl)	Range Depths - Base (m bgl)	Brief Description
Made Ground Topsoil	Ground Level	0.30 – 0.45	Sl gravelly clayey SAND.
General Made Ground	0.10 – 2.00	3.90 – 5.45	Sandy GRAVEL. Gravelly SAND.
Reworked Made Ground	0.30 – 2.70	2.50 – 5.45	Sandy GRAVEL. Gravelly SAND.

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

5.2 Made Ground

Made Ground Topsoil
Made Ground Topsoil was only recorded within WS03 and PL01 and comprised gravelly clayey sand with rootlets, and anthropogenic inclusions of gravel sized brick and pottery. This was encountered from ground level to between 0.30m and 0.45m bgl.

Hardstanding
Tarmacadam was recorded in WS01, WS02, WS04, WS101, WS102, WS103, PL01 and PL02 from between ground level and 0.45m to between 0.10m and 0.50m bgl.

General Made Ground
Granular made ground was found throughout all exploratory holes, from between 0.10m and 2.00m to between 3.90m and 5.45m bgl. The made ground was comprised predominantly of sand and gravel with varying amounts of clay, sand, and gravel as minor constituents, and rare anthropogenic inclusions of brick and concrete.

Cohesive made ground was observed within WS01, WS101, WS102, and WS103 from between 2.00m and 3.90m to between 2.50m and 4.40m bgl, with a maximum thickness of 0.60m, comprising predominantly slightly sandy gravelly clay with rare anthropogenic inclusions of brick.

Reworked Made Ground
Reworked made ground was encountered interbedded with the general made ground in WS02, WS03, WS04, WS101, WS102, and WS103 from between 0.30m and 2.70m bgl, to between 2.50m and 5.45m bgl, comprising predominantly sand and gravel with varying amounts of clay, sand, and gravel as minor constituents. It was noted that a large proportion of the gravel consisted of poor quality coal fragments.

5.3 Natural Superficial Strata

Natural Superficial Strata was not encountered in this investigation.

5.4 Solid Geology

The solid geology of the Salop Formation was not encountered in this investigation.

5.5 Groundwater

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

Location	Depth During Site Works (m)	Comments
WS01	NGW	
WS02	NGW	
WS03	1.20	Small seepage
WS04	NGW	
WS101	0.70	Small seepage
WS102	4.20	Small seepage
WS103	3.60	Small seepage

NGW – No Groundwater Encountered

Post site works monitoring has revealed the following depths to groundwater:

Location	Depth During Monitoring Period (range) (m)	
	Min	Max
Overall min/max	NGW	4.78
WS101	NGW	NGW
WS102	NGW	NGW
WS103	NGW	4.78

5.6 Observations

Contamination
During the works undertaken by BSL, observations for both visual and olfactory evidence of contamination were undertaken. No evidence of such contamination was observed at the site.

Stability of Excavations/Boreholes
The borehole sidewalls were generally stable and window sampling progressed without the need to install casing.

6.0 TEST RESULTS

6.1 In Situ Geotechnical Testing

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

Location	Response Zone (m)	Stratum Type	Hydraulic Conductivity (m/sec)
WS101	1.00 – 5.00	MADE GROUND	4.83×10^{-4}
WS102	1.00 – 4.60	MADE GROUND	1.05×10^{-3}
WS103	1.00 – 5.00	MADE GROUND	4.02×10^{-5}

The full test results are presented in Appendix C.

6.2 Aggressive Ground Conditions – Geotechnical Chemical Testing

The test results for the assessment of aggressive ground conditions are presented in Appendix D. The results are summarised and assessed within Section **Error! Reference source not found.** of this report.

6.3 Geo-Environmental Testing

Chemical Laboratory Testing
The chemical test results for soils, are presented in Appendix D. The results are summarised and assessed within Section 8.2 of this report.

Ground Gas Monitoring
Ground gas monitoring results are presented in Appendix E and are summarised and assessed within Section 8.7 of this report.

7.0 GEOTECHNICAL ASSESSMENT

The majority of the geotechnical information, including foundation design, is presented in the separately issued BSL Geotechnical Letter Report (JL/C6579/15383 Rev A) issued in March 2026.

The below points are pertinent additions to that document, relating to concrete classification and site drainage.

7.1 Ground Model

The site is currently occupied by Colliers Park sports complex, with associated commercial buildings, hard standing car parks, storage compounds, and soft landscaped land.

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

- General and reworked made ground generally comprising sand and gravel from ground level to a maximum of 5.45m bgl.
- Groundwater levels ranging between 0.70m and 4.20m bgl during site works.
- Post site works monitoring levels ranging between no groundwater encountered and 4.70m bgl.

7.2 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 made ground is considered to be relatively permeable, therefore the groundwater has been classed as mobile.

Stratum	No. Samples	Characteristic SO_4 (g/l)	Characteristic pH	DS Class	ACEC Class
Made Ground	4	1890	7.4	DS-3	AC-3

Based on the above, the results of laboratory pH and sulphate content, indicate that sulphate class DS-3 and ACEC Class AC-3 conditions prevail in accordance with BRE Special Digest 1 "Concrete in aggressive ground" 2005.

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

7.3 Site Drainage

The tests undertaken across the site indicate good drainage conditions. Based on the infiltration rates obtained, on the order of 10^{-5} m/s or greater, it is likely that drainage to soakaways will be feasible at the site. We recommend the design of soakaway drainage is carried out in accordance with BRE 365 and CIRIA C753. Consideration should also be given to future maintenance, where infiltration capacity can be reduced as a result of blinding through ingress of fines.

Note the base of any soakaway incorporated into the future development of the site is required to be at least 1m above the water table. Observed groundwater levels ranged between 0.70m and 4.20m bgl across

the site during site works. Post site works monitoring has ranged between no groundwater encountered and 4.80m bgl.

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

8.0 GEO-ENVIRONMENTAL RISK ASSESSMENT

8.1 Introduction

The samples were tested for an assessment of the chemical contamination that may pose a risk to human health. The results were examined with reference to a selection of guidance documents as detailed in Appendix A. In this case the LQM/CIEH S4ULs and DEFRA C4SLs for a commercial end use have been adopted as Tier 1 generic screening values.

Where samples record determinand concentrations that exceed the relevant screening values then these will be considered further.

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

8.2 Soils Test Results and Risk Assessment – Human Health

Metals
No metals have been detected above the adopted screening criteria.

Asbestos
No asbestos has been detected in any of the three samples screened.

Poly Aromatic Hydrocarbons (PAHs)
No PAHs have been detected above the adopted screening criteria.

Total Petroleum Hydrocarbons (TPH CWG)
No petroleum hydrocarbons have been identified above the adopted screening criteria.

BTEX and MTBE
No BTEX or MTBE compounds have been identified above the adopted screening criteria.

8.3 Summary – Human Health Risk Assessment

Based on the testing and assessment undertaken, no further action is required in respect to human health risks from soils contamination, based on the intended end use.

8.4 Soil Test Results – Controlled Waters

Soils
No significant contaminants were identified in soils as an indicator of potential impaction on groundwater.

8.5 Controlled Waters Risk Assessment

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

- No significant gross or mobile contamination has been identified on site in soils based on the results obtained as a potential indicator of groundwater contamination.
- There is no indication under present conditions of significant pollution of controlled waters and conditions following development of the site will not be any worse.
- For the made ground, the preparation of samples for leachability analysis has not been undertaken as this is an aggressive methodology and provides theoretical values which are unlikely to be

representative of existing site conditions, real site leaching concentrations will be reduced significantly from that indicated by the laboratory testing, furthermore this would not be representative of post construction conditions, which will significantly reduce infiltration.

- The concentrations of leachable substances that could emanate from the site will be subject to dilution and dispersal during transport and so the risks will reduce with distance from the site and into the identified surrounding water bodies.
- The nearest watercourse is over 600m away, which provides considerable distance for attenuation and contaminant degradation.
- The site does not lie within 500m of an SPZ.

8.6 Permanent Ground Gas and Vapours Results

A total of 4 ground gas monitoring visits have been carried out between the dates of 2nd April and 13th May 2026. The gas monitoring regime has now been completed and no further visits are scheduled. Results are summarised in the table below:

	CH_4 (%)		CO_2 (%)		O_2 (%)		CO (ppm)		H_2S (ppm)		Steady Flow (l/hr)	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Peak	0.1	0.1	0.1	8.7	1.3	20.3	0.1	0.1	0.1	0.1	0.1	0.1
Steady	0.1	0.1	0.1	8.7	1.3	18.9					0.1	0.1

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

The highest carbon dioxide concentrations were recorded in WS101 (8.7% v/v) on the second monitoring visit. The maximum methane concentration recorded was below the detection limit, and therefore has assumed to be 0.1% v/v. The maximum peak and steady positive flow recorded was below the detection limit, and therefore has assumed to be 0.1l/hr.

The atmospheric pressure ranged between 991mb and 1013mb over the monitoring period, of which visits were conducted over a range of falling, steady and rising pressure trends.

It should be noted that the results from the first gas monitoring visit are considered anomalous due to the disparity in results when compared to the remainder of the visits. No evidence of elevated carbon dioxide or depleted oxygen were noted, whereas this was observed within all wells on all remaining visits. Therefore the results from the first visit should be considered with caution.

8.7 Ground Gas Risk Assessment

Basis of Assessment

In order to assess the ground gas situation and the requirement for ground gas precautionary measures at the site, guidance was taken from BS8485:2015+A1:2019 'Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings' and CL:AIRE Technical Bulletin TB17 'Ground Gas Monitoring and 'Worst-Case' Conditions'.

As the site lies within a Coal Authority defined Coal Mining Reporting Area, a CON29M Coal Mining Search (ref. BRO-YZJ-TFG-6HC-SF9) issued May 2026, was reviewed in order to determine the level of risk from mine gas, this is presented within Appendix G. As the site has no mine entries within 50m, no workings at less than 150m depth, no faults or connecting pathways, and is outside the area of probable shallow coal workings, the site is considered to be within a negligible risk zone.

A review of the available historical mapping and environmental database information indicates that historical potentially contaminative land uses, including former refuse heaps, mining related features and

associated workings, were located predominantly to the west and south-west of the site and do not appear to encroach upon the site boundary. Whilst the Groundsure Enviro Insight report identifies a historical landfill record associated with Pont-y-Capel Lane, the corresponding mapped historical land use features are located offsite, and the referenced waste licence (WMBC L/45) is recorded approximately 180m south-west of the Site. Consequently, there is insufficient evidence to demonstrate that landfill materials are present beneath the site itself.

Ground gas monitoring undertaken as part of this investigation identified generally low and stable concentrations of landfill indicator gases. Methane concentrations were negligible throughout the monitoring period and no characteristic landfill gas regime was identified. A single isolated elevation in carbon dioxide concentration was recorded; however, this was not accompanied by elevated methane concentrations and is considered more likely to reflect natural biological processes within the soil profile than the influence of landfill derived gas. The monitoring results are therefore not consistent with the presence of significant landfill deposits beneath the site and indicate a low risk of ground gas generation from anthropogenic sources. On the basis of the historical review and the measured gas regime, the potential for landfill derived ground gas to affect the site is considered to be low.

Rationale and Suitability of Dataset

In accordance with BS8485 and as set out in Appendix A of this report, and as noted previously, the ground gas generation potential is considered to be **very low** (sources as made ground). The sensitivity of the development is **low** on account of the proposed commercial use.

In line with current guidance, it is recommended gas monitoring should comprise four visits over a one-month period. The required monitoring frequency has been met.

Although the first visit is considered to show anomalous results, as installations have been monitored under falling pressure on a number of occasions and what can be considered to be "worse case" conditions, the data set is considered to be suitable for assessment purposes and no further visits would be required – further visits would be unlikely to change the outcome of this assessment given the readings obtained under the conditions observed (as per CL:AIRE TB17 and BS8576).

Assessment of Data

Derivation of a Gas Screening Values (GSV) has been undertaken based on the guidance with BS8485 using the following equation: (max gas concentration / 100) x maximum steady flow.

A maximum steady flow of 0.1l/hr has been used to derive the worst credible GSVs. The GSV's for the site are presented below.

Ground Gas	Adopted Typical Steady Flow Rate (l/hr)	Max Concentration (% v/v)	Worst Credible GSV (l/h)	Classification based on GSV	Typical Threshold Concentration Exceeded
Methane	0.1	0.1	0.0001	CS1	No – CS1
Carbon Dioxide	0.1	8.7	0.0087	CS1	Yes – CS2

The GSVs place the site the site into Characteristic Situation 1 (CS1), however due to concentrations of carbon dioxide greater than 5% v/v being recorded at the site then guidance states ***consideration*** should be given to increasing the site classification as part of assessment.

Based on the historical BGS mapping and the exploratory hole logs, the made ground encountered across the site is interpreted to comprise predominantly of gravel containing variable quantities of poor-quality coal. No evidence of putrescible or biodegradable material was identified during the intrusive investigation and, therefore, there is no indication of an active biogenic gas source associated with the site. Based on

the above, it is considered that the recorded ground gas concentrations are most likely attributable to low level residual coal degassing within the made ground.

While ground gas monitoring recorded elevated carbon dioxide concentrations, with a maximum recorded concentration of 8.7% v/v, no gas flow rates were recorded above the detection limit of 0.1l/hr during the monitoring programme. The absence of measurable flow indicates limited gas mobility and a low potential for significant ground gas migration beneath the proposed development.

In addition, the proposed development incorporates a suspended floor construction with a ventilated sub-floor void. The provision of a ventilated void beneath the building footprint will promote dilution and dispersal of any ground gases that may be generated within the underlying made ground, thereby substantially reducing the potential for gas accumulation beneath the proposed development.

Furthermore, the proposed development will incorporate radon protection measures. Whilst primarily intended for radon protection, the inclusion of a radon barrier and associated detailing will provide an inherent degree of carbon dioxide resistance, representing an additional level of gas protection beyond that typically associated with a Characteristic Situation 1 classification.

Assessment Summary
In summary, based on a lines of evidence approach, we consider that the site should be placed within CS1 classification and ground gas protection measures are not required within structures at the development, subject to agreement with the Local Authority, based on the following rationale:

- The available data set exceeds the minimum requirements suggested by the guidance for assessment.
- It is considered that the ground gas concentrations and flows have been monitored to enable a predication of “worst case” conditions; rapid and short pressure decreases are within the dataset.
- Based on the GSVs alone, the site falls into CS1 classification.
- The derived GSVs are considered to be highly conservative due to the interpreted artificial generation of gas flows.
- The typical threshold concentrations of 5% carbon dioxide have been exceeded on one occasion within WS101 during the spot monitoring data.
- The proposed suspended floor construction incorporates a ventilated sub-floor void, which will provide passive dilution and dispersal of any ground gases beneath the building footprint.
- Proposed radon protection measures will provide an inherent degree of additional gas resistance to the completed development.
- CL:AIRE Research Bulletin RB17 states the minimum level of ventilation required to deal with condensation is capable of dealing with quite onerous ground gas regimes. In addition, the requirements of Part L of the building regulations relating to the air tightness of buildings also leads to the need for a well-sealed floor slab (NHBC Foundation, 2009).
- Therefore, the structures on the development will also have an inherent level of ground gas protection, thus adding an additional layer of mitigation to the already low assessed level of risk.

8.8 Qualitative Risk Assessment

The CSM has been based on the findings of the site investigation and laboratory testing results and these are presented overleaf.

Human Health						
Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk	Justification
On site Made Ground Metals, PAH's, Petroleum Hydrocarbons, asbestos	Root uptake, ingestion, direct contact, inhalation of dusts	End-users	Unlikely	Medium	Low	Historical BGS mapping indicates a substantial area of Made Ground associated with former colliery spoil tips along the south-western boundary of the site. In addition, Groundsure data identifies a historic landfill to the west and south-west of the site, with a licence issued in 1987 and last recorded inputs in 1988, listed as inert waste. These features are considered to represent potential sources of contamination, however laboratory analysis of soils undertaken as part of the Phase II investigation has not identified any exceedances of metals, PAHs, petroleum hydrocarbons, or asbestos above relevant Generic Assessment Criteria (GACs). Furthermore, the presence of hardstanding across the commercial development will break the pathway to site end users. Therefore the 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	Likely	Mild	Moderate/ Low	Contaminants within the soil/groundwater could potentially attack the clean potable water supply pipe, high characteristic SO_4 and low pH have been identified during chemical testing, contaminants should be assessed in accordance with the relevant guidance to determine the correct pipe material and level of precautions required. Whilst the longer chain hydrocarbons do not exceed human health limits from a commercial screening value perspective, they would exceed typical thresholds for PE pipe.
Made Ground Ground Gas (carbon dioxide and methane)	Migration into confined spaces, inhalation and asphyxiation/ explosion	End-users / property / structures	Unlikely	Medium	Low	As stated above a historical landfill was noted to be present offsite from approximately 1987 to 1988 which is considered to pose a potential gas risk. No significant elevations of methane, carbon monoxide or hydrogen sulphide were detected during the gas monitoring programme and there is not considered to be a credible risk of explosion, therefore the severity of the hazard is considered to be medium. Elevated concentrations of carbon dioxide and reduced oxygen levels were recorded, which may present a potential asphyxiation risk within confined spaces. However, measured gas flow rates were low, indicating limited gas mobility, and the proposed development incorporates a number of inherent gas protection measures, including radon protection measures and a ventilated sub-floor void, which will assist in the passive dilution and dispersal of any ground gases.

Human Health						
Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk	Justification
						The ground gas risk assessment has characterised the site as Characteristic Situation 1 taking into account various lines of evidence including gas monitoring data. Mitigation will not be required and the risk is considered to be low.
Natural Geology Radon	Migration into confined spaces, inhalation	End-users	Likely	Medium	Moderate	BR 211 radon advice indicates full radon measures are required.

Controlled Waters						
Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk	Justification
Onsite Made Ground PAH's, Metals	Overland flow, / migration through saturated zone	River Alyn 600m away (Surface waters)	Unlikely	Medium	Low	There are thick deposits of made ground on site, however no exceedances of any contaminants tested for have been identified. The nearest identified surface water receptor is the River Alyn, located approximately 600m from the site boundary. Based on the available information, it is considered unlikely that contaminants potentially associated with the made ground or historical industrial land uses would adversely impact the watercourse. This is due to the significant separation distance between the site and the river, together with the likelihood for attenuation, dilution, adsorption and natural degradation processes to reduce contaminant concentrations during any potential migration pathway. Accordingly, the pollutant linkage between the identified made ground and the River is considered to be incomplete, and therefore the risk posed to the watercourse is assessed as low.
	Leaching through unsaturated zone / Migration through saturated zone	Secondary A Aquifer (Ground-water)	Unlikely	Medium	Low	The site is currently surfaced in hardstanding and will remain so, with a new surface water drainage system installed which will further reduce the risk to controlled waters. By virtue of the development taking place, this should contribute to an overall "betterment" of groundwater quality.
	Migration through saturated zone	Principal Aquifer (Ground-water)	Unlikely	Medium	Low	The closest groundwater abstraction is over 600m SW of the site, there are no Source Protection Zones near the site. As stated above, the site is currently surfaced in hardstanding and will remain so, with a new surface water drainage system installed which will further reduce the risk to controlled waters.

8.9 Outline Remedial Measures

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

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

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

Ground Gas Protection Systems
Based on the ground gas monitoring results and ground gas risk assessment, no mitigation measures are required.

Full radon protection measures are required for new buildings at this location.

As part of any enabling or remedial works, it is recommended that all boreholes with monitoring installations are decommissioned in line with EA guidance in order to remove preferential pathways for ground gas migration.

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

8.10 Health and Safety Issues

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

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

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

It is noted that concentrations of carbon dioxide (an asphyxiant) in the soil exceed HSE Workplace Exposure Limits for personnel in the working environment of 1.5% for short term (15 minutes) exposure and/or 0.5% for long term exposure. Furthermore, soil concentrations of oxygen are below the HSE recommendations of 18%, noted to be as low as 1.3%.

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 depleted oxygen 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.
- Good practices relating to personal hygiene should be adopted on the site.
- The contractor shall satisfy the Health and Safety Executive with regard to any other matters concerning the health, safety and welfare of persons on the site.

9.0 WASTE SOIL CLASSIFICATION & ASSESSMENT

9.1 Summary

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

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

It should be noted that testing requirements for contaminated land risk assessment differ to those for waste classification purposes. Unless otherwise stated, the assessment in this section has been carried out to provide initial indications in respect to disposal of waste soils, however this may not be fully compliant with waste testing requirements or frequencies, with further testing potentially required.

9.2 Soils 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.

Waste classification should be based on soils analyses that are representative of the actual waste load. At the stage of ground investigation, the materials that will become waste have generally not been defined yet, however test data can provide a useful guide to the likely waste classification before it is generated.

Further guidance is provided in Appendix A.

The Landfill Directive (Directive 1999/31/EC on the landfilling of waste, Decision 2003/33/EC and Landfill Regulations 2005) led to the establishment of a methodology for classifying wastes. Wastes first need to be classified based on their total concentrations and classified as either hazardous or non-hazardous waste. WAC testing is only required if the end disposal route is a landfill and WAC analysis must not be used for waste classification.

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

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

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

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

1 Total concentrations are defined as tests results on solids as opposed to leachate (i.e. a liquid).
2 Individual sites may have certain limit values pre-determined in their licence.
3 After pre-treatment the material characteristics may have changed to an extent that allow the soil to be re-classified.
4 Possibility that wastes could be classified as stable Nonreactive HAZARDOUS waste in non-hazardous Landfill (e.g. soils containing low concentrations of asbestos, gypsum or sulphate bearing soils).

Inert Waste

The possibility of automatic inert classification of the naturally occurring "clean" soils should be explored in accordance with Section 4.3 of the EA guidance document. See Appendix A for further guidance.

9.3 Waste Classification and Waste Acceptance Criteria (WAC)

We have reviewed the testing results and assessed them 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").

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

The Waste Classification Report and WAC testing results are presented in Appendix F. Locations of hazardous soils are presented in the table below, alongside the WAC analysis test results.

Location	Depth (m)	Stratum	Waste Classification	WAC Analysis	Landfill	Comments
WS103	0.1 – 0.6	MADE GROUND	Hazardous	Mineral Oil	Stable Non-reactive Hazardous waste in non-hazardous Landfill	HP7, HP11

Based on the waste classification database assessment, the majority of the made ground soils have been classified as **non-hazardous,** however the made ground soils associated with the shallow gravel in WS103 have been classified as **hazardous.**

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

Waste Containing Asbestos

Should soils contain asbestos, the concentration and type of asbestos identified, in addition to the chemical composition (i.e. hazardous or non-hazardous detailed above), will determine which waste code is applicable to the soils and which landfill will accept it as summarised below:

Waste	Conc. by Weight (%)	EWC 2002 Catalogue Entry Code	Waste Disposal Route
Non-hazardous containing asbestos fibres	<0.001 - <0.1%	17 05 04 (soil and stones other than those mentioned in 17 05 03*)	Non-hazardous landfill subject to achieving Waste Acceptance Criteria (WAC) for a stable non-reactive hazardous landfill site.

Waste	Conc. by Weight (%)	EWC 2002 Catalogue Entry Code	Waste Disposal Route
Hazardous containing asbestos fibres	<0.001 - <0.1%	17 05 03* (soil and stones containing dangerous substances)	Hazardous landfill subject to achieving Waste Acceptance Criteria (WAC) for a hazardous landfill site.
Non-hazardous soils containing asbestos fibres	<0.1%	17 05 03* (soil and stones containing dangerous substances)	Hazardous landfill authorised to receive asbestos, or in a stable non-reactive hazardous waste cell at a non-hazardous landfill authorised to receive asbestos.
Non-hazardous Soils containing ACM (Mechanically separable)	>0.1%	17 06 05 (construction material containing asbestos) 17 05 04 (soil and stones other than those mentioned in 17 05 03*)	ACMs disposed of at a hazardous landfill authorised to receive asbestos, or in a stable non-reactive hazardous waste cell at a non-hazardous landfill authorised to receive asbestos. Soils should be disposed of at a non-hazardous landfill subject to achieving Waste Acceptance Criteria (WAC) for a stable non-reactive hazardous landfill site.
Hazardous soils containing ACM	>0.1%	17 05 03* (soil and stones containing dangerous substances)	Hazardous landfill subject to achieving Waste Acceptance Criteria (WAC) for a hazardous landfill site.

General

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

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

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

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

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

Where possible, the option that the soils could be recycled at a suitable local waste treatment plant or transfer station rather than a landfill disposal route should be explored.

9.4 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".

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

Soils Re-use Under DoWCoP

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

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

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

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

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

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

Note that for re-use of landfilled materials or mining wastes, the DoWCoP may not apply and a Waste Recovery Permit (or others) may be required. Liaison with the Environment Agency would be needed on a case by case basis to determine the best option.

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

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

Soils Re-use under Exemptions and Permits

Other potentially suitable re-use mechanisms may include U1 Exemptions, WRAP quality protocols (for aggregates) or Waste Framework Directive (WFD) Exclusions, amongst other mechanisms. Further details are provided in Appendix A.

10.0 CONCLUSIONS

10.1 Geo-Environmental

Geo-Environmental – Human Health – Soils
Testing of the made ground at the site did not reveal any exceedances of heavy metals, PAHs, petroleum hydrocarbons, BTEX or MTBE compounds.

Based on the testing and assessment undertaken, no further action is required in respect to human health risks from soils contamination, based on the intended end use.

Geo-Environmental – Ground Gases and Vapours
Ground gas monitoring has revealed a maximum peak carbon dioxide concentration of 8.7%v/v and methane concentrations of 0.1%v/v. Based on the gas monitoring and assessment the site is classified as Characteristic Situation 1 and ground gas protection measures are not required.

Full radon protection measures are required for new buildings at this location.

Geo-Environmental – Controlled Waters
The overall risk to controlled waters is considered to be low and no further action is required.

Waste
Waste classification for the made ground at the site has revealed the majority of the soils to be non-hazardous. However, one of the samples tested for identification (WS103) confirmed an exceedance of mineral oils resulting in a hazardous classification, therefore being determined as unsuitable for 'Inert Waste Landfill'.

10.2 Geotechnical

Concrete classification
Sulphate class DS-3 and ACEC Class AC-3 conditions prevail.

Drainage (SuDS)
Based on the infiltration rates obtained, on the order of 10^{-5} m/s or greater, it is likely that drainage to soakaways will be feasible at the site.

10.3 Further Work

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

- Detailed foundation design by a structural engineer.
- Production of Ground Gas Protection Measures Verification Plan for radon protection.
- Production of Materials Management Plan (MMP) under the CL:AIRE DoWCoP, if required.

11.0 ABBREVIATIONS AND DEFINITIONS

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

GLOSSARY	
Term / Abbreviation	**Definition**
GAC	Generic Assessment Criteria.
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.

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

12.0 REFERENCES

References used in the production of this report are listed below; note not all of the below are relevant to the subject site and may not have been utilised.

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

Association of Ground Investigation Specialists. 'Description Of Anthropogenic Materials– A Practitioners' Guide'. 2018.

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

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

BRE Report BR211, Scivyer, C. 'Radon – Guidance on protective measures for new buildings' 2023 Edition.

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

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

BRE Digest 365 'Soakaway Design'. 2016.

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

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

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

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

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

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

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

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

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

BS 3882: 'Specification for topsoil'. 2015.

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

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

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

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

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

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

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

BS 10175:2026 'Investigation of Potentially Contaminated sites - code of practice'. 2026.

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

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

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

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

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

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

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

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

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

CIRIA 149 'Protecting Development from Methane'. 1995.

CIRIA 150 'Methane Investigation Strategies'. 1995.

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

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

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

CIRIA C574 'Engineering in Chalk'. 2002.

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

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

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

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

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

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

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

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

CIRIA C753 'The SuDS Manual'. 2015.

CIRIA C758 'Abandoned Mine Workings Manual'. 2019.

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

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

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

CL:AIRE TB17 'Ground Gas Monitoring and 'Worst-Case' Conditions'. 2018.

CL:AIRE TB18 ‘Continuous Ground-Gas Monitoring and the Lines of Evidence Approach to Risk Assessment’. 2019.

CL:AIRE TB19 ‘Managing Risks and Liabilities associated with Per and Polyfluoroalkyl Substances (PFASs)’. 2019.

CL:AIRE TB22 ‘An overview of the uses of PFAS to assist with identification of sites of concern’. 2023.

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

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

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

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

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

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

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

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

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

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

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

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

DETR. Circular: Contaminated Land. 2006.

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

Environment Agency guidance - Land Contamination: Risk Management (LCRM). 2020.

Environment Agency ‘Using Soil Guideline Values’. 2009.

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

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

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

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

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

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

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

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

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

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

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

Environmental Quality Standards. 2008.

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

European Parliament. Directive 2014/955/EU: Commission Decision of 18 December 2014 amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC.

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

Hazardous Waste (England and Wales) Regulations. 2005.

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

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

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

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

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

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

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

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

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

National Planning Policy Framework (NPPF). 2023.

National Planning Policy Framework - Technical Guidance. March 2012.

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

NHBC Standards, Part 4 'Foundations.'

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

NHBC. 'Hazardous Ground Gas - An essential guide for housebuilders'. May 2023.

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

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

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

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

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

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

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

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

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

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

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

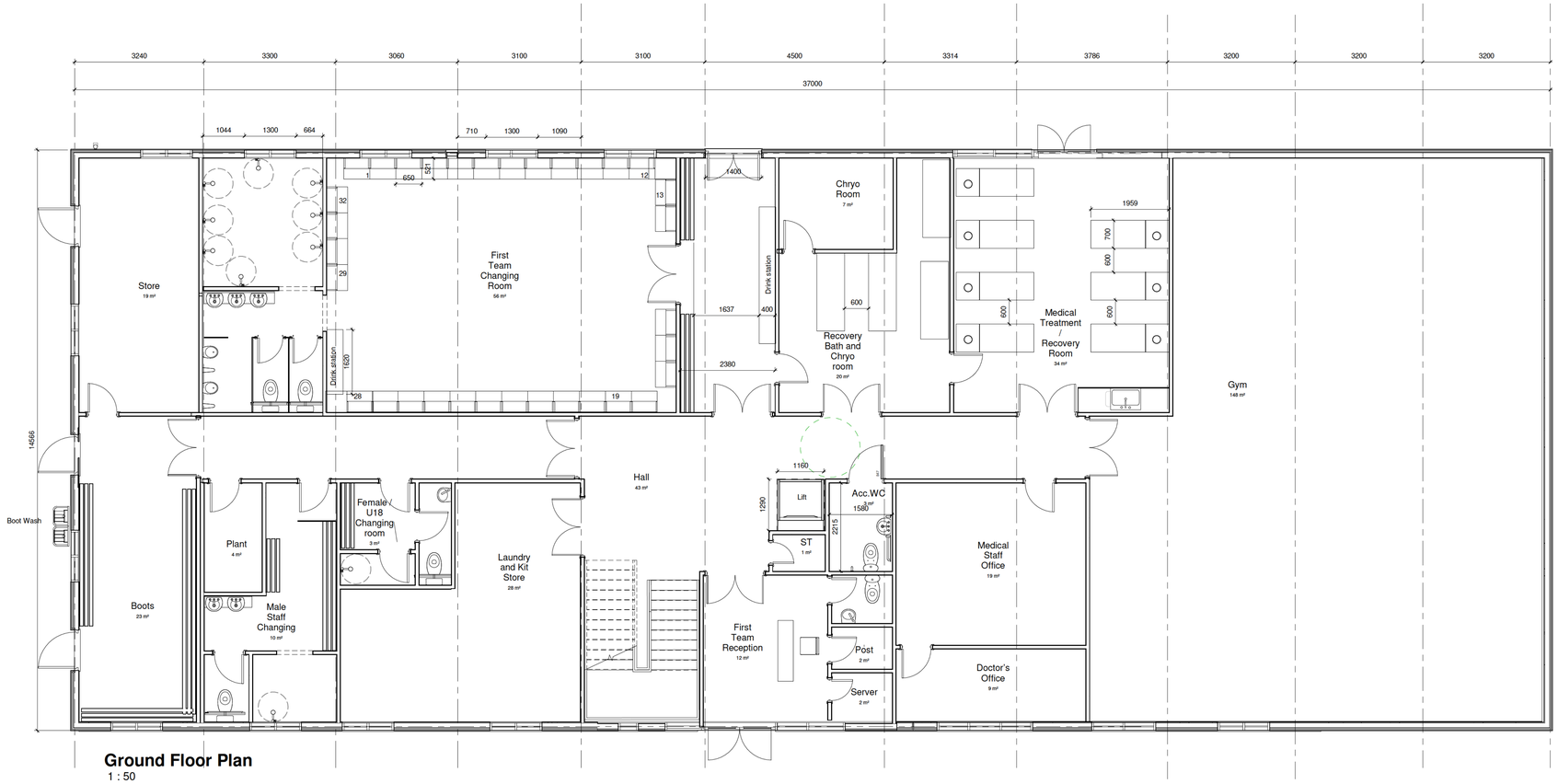
Water Framework Directive, 2000.

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

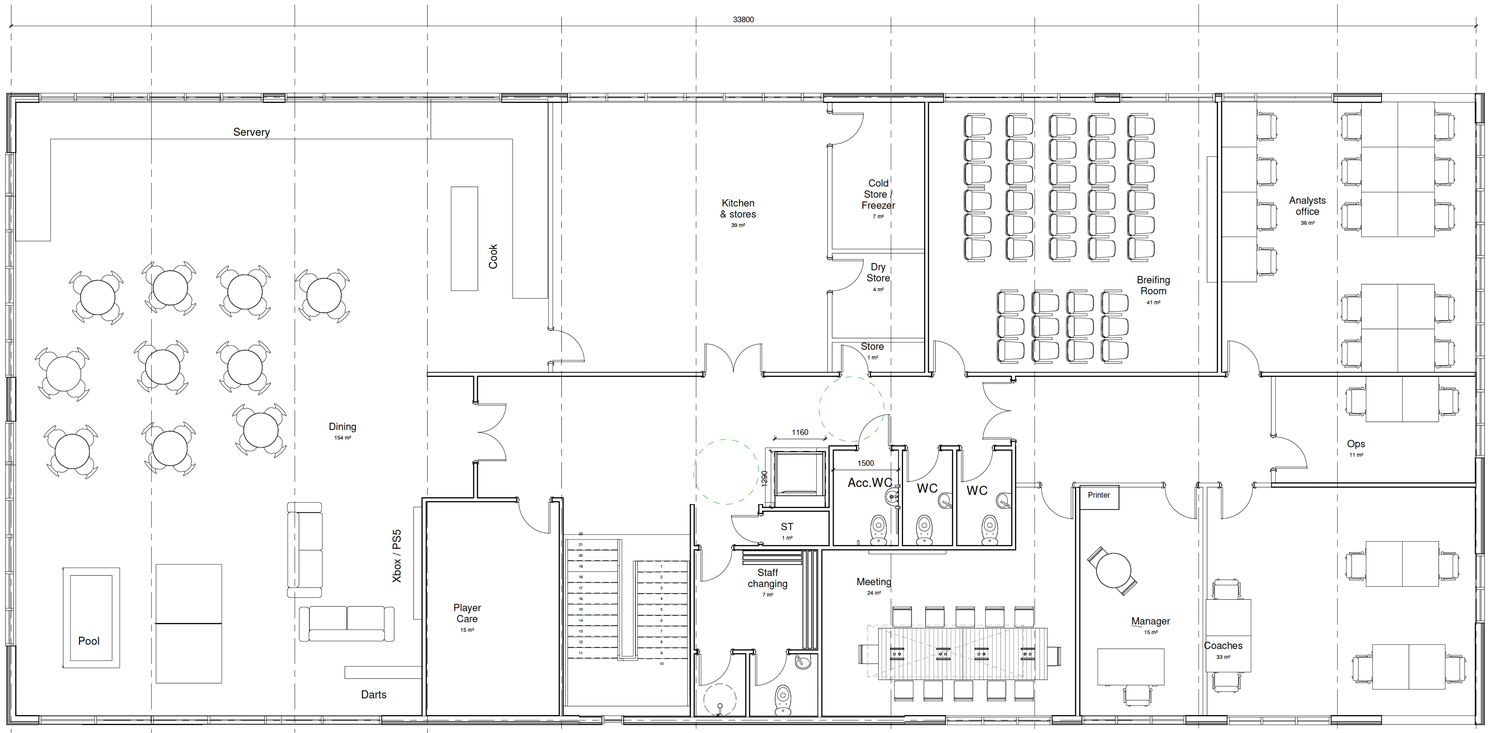
DRAWINGS

Drawing designs are copyright of Modulek and should not be provided to 3rd parties without written consent. Any queries please contact Modulek.

0.5 0 0.5 1 1.5 2 2.5 m
SCALE 1:50



Ground Floor Plan
1 : 50



First Floor
1 : 50

Rev	Description	Date
2	Clients comments added	16/02/2026
1	Clients comments added	13/02/2026

SCAN ME FOR EXAMPLES

Modulek House, 19 Bessemer Close, Eblake Industrial Estate, Verwood, Dorset, BH31 6AZ

Tel 01202 813 121 Fax 08700 110 153

Email sales@modulek.co.uk

Client
Wrexham FC

Project Title
First Team Pavilion

Drawing Title
Proposed Plans

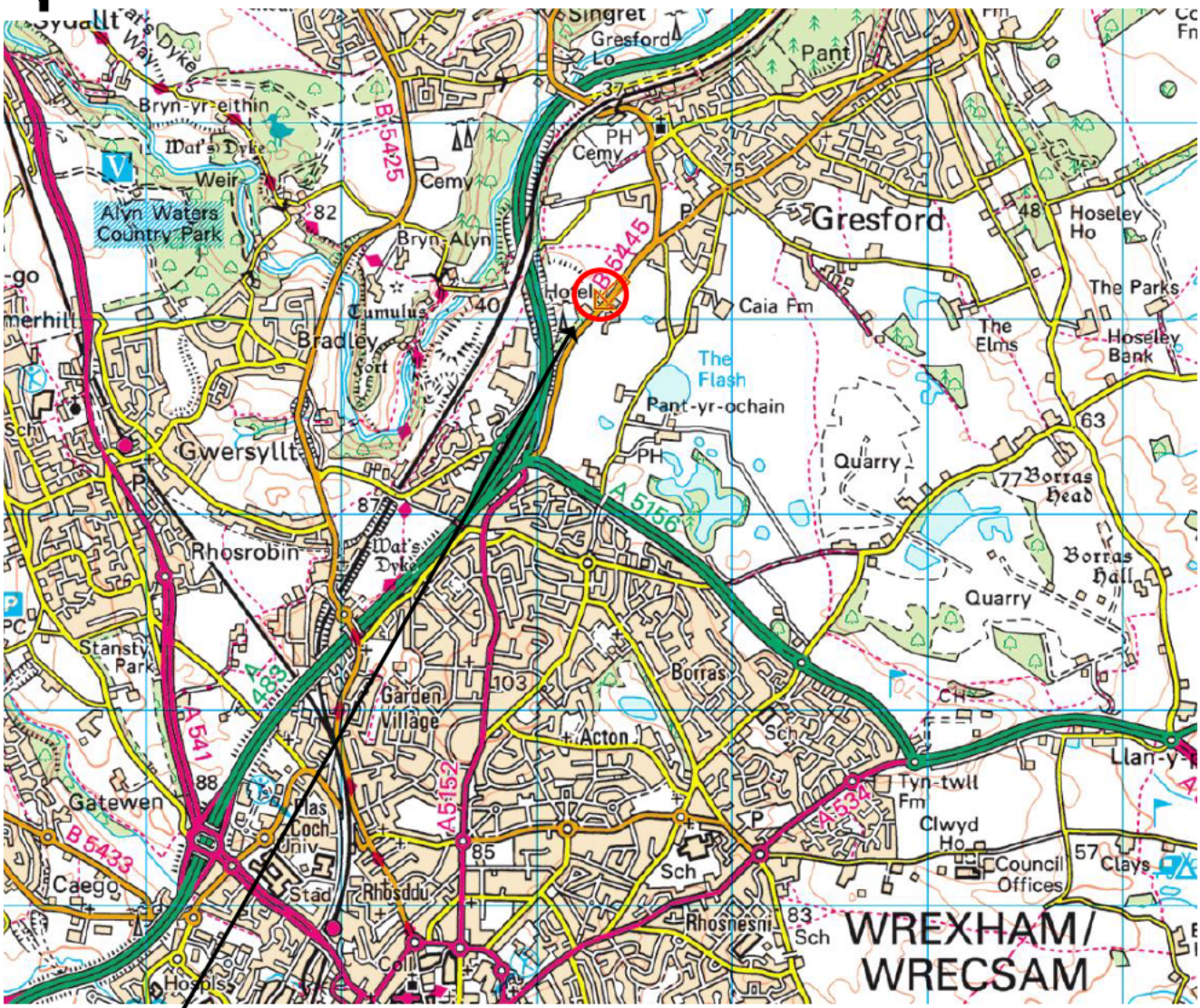
Drawn by	Checked by	Date
SSH	DP	10/02/2026

Project number	Scale
3287	1 : 50

Drawing No	Revision
3287-MLK-XX-ZZ-DR-Y-1	2

16/02/2026 08:59:16

 © Modulek Ltd



SITE LOCATION

NEAREST POSTCODE: LL12 8PW

SITE ENTRANCE. WHAT THREE WORDS /// marble.extra.deflection



REV	DATE	DESCRIPTION	BY	CKD

BROWNFIELD SOLUTIONS LTD
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

CLIENT: MODULEK

PROJECT TITLE: WREXHAM FC TRAINING GROUND

DRAWING TITLE: SITE LOCATION PLAN

DRAWING No.	REVISION	SCALE	DATE
C6579/01	-	NTS	24/02/26

DRAWN BY	CHECKED BY
MO	JM



KEY

PROPOSED OUTLINE 1

PROPOSED OUTLINE 2

WINDOW SAMPLE BOREHOLE
WSXX

PLATE LOAD TEST
PLXX

NOTES

1. ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE COMMENCING WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ARCHITECT & ENGINEER FOR VERIFICATION. FIGURED DIMENSIONS ONLY ARE TO BE TAKEN FROM THIS DRAWING.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS REPORTS. THIS DRAWING IS COPYRIGHT OF BSL.
3. DRAWING NOT FOR CONSTRUCTION PURPOSES.

REV	DATE	DESCRIPTION	BY	CKD

BROWNFIELD SOLUTIONS LTD
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

CLIENT
MODULEK

PROJECT TITLE
WREXHAM FC TRAINING GROUND

DRAWING TITLE
EXPLORATORY HOLE PLAN

DRAWING No.	REVISION	SCALE	DATE
C6579/02	A	NTS	12/03/26

DRAWN BY	CHECKED BY
JL	JM



KEY

- PROPOSED OUTLINE 1
- PROPOSED OUTLINE 2
- ELECTRICAL SERVICE
- DRAIN COVER
- UNDERGOUND DRAINAGE
- SHIPPING CONTAINER

NOTES

1. ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE COMMENCING WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ARCHITECT & ENGINEER FOR VERIFICATION. FIGURED DIMENSIONS ONLY ARE TO BE TAKEN FROM THIS DRAWING.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS REPORTS. THIS DRAWING IS COPYRIGHT OF BSL.
3. DRAWING NOT FOR CONSTRUCTION PURPOSES.

REV	DATE	DESCRIPTION	BY	CKD

BROWNFIELD SOLUTIONS LTD
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

CLIENT
MODULEK

PROJECT TITLE
WREXHAM FC TRAINING GROUND

DRAWING TITLE
SITE FEATURES PLAN

DRAWING No.	REVISION	SCALE	DATE
C6579/03	-	NTS	07/04/26

DRAWN BY	CHECKED BY
JL	JM

APPENDIX A

BSL Methodology and Guidance

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

Background

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. In the case of the geotechnical hazard identification, this is referred to as the **Ground Model.**

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.



Where any one of the "pollution linkages" between the above is absent there is deemed to be no risk.

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) – latest version.

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:



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
	Negligible	Negligible Risk / No Linkage			

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 'negligible risk' and 'no linkage' in the summary table, which give rise to an overall **negligible** risk category and no further action is required.

Contaminated Land Screening Values

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

General
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 remedial action based on the data to hand is cost effective.

Human Health
Current UK guidance on risks to human health is provided by DEFRA and the Environment Agency (EA). Under the land use planning system where the aim is to demonstrate 'suitability for use' the key will usually be to confidently determine that the level of contamination of the land is low relative to some appropriate measure of risk at a particular critical connection.

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 or Generic Assessment Criteria (GACs) for soils contamination based on standard land uses and soil assumptions. The critical concentrations referred to above can be the relevant GAC.

CLEA guidance has gone through a number of revisions over time. Tier 1 generic S4UL values (or GACs) 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. 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 were published by DEFRA/CL:AIRE in December 2014. Additional determinands were added in 2021. They represent a low risk as opposed to minimal risk, however they are still strongly precautionary. These screening values were published by DEFRA for Part 2A use, although DEFRA have also confirmed acceptability for use under planning. However, S4ULs remain the first reference point for BSL due to the broader range of end uses scenarios and the availability of a wide array of determinands with various soil organic contents.

As part of Tier 1 assessments, the following data sources are used in the order of preference given below, unless further justification is provided to adopt less conservative criteria:

- CIEH S4UL values (derived by CIEH/LQM).
- DEFRA/CL:AIRE C4SL's https://www.claire.co.uk/projects-and-initiatives/category-4-screening-levels
- CL:AIRE GAC values.
- Guidance from other European countries.
- Guidance from the outside Europe.

Dependent on requirements, test results may be divided into representative data sets for assessment against the above referenced screening criteria, based on the conceptual model and taking into account such characteristics as variation in soil properties, historical, existing or proposed land uses. The soils in these areas are considered likely to form the ground cover in critical receptor areas (e.g. gardens, soft landscaping etc)

where pathways may exist. The critical part of the soil column is typically taken as the upper metre in terms of contact with end users of a development site for the purposes of initial assessment.

The screening criteria adopted by BSL are presented overleaf.

Further Assessment
When screening values are exceeded then further consideration is required. This could include further additional detailed investigation and assessment to further define the risk or to design appropriate remedial measures to either remove the source or break the pathway. In some cases, dependant on the Conceptual Site Model (CSM), no action may be required.

PAHs and B(a)P as a Surrogate Marker for Adoption of C4SLs
As stated above, S4ULs remain the first reference point as screening levels unless further justification is provided. In order to determine if the C4SL can be adopted, benzo(a)pyrene (B(a)P), the following guidance within SP1010 Appendix E for B(a)P and Public Heath England (PHE) may be adopted with our assessments where appropriate.

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

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

In order to risk assess the PAH mixture for site specific soil samples using human health guideline values, notably the C4SLs, as detailed in SP10101 the ratio of the seven genotoxic PAHs as shown below, relative to B(a)P, should be calculated to ensure it is similar to the test material used in the Culp study (PHE 2010). To be considered sufficiently similar, the ratio relative to B(a)P should fit within the upper and lower limits (representing an order of magnitude above and below the mean ratio to B(a)P of test material used in the Culp et al study). In such cases B(a)P is considered an adequate surrogate marker and the Low Level of Toxicological concern (LLTC) for B(a)P (i.e., the C4SL) may be used in the risk assessment.

Statistical Analysis on Soils
Guidance on the use of statistics is taken from the CL:AIRE publication "Comparing Soil Contamination Data with a Critical Concentration" 2020, the basis of which in statistics is termed Central Limit Theorem (CLT), which says "*The distribution of sample means converges to a normal distribution as the sample size increases*".

If the critical concentrations have been exceeded, as part of a further assessment, statistical analysis may be undertaken on a dataset to demonstrate that the mean concentration on the site (or a particular area) is actually below the critical concentration. The true mean concentration of a contaminant is never known because all the site soil has not been tested. An estimation of the true mean can be obtained from the samples tested during the investigation. The greater the number of samples tested, the closer the mean of these values is to the true mean.

As discussed above, test results are typically divided into representative data sets for assessment and may be referred to as 'averaging areas' to which statistics can be applied, although several statements need to be satisfied before applying the guidance:

- Averaging areas have been defined based on the CSM.
- Sample locations – random/grid sampling adopted as opposed to targeted investigation.
- Samples are evenly spread and not clustered.

- Analysis do not suggest a hotspot/outlier or cluster established by histogram or other means.
- Samples are of same/similar depth and taken from one population (e.g. just topsoil).
- Analyses do not show a spatial trend or other spatial pattern across that zone.
- The number of samples has been shown to be sufficient for statistical analysis.

Once the above have been satisfied, when undertaking statistical analysis, the question "*are mean soil concentrations within the averaging area equal to, or greater than, the GAC*?" is being asked. Typically, outliers or "hotspots" are treated as separate zones or averaging areas. The sampling strategy and assessment should also take into account uncertainty (for example, spatial heterogeneity) in contaminant concentrations. There is the assumption that sampling was random or stratified and systematic (e.g. on a grid) and not targeted at specific sources; data from such targeted areas should be omitted from the statistical analysis. Data should be from one population (i.e. the same materials).

The statistical test that is carried out is used to demonstrate that there is a certain probability that the true mean falls below the critical concentration (typically the GAC in a screening exercise). The main tool used to draw conclusions based on the 2020 guidance is a comparison of a 2-way confidence interval with the critical concentration. A confidence interval consists of two sets of numbers; an interval i.e. a range of values plus a pre-determined level of confidence e.g. 80%. A common interpretation of a confidence interval of say 80% is that "*there is an 80% chance that the true mean concentration level of the contaminant in a sampling zone lies between X concentration and Y concentration*".

The current guidance for planning says that the site has to be "safe" which suggests we should use a large confidence interval such as 95% or higher to make a decision. This means that there is a 95% chance of the true mean concentration lying in this interval, there is also a 5% chance it lies outside this interval. One could then conclude that the requirements of planning have been met if the 95% confidence interval lies below the critical concentration.

The guidance recommends that at least two confidence levels are used such as 90% and 99% or 80% and 95%. By using two differing confidence intervals, we can use the smaller confidence interval (e.g. 80% confidence interval) to say "*we think the mean is most likely to be inside this range*" and the larger confidence interval (e.g. 95% confidence interval) to say "*we think the mean is most unlikely to be outside this range*".

If the confidence interval extends to above the critical concentration, then further action may be required.

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 (Water Quality Targets – WQTs) 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 Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 and The Private Water Supplies (England) Regulations 2016. SI 2016 / 618). In Scotland, the Public Water Supplies (Scotland) Regulations 2014 apply. 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). These cover a large number of compounds. EQS are available for inland surface waters (freshwater) and other surface waters (transitional and marine).

Several EQS are based on bioavailable metal proportions (i.e. copper, lead, manganese, nickel and zinc). A software tool (M-BAT) is available from the Water Framework Directive - UK TAG website for calculating the bioavailable fraction. Where this tool has been used, the bioavailability has been taken into account by calculating site-specific $PNEC_{dissolved}$ (Predicted No Effect Concentration) values. These enable the dissolved concentration data to be compared with the PNEC as if it were an EQS.

UK Drinking Water Standards (DWS) apply to waters abstracted for human consumption. Where no UK or EU drinking water standard exists, reference is made to the World Health Organisation criteria (2011).

The DWS apply to groundwater or to surface water used for abstraction and the EQS apply to surface water where the aquatic ecosystem is the receptor. Where the most appropriate water quality target cannot be determined with certainty, the lowest one is adopted in line with the precautionary principle.

In some instances, the laboratory detection limits (LODs) may be greater than the water quality target it is being screened against, but it should be noted that these comparisons are an initial screening assessment. It may be the case that lower LODs could be obtained using a more specialised technique, but it would be disproportionately expensive to adopt the more costly specialist technique for initial screening exercises.

The preference of BSL is to have testing carried out on actual samples of ground/surface water rather than theoretical values obtained from leachate testing, which is considered to often be highly conservative. Data from water samples obtained or from leachate analysis is then compared against the screening criteria adopted by BSL, which are presented overleaf.

When screening values are exceeded then further consideration is required. This could include further additional detailed investigation and detailed quantitative risk assessment (DQRA) to further define the risk or to design appropriate remedial measures to either remove the source or break the pathway.

Ground Gas Risk Assessment

BS8485:2015+A1:2019, BS 8576:2013, CL:AIRE RB17, and NHBC 'Hazardous Ground Gas - An essential guide for housebuilders' 2023, are the current guidance which gives up-to-date advice on all aspects of permanent ground gas risk. BS8576 alongside CIRIA C682 also provides guidance on assessment of hydrocarbon vapour intrusion.

The CL:AIRE publication 'Good Practice for Coal Mine Gas Emissions" 2021 provides guidance on the assessment of risks from mine gas sources.

The above all outline good practice in investigation, the collection of relevant data and monitoring programmes in a risk-based approach to ground gas contamination. 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 (and pre -1945 landfills).
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").
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

BS8576 notes to determine where and how to monitor ground gases requires consideration of credible pathways of possible exposure of the receptors, taking into account what is known about the geology and hydrogeology, building construction and services layout, foreseeable events such as flooding, changes in groundwater level, climate change, extreme weather conditions, the closure of mines, and possible changes to the gas regime caused by future development.

The monitoring period for a specific site should cover 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 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 ground 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

Sensitivity of Development	Generation of Potential Source				
	Very Low	Low	Moderate	High	Very High
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

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

Notes

1 Generation potential of sources based on descriptions within BS 8576:2013.

2 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.

Gas Risk Assessment

Within BS8485:2015+A1:2019 a semi-quantitative method is set out for the assessment of risk.

This method (Modified Wilson and Card) uses the concept of Gas Screening Values (GSVs) and typical threshold concentrations of carbon dioxide and methane to identify levels of risk. Sites are then classified into a 'Characteristic Situation' or 'CS' from CS1 where no mitigation is required and CS2 increasing up to CS6 where protection measures are required.

The NHBC **guide** 'Hazardous Ground Gas - An essential guide for housebuilders' 2023 provides further assessment tools for ground gas monitoring data, including the use of ternary plots to determine ground gas sources.

A separate approach to assessment without monitoring data is discussed under the RB17 header further below.

CIRIA C682 and BS 8576:2013 provide guidance on assessment of VOC intrusion risk.

Ground Gas Mitigation

Where a risk is determined to be present by assessment, BS8485:2015+A1:2019 provides guidance for the design of protection systems based on a points scoring system depending on the characteristic situation, structure type, structural barrier types, ventilation and a gas resistant membrane. Source removal can also be considered.

The design requires the structures to be categorised into one of four building types: Type A, Type B, Type C or Type D, related to the construction and end use of the building, together with the control of future structural changes and maintenance.

CIRIA C748 provides advice on the use of membranes as VOC vapour barriers.

CIRIA C735 sets out the approach for verification of installed mitigation measures. Note that if a membrane is installed it must be verified in accordance with CIRIA C735 or it will score zero points and assumed to not afford any protection.

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).

Radon
Advice on radon protection in England is provided by the UK Health Security Agency, https://www.ukradon.org/information/ukmaps and by the BRE (BR 211 (Scivyer 2023).

Areas of the country can be categorised according to the percentage of existing homes where radon is present above the Action Level:

- 0-1% lower probability.
- 1-3% and 3-10% intermediate probability.
- >10% higher probability.

Basic radon protection measures are required in new buildings and extensions in areas of England and Wales where 3-10% of properties exceed the Action Level and full radon protection measures where >10% exceed the Action Level.

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.

Geotechnical Guidance

A preliminary risk assessment of geotechnical hazards is carried out at the desk study stage and confirmed (or amended) at the ground investigation stage.

The CD 622 'Managing Geotechnical Risk' guidance document defines the technical approval and certification procedures to be used to ensure that the risk associated with the geotechnical activities are appropriately managed.

The desk-based stage may also include the requirements for a Coal Mining Risk Assessment (CMRA) which specifically assesses the risks from mining induced instability and related issues in high risk development areas: https://www.gov.uk/guidance/planning-applications-coal-mining-risk-assessments.

In order to establish the requirements of a project, the Geotechnical Category which is based on a consideration of project complexity, proposed geotechnical activities, presence of geo-hazards and severity of geotechnical risks, shall also be considered. These range from Category 1 (small/simple structures) to Category 3 (very large, unusual or complex activities/structures, such as tunnels). It is envisaged most projects typically fall into Category 2, including conventional types of geotechnical structures, earthworks and activities.

In the case of the geotechnical hazard identification at the intrusive investigation stage, this is referred to as the **ground model**.

The geotechnical sections of the report contain the factual information on the geology and relevant site data, including both in situ and laboratory testing, with a geotechnical evaluation of the information stating the assumptions made in the interpretation of the data.

Derived values of geotechnical parameters are obtained from test results by theory (book values), correlation or empiricism in general accordance with BS EN 1997-2:2007 (EC7).

Where derived geotechnical parameters are to be used in designs in accordance with EC7, the selection of characteristic values for geotechnical parameters using the derived values is carried out by well-established experience.

The characteristic value is a cautious estimate of the value affecting the occurrence of the limit state. For any particular material type there may be more than one characteristic value for each parameter because there may be more than one limit state.

The second stage is the selection of design values. The design values are either derived from the characteristic value by applying the relevant partial factors or assessed directly. Similarly, there can be several design values for the same material type.

In the event that geotechnical designs are included in this report, selection of the characteristic and design values is included. Otherwise, it is the duty of the geotechnical designer to determine these within a separate design report (a GDR).

Where it has not been possible to reasonably use an EC7 compliant 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.

In addition to the above:

- Assessments for highways designs are based on CD 622 Managing Geotechnical Risk.
- The assessment of sustainable drainage is based on BRE365 and CIRIA C753 'The SuDS Manual'.
- Earthworks Assessments are based on SHW Series 600 and BS6031.
- Risks from mining (both at the desk based and intrusive stages) are assessed adopting guidance from CIRIA C758.

Re-Use of Waste Soils Guidance

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 drainage trenches, foundation arisings, site strips etc. It is no longer required in its original location, therefore it is considered to be waste. Without an appropriate materials management plan, permit or exemption 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.

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".

https://www.claire.co.uk/projects-and-initiatives/dow-cop

Developers and contractors are advised to complete all works under the DoWCoP where applicable.

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

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

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

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 e.g. Hub site.

In order to satisfy these requirements, the following are required:

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

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

Soils which require treatment on site (e.g. bioremediation, stabilisation etc) may require an Environmental Permit for treatment, together with justification and validation to prove, once treated, this material is suitable for use.

Construction activities carried out on uncontaminated soils solely for the purpose of improving geotechnical properties are not generally regarded as waste treatment operations and do not require a permit.

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.

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

Regardless of implementing re-use under the code of practice or not, all sites should have some form of materials tracking in place in compliance with current legislation. Any re-use scheme should also be designed to minimise disposal costs. Note that for re-use of landfilled materials or mining wastes, the DoWCoP may not apply and a Waste Recovery Permit (or others) may be required. Liaison with the Environment Agency would be needed on a case by case basis to determine the best option.

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

Soils Re-use under Exemptions and Permits
Other potential options to allow the re-use and/or import of soils and aggregates on site are provided in the table below. Applies to England/Wales only – Scotland differs.

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

There are also potential non-enforcement positions for re-use e.g. a site has a large volume waste illegally deposited on it (not by landowner). The new owner is keen to re-use waste where possible to reprofile the site (planning condition granted). The DoWCoP could not be used as materials already excavated and deposited as a waste (illegally). The EA may agree that although the DoWCoP not applicable, they would take a non-enforcement position if the works were completed in accordance with the DoWCoP – this would need to be agreed in advance.

Waste Classification and Disposal Guidance for Soils

Introduction
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. 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
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 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 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 (e.g. 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** and classified as either hazardous or non-hazardous waste. WAC analysis must not be used for waste classification.

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) then WAC is not relevant. Furthermore, the WAC limits **cannot** be used to make an assessment of whether a waste is hazardous. WAC testing does however define if a non-hazardous waste is suitable for an inert landfill.

Classification based on Total Concentrations[1]	Non-Hazardous Waste		Hazardous Waste	
WAC testing	Below inert WAC limit values:	Above inert WAC limit values:	Below hazardous WAC limit values	> WAC limit values

Landfill requirements	INERT landfill	NON-HAZARDOUS landfill[2]	HAZARDOUS landfill	PRE-TREATMENT[3]

1 Total concentrations are defined as tests results on solids as opposed to leachate (i.e. a liquid).
2 Individual sites may have certain limit values pre-determined in their licence.
3 After pre-treatment the material characteristics may have changed to an extent that allow the soil to be re-classified.
4 Possibility that wastes could be classified as stable Nonreactive HAZARDOUS waste in non-hazardous Landfill (e.g. soils containing low concentrations of asbestos, gypsum or sulphate bearing soils).

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

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

Greenfield Sites and Inert Waste
The possibility of automatic inert classification naturally occurring "clean" soils should be explored in accordance with the requirements of paragraph 10 (wastes acceptable without testing at landfills for inert waste) of the Landfill (England and Wales) (Amendment) Regulations (2005). This is the case if:

- They are single stream waste of a single waste type (although different waste types from the list may be accepted together if they are from a single source); and
- There is no suspicion of material or substances such as metals, asbestos, plastics, chemicals, etc to an extent which increases the risk associated with the waste sufficiently to justify contamination and they do not contain other classes of landfill (e.g. the waste producer can characterise the waste based on visual assessment and written description with supporting evidence such as a desk study, subject to agreement by the landfill operator).

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

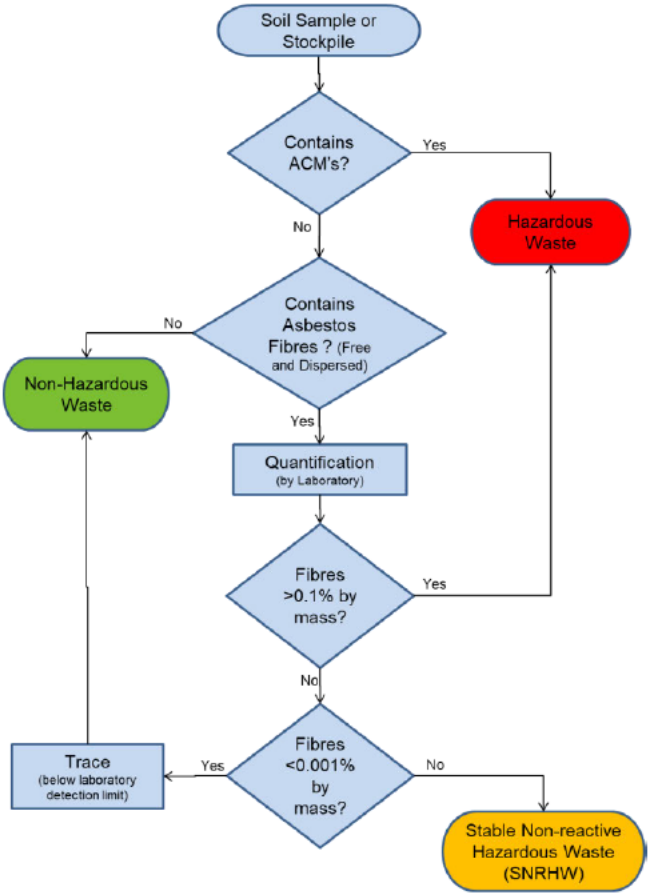
1. Environmental Permitting (England and Wales) Regulations 2010 (as amended) (EP Regulations), the Landfill Directive (1999/31/EC) and the subsequent Council Decisions.
2. Environment Agency Environmental Permitting Regulations: "Inert Waste Guidance- Standards and Measures for the Deposit of Inert 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).

Waste Containing Asbestos

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.



Should soils contain asbestos, the concentration and type of asbestos identified, in addition to the chemical composition (i.e. hazardous or non-hazardous detailed above), will determine which waste code is applicable to the soils and which landfill will accept it as summarised below:

Waste	Conc. by Weight (%)	EWC 2002 Catalogue Entry Code	Waste Disposal Route
Non-hazardous containing asbestos fibres	<0.001 - <0.1%	17 05 04 (soil and stones other than those mentioned in 17 05 03*)	Non-hazardous landfill subject to achieving Waste Acceptance Criteria (WAC) for a stable non-reactive hazardous landfill site.
Hazardous containing asbestos fibres	<0.001 - <0.1%	17 05 03* (soil and stones containing dangerous substances)	Hazardous landfill subject to achieving Waste Acceptance Criteria (WAC) for a hazardous landfill site.
Non-hazardous soils containing asbestos fibres	>0.1%	17 05 03* (soil and stones containing dangerous substances)	Hazardous landfill authorised to receive asbestos, or in a stable non-reactive hazardous waste cell at a non-hazardous landfill authorised to receive asbestos.

Waste	Conc. by Weight (%)	EWC 2002 Catalogue Entry Code	Waste Disposal Route
Non-hazardous Soils containing ACM (Mechanically separable)	>0.1%	17 06 05 (construction material containing asbestos) 17 05 04 (soil and stones other than those mentioned in 17 05 03*)	ACMs disposed of at a hazardous landfill authorised to receive asbestos, or in a stable non-reactive hazardous waste cell at a non-hazardous landfill authorised to receive asbestos. Soils should be disposed of at a non-hazardous landfill subject to achieving Waste Acceptance Criteria (WAC) for a stable non-reactive hazardous landfill site.
Hazardous soils containing ACM	>0.1%	17 05 03* (soil and stones containing dangerous substances)	Hazardous landfill subject to achieving Waste Acceptance Criteria (WAC) for a hazardous landfill site.

Asbestos concentrations below 0.001% by mass are below standard laboratory detection limits and are not currently regarded as containing asbestos for the purposes of disposal and may be disposed of to an inert landfill site[1]. These levels are often termed "trace" by laboratories.

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

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

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

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

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

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

Construction

Health and Safety Executive (HSE) guidance on asbestos is not directly related to soil and much of the guidance focuses on the removal of asbestos from buildings. The overarching legislation is the Control of Asbestos Regulation (CAR 2012). However, where work involves (or is likely to involve) contact with asbestos then CAR 2012 requires a risk assessment including whether 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.

Asbestos containing materials can remain in situ under a suitable cover system which may be hard surfacing 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.

Publications from the JIWG 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. Re-use of soils containing asbestos should be as per CARSOILS.

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

Asbestos in Soil as Free Fibres

Concentration (by weight)	Waste Disposal				Construction Issues	End Use	
	Recycle	Inert	SNR	Haz		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 contractor's 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 with hard dig/demarcation layer 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.	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	Clean cover and a hard dig / demarcation 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	
	Recycle	Inert	SNR	Haz		Suitable for re-use on site	Precautions
					• Clean haulage routes. • Decontamination unit	increased with repeated handling and compaction.	

1. The standard laboratory detection limit is normally 0.001%. Below 0.001% is trace and currently regarded as not containing asbestos for the purposes of disposal off site. However the waste producer has a duty to fully classify the waste and the presence of trace asbestos should be declared. Consequently it is unlikely that a waste treatment site will take this soil and an inert landfill may make a commercial decision to only take it under some circumstances.

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

APPENDIX B

Exploratory Hole Logs

BROWNFIELD SOLUTIONS LTD

Trial Pit Log

No.
PL01
Sheet 1 of 1

PROJECT NO:	C6579	**CO-ORDS:**	**Hole Type** TP
PROJECT NAME:	WREXHAM FC TRAINING GROUND	**LEVEL:**	**Scale** 1:25
CLIENT:	MODULEK	**DATES:**	30/03/26 - 30/03/26

Logged	Checked
JL	JM

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.45			MADE GROUND: Grass over dark brown slightly gravelly slightly clayey SAND with moderate rootlet content. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of mudstone, coal, brick, and pottery. (TOPSOIL)
				0.50			MADE GROUND: Tarmacadam.
							End of Trial Pit at 0.50m

1.0
2.0
3.0
4.0
5.0

Remarks

1. Service clearance undertaken by BSL engineer using CAT & Genny.
2. No groundwater encountered.
3. Excavation sides stable.
4. 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.
PL02
Sheet 1 of 1

PROJECT NO:	C6579	**CO-ORDS:**	**Hole Type** TP
PROJECT NAME:	WREXHAM FC TRAINING GROUND	**LEVEL:**	**Scale** 1:25
CLIENT:	MODULEK	**DATES:**	30/03/26 - 30/03/26

Logged	Checked
JL	JM

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.10			MADE GROUND: Tarmacadam.
				0.20			MADE GROUND: Light yellowish brown and grey sandy GRAVEL. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of concrete, sandstone, and limestone.
							End of Trial Pit at 0.20m

1.0
2.0
3.0
4.0
5.0

Remarks

1. Service clearance undertaken by BSL engineer using CAT & Genny.
2. No groundwater encountered.
3. Excavation sides stable.
4. 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.
WS01
Sheet 1 of 1

PROJECT NO:	C6579	**CO-ORDS:**	**Hole Type** WS
PROJECT NAME:	WREXHAM FC TRAINING GROUND	**LEVEL:**	**Scale** 1:30
CLIENT:	MODULEK	**DATES:** 26/02/26	**Logged** JL / **Checked** JM

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
		0.10-0.50	B		0.10			MADE GROUND: Tarmacadam.
								MADE GROUND: Grey sandy GRAVEL. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of concrete and limestone.
		0.50-0.80	B		0.50			MADE GROUND: Brown gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of brick, concrete, and sandstone.
		0.80-2.00	B		0.80			*Becoming orangish brown from 0.70m bgl.*
								MADE GROUND: Dark brown gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone, mudstone, coal, and rare brick.
		1.20	SPT	N=26 (5,6/6,5,7,8)				
		2.00	SPT	N=9 (1,2/2,2,3,2)				
		3.00	SPT	N=15 (1,0/3,4,4,4)				
					3.50			MADE GROUND: Reddish brown gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone and rare coal.
		4.00	SPT	N≥50 (1,2/50 for 255mm)	3.90			MADE GROUND: Dark brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone, coal, and rare brick.
					4.40			End of Borehole at 4.40m

1.0 2.0 3.0 4.0 5.0 6.0

Remarks

1. Service clearance undertaken by BSL engineer using CAT & Genny.
2. Hand dug inspection pit to 1.20m bgl.
3. No groundwater encountered.
4. Hole backfilled with arisings upon completion.

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

BROWNFIELD SOLUTIONS LTD

Borehole Log

Window Sampler No.: **WS02**

Sheet 1 of 1

PROJECT NO:	C6579	**CO-ORDS:**	**Hole Type:** WS
PROJECT NAME:	WREXHAM FC TRAINING GROUND	**LEVEL:**	**Scale:** 1:30
CLIENT:	MODULEK	**DATES:** 26/02/26	**Logged:** JL / **Checked:** JM

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
		0.10-0.40	B		0.10			MADE GROUND: Tarmacadam.
		0.40-1.00	B		0.40			MADE GROUND: Grey sandy GRAVEL. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of concrete and limestone.
		1.00-1.40	B		1.00			MADE GROUND: Brown gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of brick, concrete, and sandstone.
		1.20	SPT	N=15 (3,3/4,3,4,4)				
		1.40-2.00	B		1.40			MADE GROUND: Light brown slightly gravelly slightly clayey SAND. Sand is fine to coarse. Gravel is sub-angular to sub-rounded fine to coarse of sandstone, mudstone, and rare brick.
		2.00	SPT	N=7 (4,3/2,2,1,2)				MADE GROUND: Dark grey slightly gravelly slightly clayey SAND. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone, mudstone, coal, and rare brick.
					2.20			MADE GROUND: Dark reddish brown gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone, mudstone, and coal. (REWORKED)
		3.00-4.00	B		3.00			MADE GROUND: Dark grey slightly gravelly slightly clayey SAND. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone, mudstone, and coal. (REWORKED)
		3.00	SPT	N=4 (1,1/1,1,1,1)				
		4.00	SPT	N=22 (5,4/3,4,8,7)	4.00			MADE GROUND: Brown fine to coarse SAND. (REWORKED)
					4.40			MADE GROUND: Dark reddish brown gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone, mudstone, coal, and concrete.
		5.00	SPT	N=44 (10,10/10,11,11,12)				
					5.45			End of Borehole at 5.45m

1.0 2.0 3.0 4.0 5.0 6.0

Remarks

1. Service clearance undertaken by BSL engineer using CAT & Genny.
2. Hand dug inspection pit to 1.20m bgl.
3. No groundwater encountered.
4. Hole backfilled with arisings upon completion.

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

BROWNFIELD SOLUTIONS LTD

Borehole Log

Window Sampler No.
WS03
Sheet 1 of 1

PROJECT NO:	C6579	**CO-ORDS:**	**Hole Type** WS
PROJECT NAME:	WREXHAM FC TRAINING GROUND	**LEVEL:**	**Scale** 1:30
CLIENT:	MODULEK	**DATES:** 26/02/26	**Logged** JL / **Checked** JM

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
		0.30-1.00	B		0.30			MADE GROUND: Grass over dark brown slightly gravelly slightly clayey SAND with moderate rootlet content. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of mudstone, coal, brick, and pottery.
								MADE GROUND: Reddish brown slightly sandy clayey GRAVEL. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of mudstone, sandstone, and rare quartz. (REWORKED)
	▽	1.20	SPT	N=23 (3,4/4,6,6,7)				
		1.40-2.00	B		1.40			MADE GROUND: Dark grey slightly gravelly slightly clayey SAND. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone, mudstone, and coal. (REWORKED)
		2.00-2.70	B		2.00			MADE GROUND: Reddish brown slightly clayey gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of mudstone, sandstone, coal, and rare volcanics. (REWORKED)
		2.00	SPT	N=8 (3,3/2,2,2,2)				
		3.00	SPT	N=5 (2,1/1,1,1,2)				
					3.70			MADE GROUND: Yellowish brown sandy GRAVEL. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone and mudstone. (REWORKED)
					3.90			MADE GROUND: Reddish brown slightly clayey gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of mudstone, sandstone, coal, and rare volcanics. (REWORKED)
		4.00	SPT	N=12 (4,3/2,3,3,4)				
		5.00	SPT	N=14 (2,4/4,3,4,3)				
					5.45			End of Borehole at 5.45m

1.0 2.0 3.0 4.0 5.0 6.0

Remarks

1. Service clearance undertaken by BSL engineer using CAT & Genny.
2. Hand dug inspection pit to 1.20m bgl.
3. Groundwater encountered from 1.20m bgl.
4. Hole backfilled with arisings upon completion.

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

BROWNFIELD SOLUTIONS LTD

Borehole Log

Window Sampler No.
WS04
Sheet 1 of 1

PROJECT NO:	C6579	**CO-ORDS:**	**Hole Type** WS
PROJECT NAME:	WREXHAM FC TRAINING GROUND	**LEVEL:**	**Scale** 1:30
CLIENT:	MODULEK	**DATES:** 26/02/26	**Logged** JL / **Checked** JM

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
		0.15-0.50	B		0.15			MADE GROUND: Tarmacadam.
		0.50-1.20	B		0.50			MADE GROUND: Light grey sandy GRAVEL. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of concrete and limestone.
		1.20-1.70 1.20	B SPT	N=22 (6,6/7,6,4,5)	1.20			MADE GROUND: Reddish brown slightly gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone and rare coal. (REWORKED)
					1.70			MADE GROUND: Dark grey slightly gravelly slightly clayey SAND. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone, mudstone, and coal. (REWORKED)
		2.00-3.50 2.00	B SPT	N=5 (3,2/1,1,2,1)	2.00			MADE GROUND: Reddish brown slightly gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of mudstone and sandstone. (REWORKED)
		3.00	SPT	N=8 (4,3/2,2,2,2)				MADE GROUND: Dark grey slightly gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone, mudstone, and coal. (REWORKED)
		4.00-5.00 4.00	B SPT	N=8 (4,3/2,2,2,2)	3.50			MADE GROUND: Reddish brown slightly clayey gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of mudstone, sandstone, and coal. (REWORKED)
		5.00	SPT	N=14 (3,4/4,3,4,3)				
					5.45			End of Borehole at 5.45m

1.0 2.0 3.0 4.0 5.0 6.0

Remarks

1. Service clearance undertaken by BSL engineer using CAT & Genny.
2. Hand dug inspection pit to 1.20m bgl.
3. No groundwater encountered.
4. Hole backfilled with arisings upon completion.

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

BROWNFIELD SOLUTIONS LTD

Borehole Log

Window Sampler No.
WS101
Sheet 1 of 1

PROJECT NO:	C6579	**CO-ORDS:**	**Hole Type** WS
PROJECT NAME:	WREXHAM FC TRAINING GROUND	**LEVEL:**	**Scale** 1:30
CLIENT:	MODULEK	**DATES:**	30/03/26

Logged	Checked
JL	JM

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.15-0.40	ES		0.15			MADE GROUND: Tarmacadam.
	▽	0.40-0.70	ES		0.40			MADE GROUND: Light grey sandy GRAVEL. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of concrete, sandstone, and limestone.
					0.70			MADE GROUND: Greyish brown slightly sandy GRAVEL. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of quartzite, sandstone, coal, and concrete.
								MADE GROUND: Reddish brown slightly clayey sandy GRAVEL. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of mudstone, sandstone, and coal. (REWORKED)
					1.30			MADE GROUND: Dark grey slightly gravelly clayey SAND. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone, mudstone, coal, and rare wood. (REWORKED)
					2.50			MADE GROUND: Dark grey slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone, mudstone, and coal. (REWORKED)
					3.00			MADE GROUND: Dark grey slightly gravelly clayey SAND. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone, mudstone, and coal. (REWORKED)
					3.60			MADE GROUND: Reddish brown gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone, coal, and rare concrete.
								Becoming slightly gravelly from 4.60m bgl.
					5.00			End of Borehole at 5.00m

1.0 2.0 3.0 4.0 5.0 6.0

Remarks

1. Service clearance undertaken by BSL Engineer using CAT & Genny.
2. Hand dug inspection pit to 1.20m bgl.
3. Groundwater encountered from 0.70m bgl.
4. Installation to 5.00m bgl: 1.00m plain 35mm PVC, 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.
WS102
Sheet 1 of 1

PROJECT NO:	C6579	**CO-ORDS:**	**Hole Type** WS
PROJECT NAME:	WREXHAM FC TRAINING GROUND	**LEVEL:**	**Scale** 1:30
CLIENT:	MODULEK	**DATES:**	30/03/26

Logged	Checked
JL	JM

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.15-0.50	ES		0.15			MADE GROUND: Tarmacadam.
								MADE GROUND: Light grey sandy GRAVEL. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of concrete, sandstone, and limestone.
		0.50-1.20	ES		0.50			MADE GROUND: Dark brown gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone, mudstone, coal, and brick.
					2.70			MADE GROUND: Light pinkish brown slightly sandy GRAVEL. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone. (REWORKED)
					2.80			MADE GROUND: Dark brown gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone, mudstone, coal, and brick.
					3.20			MADE GROUND: Dark brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone, mudstone, coal, and rare brick.
					3.80			MADE GROUND: Light pinkish brown slightly sandy GRAVEL. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone. (REWORKED)
					4.00			MADE GROUND: Dark brown sandy GRAVEL. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone, mudstone, and coal. (REWORKED)
					4.60			End of Borehole at 4.60m

1.0
2.0
3.0
4.0
5.0
6.0

Remarks

1. Service clearance undertaken by BSL Engineer using CAT & Genny.
2. Hand dug inspection pit to 1.20m bgl.
3. Groundwater encountered from 4.20m bgl.
4. Installation to 4.60m bgl: 1.00m plain 35mm PVC, 3.60m 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.
WS103
Sheet 1 of 1

PROJECT NO:	C6579	**CO-ORDS:**	**Hole Type** WS
PROJECT NAME:	WREXHAM FC TRAINING GROUND	**LEVEL:**	**Scale** 1:30
CLIENT:	MODULEK	**DATES:** 30/03/26	**Logged** JL / **Checked** JM

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
		0.10-0.60	ES		0.10			MADE GROUND: Tarmacadam.
								MADE GROUND: Light yellowish brown and grey sandy GRAVEL. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of concrete, sandstone, and limestone.
		0.60-0.90	ES		0.60			MADE GROUND: Greyish brown sandy GRAVEL. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of sandstone and concrete.
					0.90			MADE GROUND: Reddish brown slightly gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone. (REWORKED)
					1.50			MADE GROUND: Dark grey slightly gravelly slightly clayey SAND. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone, mudstone, and coal. (REWORKED)
					2.00			MADE GROUND: Grey and light grey slightly sandy CLAY. Sand is fine to coarse. (REWORKED)
					2.50			MADE GROUND: Dark reddish brown gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone, mudstone, coal, rare quartzite, and rare brick.
					5.00			End of Borehole at 5.00m

1.0 2.0 3.0 4.0 5.0 6.0

Remarks

1. Service clearance undertaken by BSL Engineer using CAT & Genny.
2. Hand dug inspection pit to 1.20m bgl.
3. Groundwater encountered from 3.60m bgl.
4. Installation to 5.00m bgl: 1.00m plain 35mm PVC, 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

Geotechnical Testing Results

MURRAY RIX
CONSULTANCY, SITE INVESTIGATION
CONSTRUCTION MATERIALS TESTING

TEST REPORT

Client Brownfield Solutions Ltd

Address William Smith House
173-183 Witton Street
Northwich
Cheshire
CW9 5LP

Contract C6579

Job Number MRN 26012/9
Date of Issue 23 March 2026

Approved Signatories

S J Hutchings, O P Davies

Notes

1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.

2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.

3 Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted.

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

6 This certificate should not be reproduced, except in full, without the express permission of the laboratory.

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

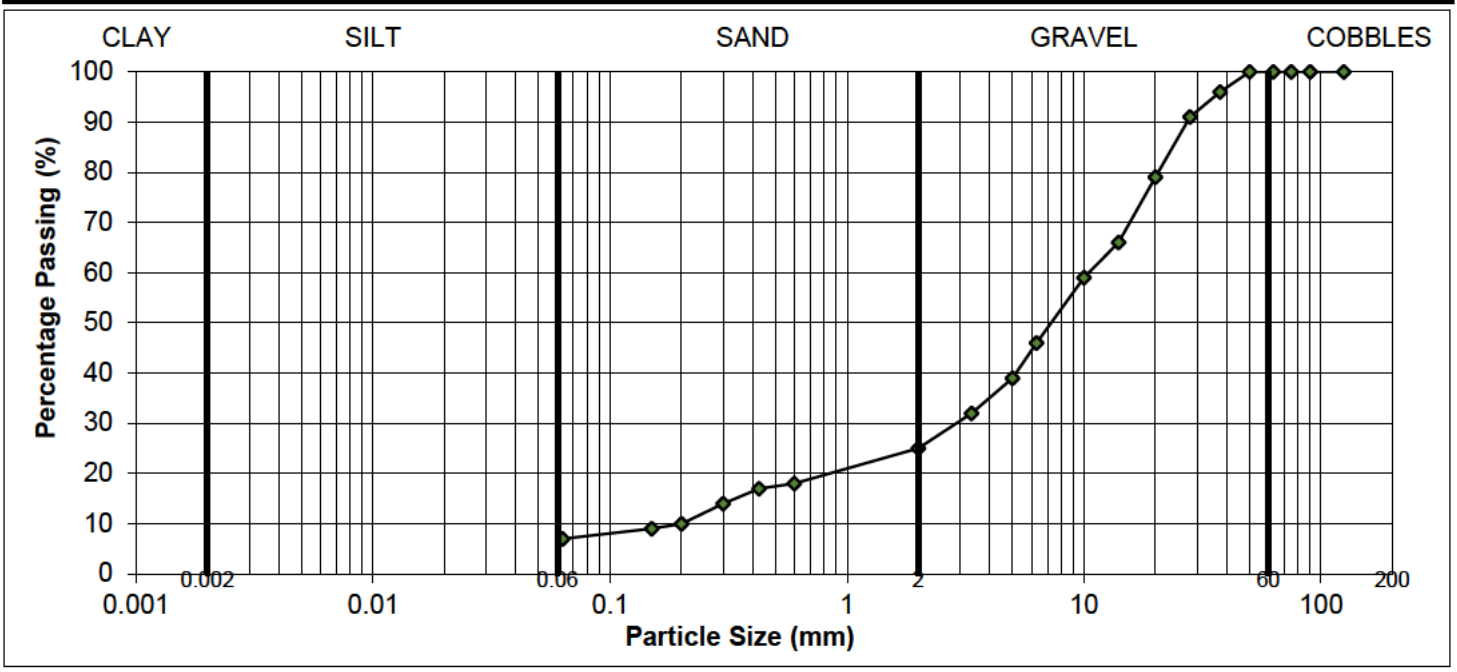
PARTICLE SIZE DISTRIBUTION
BS EN ISO 17892-4:2016
Determination of Water Content in accordance with BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

CLIENT	Brownfield Solutions Ltd
SITE	C6579
JOB NUMBER	MRN 26012/9

SAMPLE LABEL	WS01 0.1-0.5m	DATE SAMPLED	26-Feb-26
LAB SAMPLE No	6042701	DATE RECEIVED	03-Mar-26
DATE TESTED	05-Mar-26	SAMPLED BY	Client

MATERIAL	Grey brown silty sandy GRAVEL		
ADVISED SOURCE	Site Won	AS RECEIVED WATER CONTENT (%)	4.2

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		6.3	46	
90	100		5	39	
75	100		3.35	32	
63	100		2	25	
50	100		0.6	18	
37.5	96		0.425	17	
28	91		0.3	14	
20	79		0.2	10	
14	66		0.15	9	
10	59		0.063	7	



SOIL FRACTIONS			
COBBLES	0	SAND	18%
GRAVEL	75%	SILT / CLAY	7%

REMARKS

SIGNED [redacted]

NAME O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE 23-Mar-26

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

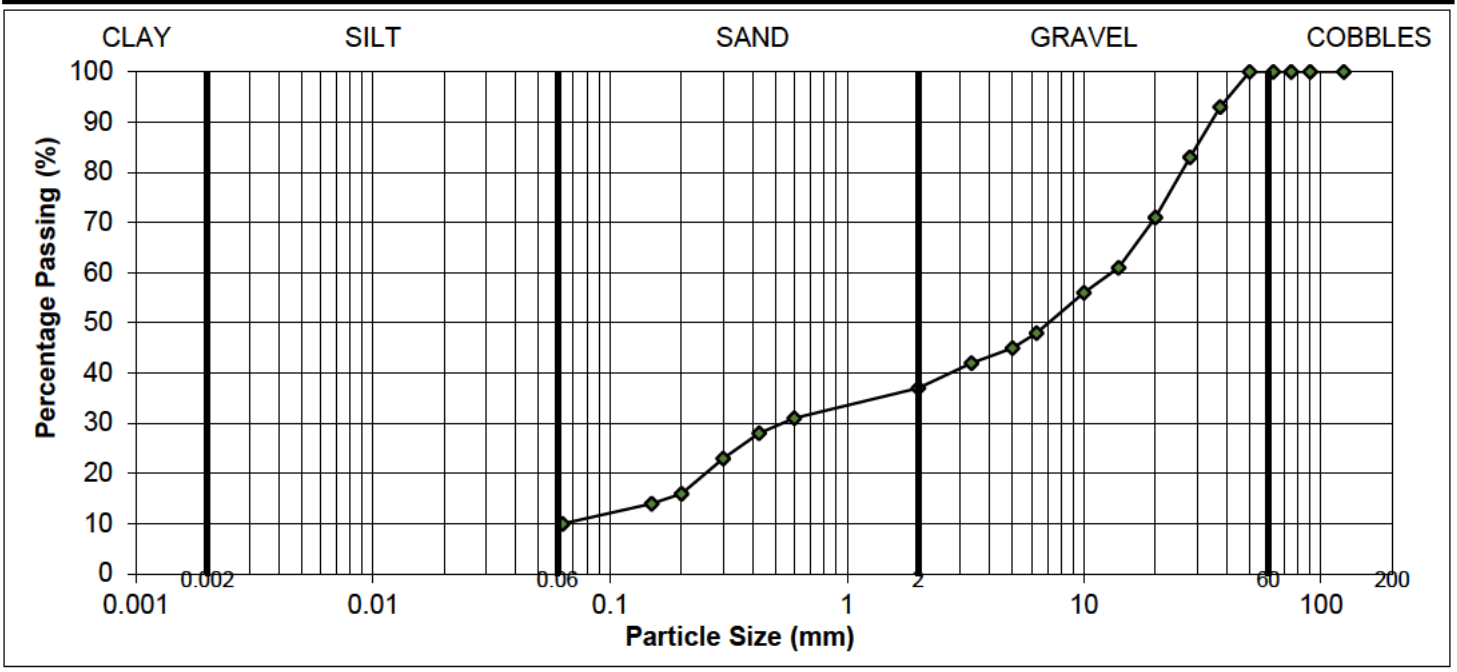
PARTICLE SIZE DISTRIBUTION
BS EN ISO 17892-4:2016
Determination of Water Content in accordance with BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

CLIENT	Brownfield Solutions Ltd
SITE	C6579
JOB NUMBER	MRN 26012/9

SAMPLE LABEL	WS04 0.5-1.2m	DATE SAMPLED	26-Feb-26
LAB SAMPLE No	6042702	DATE RECEIVED	03-Mar-26
DATE TESTED	05-Mar-26	SAMPLED BY	Client

MATERIAL	Grey brown silty very sandy GRAVEL		
ADVISED SOURCE	Site Won	AS RECEIVED WATER CONTENT (%)	8.5

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		6.3	48	
90	100		5	45	
75	100		3.35	42	
63	100		2	37	
50	100		0.6	31	
37.5	93		0.425	28	
28	83		0.3	23	
20	71		0.2	16	
14	61		0.15	14	
10	56		0.063	10	



SOIL FRACTIONS			
COBBLES	0	SAND	27%
GRAVEL	63%	SILT / CLAY	10%

REMARKS

SIGNED [redacted]

NAME O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE 23-Mar-26

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

DRY DENSITY/WATER CONTENT RELATIONSHIP 4.5kg RAMMER
BS 1377-2:2022 Cl.11
PARTICLE DENSITY METHOD BS 1377-2:2022 Cl.9.2

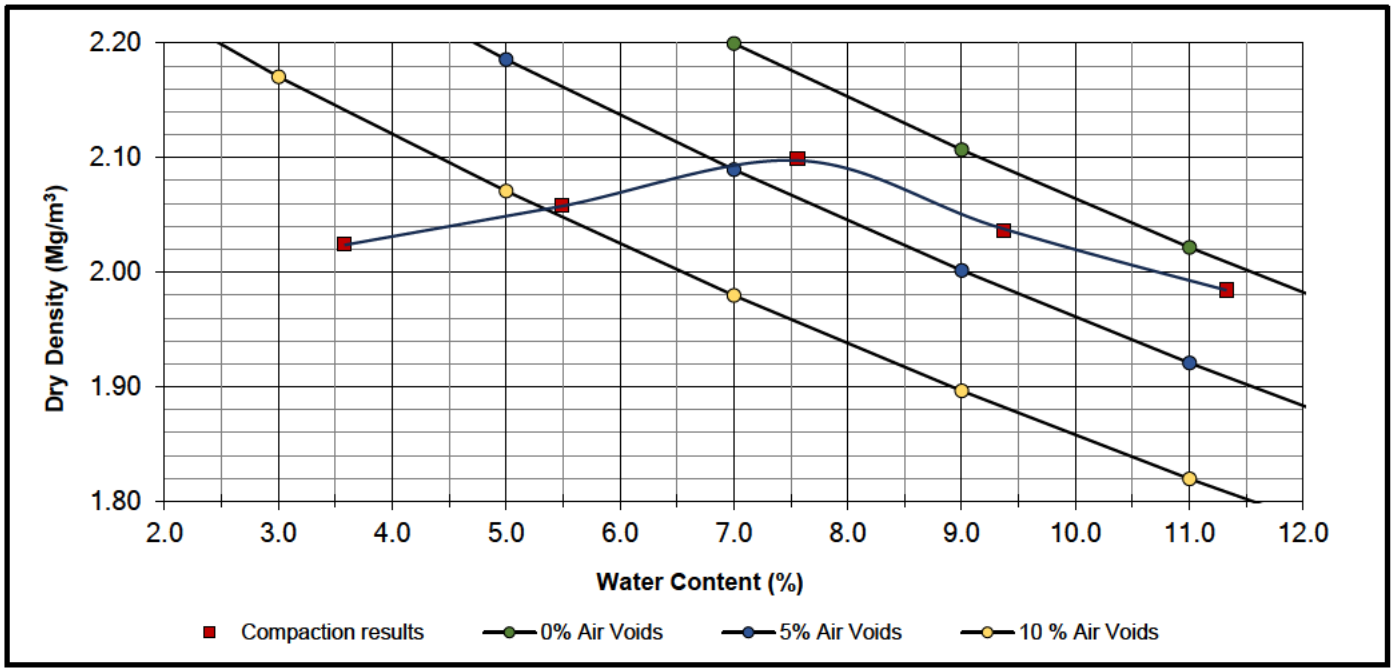
CLIENT	Brownfield Solutions Ltd
SITE	C6579
JOB NUMBER	MRN 26012/9

SAMPLE LABEL	WS02 0.4-1.0m	DATE SAMPLED	26-Feb-26
SAMPLE NUMBER	6042703	DATE RECEIVED	03-Mar-26
DATE TESTED	13-Mar-26	SAMPLED BY	Client

MATERIAL	Grey brown silty sandy GRAVEL
ADVISED SOURCE	Site Won
PRE TREATMENT	Air Dried / Separate Batches

RETAINED 37.5mm	6 %	GRADING ZONE	ZONE 5	MOULD SIZE	CBR
RETAINED 20mm	24 %	PARTICLE DENSITY	2.60 Mg/m3	(Assumed)	

POINT NUMBER	WATER CONTENT (%)	DRY DENSITY (Mg/m^3)
1	3.6	2.024
2	5.5	2.059
3	7.6	2.099
4	9.4	2.036
5	11.3	1.984



OPTIMUM WATER CONTENT	**7.6**	(%)
MAXIMUM DRY DENSITY	**2.10**	(Mg/m^3)

REMARKS

NAME O.P. Davies BA (Hons) SIGNED [redacted] DATE 23-Mar-26
(Director / Head of Laboratory)

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

DRY DENSITY/WATER CONTENT RELATIONSHIP 4.5kg RAMMER
BS 1377-2:2022 Cl.11
PARTICLE DENSITY METHOD BS 1377-2:2022 Cl.9.2

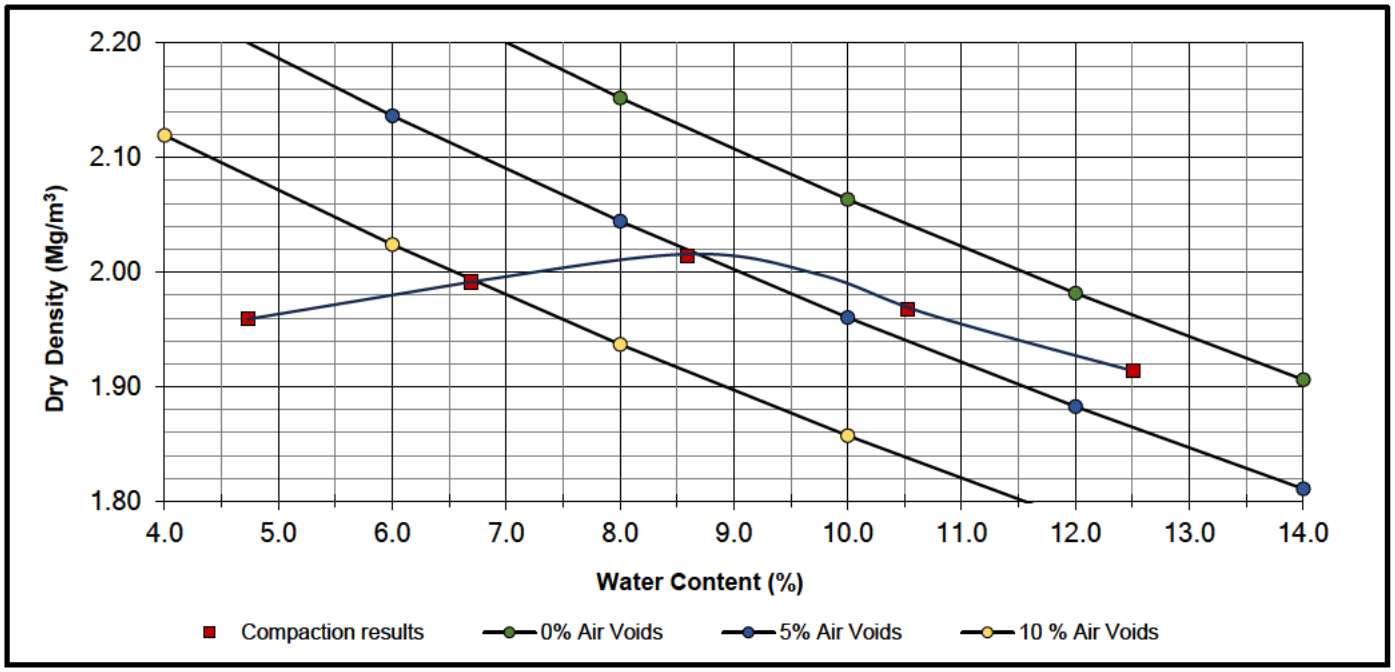
CLIENT	Brownfield Solutions Ltd
SITE	C6579
JOB NUMBER	MRN 26012/9

SAMPLE LABEL	WS03 0.3-1.0m	DATE SAMPLED	26-Feb-26
SAMPLE NUMBER	6042704	DATE RECEIVED	03-Mar-26
DATE TESTED	13-Mar-26	SAMPLED BY	Client

MATERIAL	Grey brown silty sandy GRAVEL
ADVISED SOURCE	Site Won
PRE TREATMENT	Air Dried / Separate Batches

RETAINED 37.5mm	3 %	GRADING ZONE	ZONE 4	MOULD SIZE	CBR
RETAINED 20mm	25 %	PARTICLE DENSITY	2.60 Mg/m3	(Assumed)	

POINT NUMBER	WATER CONTENT (%)	DRY DENSITY (Mg/m^3)
1	4.7	1.960
2	6.7	1.991
3	8.6	2.014
4	10.5	1.968
5	12.5	1.914



OPTIMUM WATER CONTENT	**8.9**	(%)
MAXIMUM DRY DENSITY	**2.02**	(Mg/m^3)

REMARKS

NAME O.P. Davies BA (Hons) SIGNED [redacted] DATE 23-Mar-26
(Director / Head of Laboratory)

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

CALIFORNIA BEARING RATIO (CBR)
BS 1377-2:2022 Cl. 15
DETERMINATION OF WATER CONTENT - BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

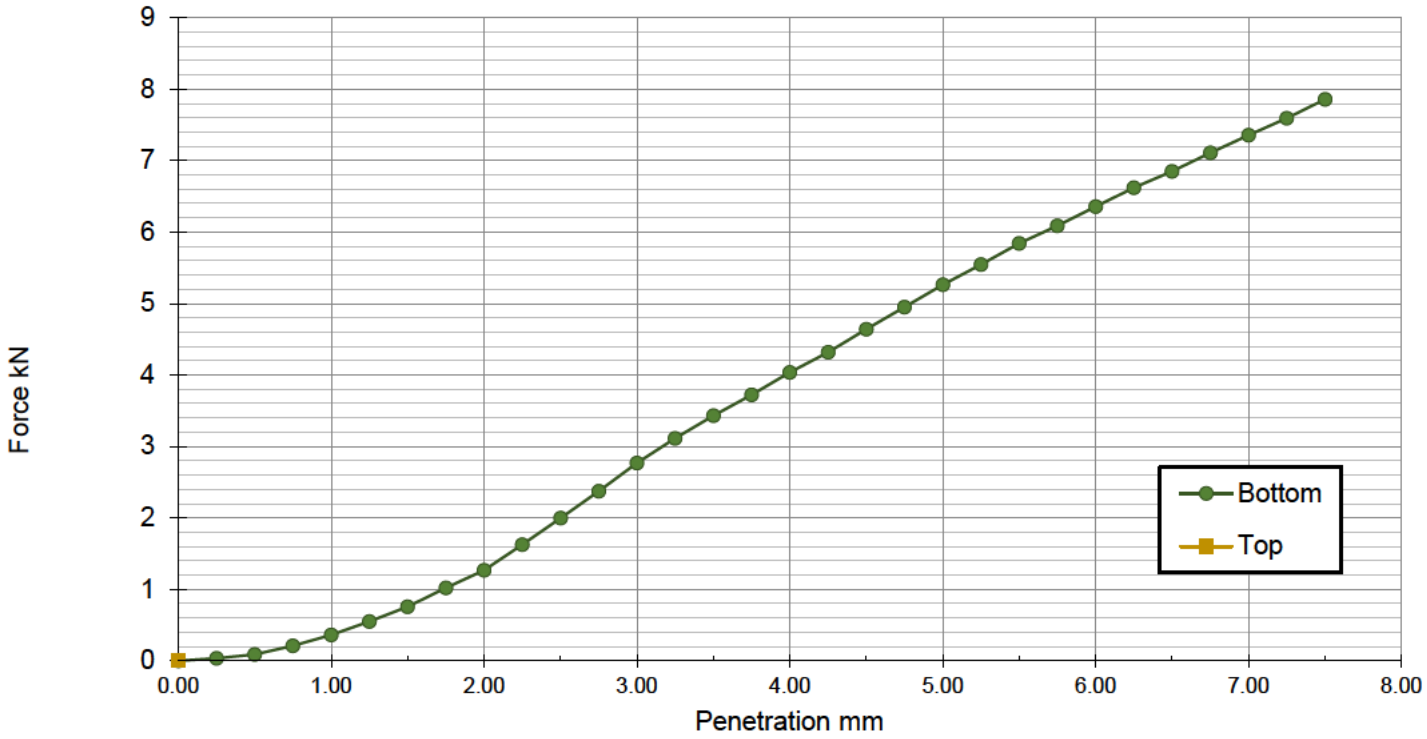
CLIENT	Brownfield Solutions Ltd
SITE	C6579
JOB NUMBER	MRN 26012/9

SAMPLE LABEL	WS01 0.8-2.0m	DATE SAMPLED	26-Feb-26
LAB SAMPLE No	6042705	DATE RECEIVED	03-Mar-26
DATE TESTED	16-Mar-26	SAMPLED BY	Client

MATERIAL	Grey brown silty sandy GRAVEL
ADVISED SOURCE	Site Won

INITIAL CONDITIONS

PRE-TREATMENT		Dynamic Compaction, Specified Effort, Vibrating Hammer			
GREATER THAN 20 mm REMOVED		24 %			
BULK DENSITY	2.00 Mg/m3	WATER CONTENT	14.0 %	DRY DENSITY	1.76 Mg/m3
TEST CONDITION	UNSOAKED	MEASURED SWELL	0 mm	SURCHARGE	2 kg



CBR VALUE

Top	N/A	%
Bottom	31.8	%

ORIGIN CORRECTION

Top	N/A	mm
Bottom	1.00	mm

FINAL MOISTURE CONTENT

Top	N/A	%
Bottom	14.0	%

REMARKS

NAME O.P. Davies BA (Hons) (Director / Head of Laboratory) SIGNED [redacted] DATE 23-Mar-26

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

CALIFORNIA BEARING RATIO (CBR)
BS 1377-2:2022 Cl. 15
DETERMINATION OF WATER CONTENT - BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

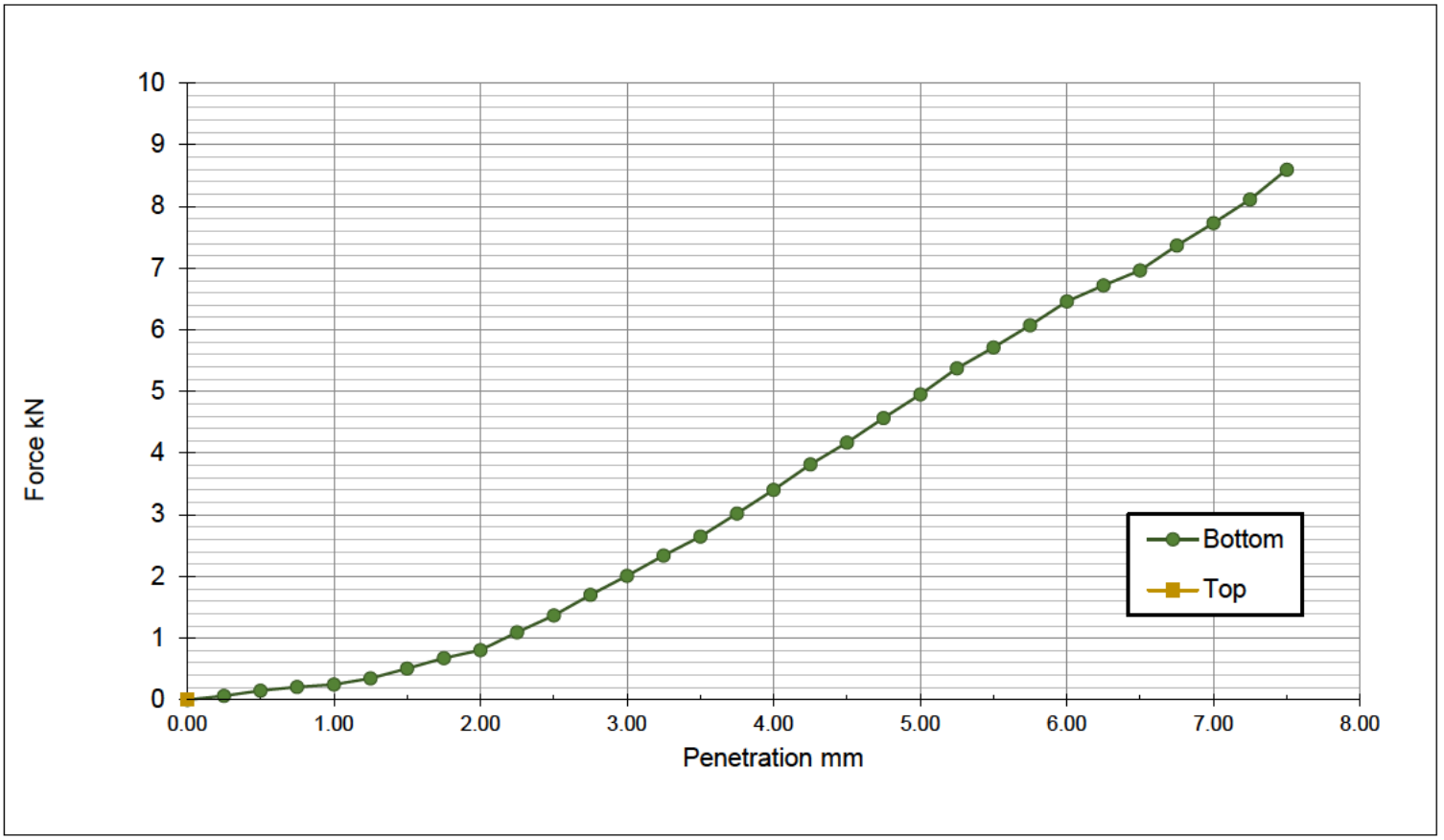
CLIENT	Brownfield Solutions Ltd
SITE	C6579
JOB NUMBER	MRN 26012/9

SAMPLE LABEL	WS04 0.15-0.5m	DATE SAMPLED	26-Feb-26
LAB SAMPLE No	6042706	DATE RECEIVED	03-Mar-26
DATE TESTED	16-Mar-26	SAMPLED BY	Client

MATERIAL	Grey brown silty sandy GRAVEL
ADVISED SOURCE	Site Won

INITIAL CONDITIONS

PRE-TREATMENT		Dynamic Compaction, Specified Effort, Vibrating Hammer			
GREATER THAN 20 mm REMOVED		27 %			
BULK DENSITY	2.09 Mg/m3	WATER CONTENT	3.4 %	DRY DENSITY	2.02 Mg/m3
TEST CONDITION	UNSOAKED	MEASURED SWELL	0 mm	SURCHARGE	2 kg



CBR VALUE

Top	N/A	%
Bottom	24.8	%

ORIGIN CORRECTION

Top	N/A	mm
Bottom	N/A	mm

FINAL MOISTURE CONTENT

Top	N/A	%
Bottom	3.4	%

REMARKS

NAME O.P. Davies BA (Hons) (Director / Head of Laboratory) SIGNED [redacted] DATE 23-Mar-26