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OXFORD BIOMEDICA OXBOX
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GROUND INVESTIGATION REPORT

Contract: 2230917

Date: May 2023

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GROUND INVESTIGATION REPORT

Carried out at

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Prepared for

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EXECUTIVE SUMMARY

On the instructions of WHP Ltd on behalf of Oxford Biomedica Plc., with Booth King Partnership acting as designers, an investigation was undertaken to determine ground conditions to enable foundation design to be carried out, together with a geoenvironmental risk assessment and a review of gas emissions.

It is understood that it is proposed to construct an extension to the existing Oxford Biomedica Oxbox building.

The site is situated at on the existing Oxford Biomedica Oxbox site, approximately 4.15 km to the southeast of the town centre of Oxford and may be located by Grid Reference SP 547 042.

No superficial deposits are present beneath the site. Bedrock of the Beckley Sand Member, part of the Kingston Formation, is present beneath the site which generally comprises grey, weathering to yellow, quartzose, fine to coarse grained sand, with calcareous sandstone beds and thin bioclastic limestone beds.

The site work was carried out between the 19th and 21st December 2022 and comprised three cable percussion boreholes taken to depths of between 1.20 m and 10.58 m. BH03 was terminated on a concrete obstruction. 50 mm diameter monitoring standpipes were installed in BH01 and BH02.

The sequence of the strata encountered during the investigation does generally reflect the anticipated geology as interpreted from the geological map. Made Ground deposits were encountered in all exploratory hole locations from ground level to depths of between 3.00 mbgl and 3.80 mbgl. The deposits comprised concrete (0.20 m to 0.30 m thick) overlying granular deposits of brown, medium dense sandy, clayey gravel and gravelly, clayey, silty sand.

Deposits considered to represent the Beckley Sand Member were present beneath the Made Ground deposits and comprised medium dense, yellowish brown becoming dark bluish grey, silty, clayey sand. Horizons of brown and dark grey limestone / calcareous sandstone and sandstone were present in BH01 and BH02.

Based on the observations made on site, together with the results of in-situ and laboratory testing, it is recommended that consideration could be given to the adoption of square pad to support the proposed structure. A pad foundation measuring 2.00 m x 2.00 m emplaced at a depth of 4.00 mbgl would result in an allowable bearing capacity of 250 kN/m^2. However, given the thickness of Made Ground on the site, it may be more economical to adopt a piled foundation solution.

Additional boreholes to depths in the range 15 to 20 m may be required to finalise design of piles. It is recommended that discussions with piling contractors should be undertaken to ensure existing and proposed additional ground investigation provide sufficient information for final design.

On the basis of the laboratory test results it is considered that a Design Sulphate Class for the site may be taken as DS-4. The site conditions would suggest that an ACEC class for the site of AC-4 would be appropriate. Additional testing may be undertaken from across the site in

order to determine whether the pH and sulphate concentrations. This may enable the Design Sulphate Class to be revised.

Contamination testing was undertaken on samples of soil collected from site. None of the results for the contaminants tested exhibited concentrations above the relevant screening level. It should also be noted that none of the contaminants exhibited concentrations above the screening level for residential with homegrown produce. No detectable asbestos was identified in any of the samples screened. the results of a HazWaste assessment indicate that the soils tested can be classified as Non-Hazardous Waste under code 17 05 04.

Six gas and groundwater monitoring visits have been undertaken at the site. Using worst-case values collected from the visits, a carbon dioxide Gas Screening Value (GSV) of 0.0384 l/h and a methane GSV of 0.00 l/h have been calculated, which would place the site within Characteristic Situation 1, for which protection measures are not required. On the basis of the monitoring undertaken, in line with current guidance, protection measures in relation to gas in ingress are not likely to be required.

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1.0 INTRODUCTION

1.1 On the instructions of WHP Ltd on behalf of Oxford Biomedica Plc., with Booth King Partnership acting as designers, an investigation was undertaken to determine ground conditions to enable foundation design to be carried out, together with a geoenvironmental risk assessment and a review of gas emissions.

1.2 It is understood that the proposed development comprises a two-story extinction of the existing Oxford Biomedica Oxbox Building.

1.3 This report should be read in conjunction with the Preliminary Investigation Report (PIR) which was reported under reference 2230917-(00) in February 2023.

1.4 It is recommended that a copy of this report be submitted to the relevant authorities to enable them to carry out their own site assessments and provide any comments.

1.5 This report has been prepared for the sole use of the Client for the purpose described and no extended duty of care to any third party is implied or offered. Third parties using any information contained within this report do so at their own risk.

1.6 The comments given in this report and the opinions expressed herein are based on the information received, the conditions encountered during site works, and on the results of tests made in the field and laboratory. However, there may be conditions prevailing at the site which have not been disclosed by the investigation and which have not been taken into account in the report.

1.7 The comments on groundwater conditions are based on observations made at the time the site work was carried out. It should be noted that groundwater levels vary owing to seasonal or other effects.

2.0 SITE SETTING

2.1 Site Location

2.1.1 The site is situated at on the existing Oxford Biomedica Oxbox site, approximately 4.15 km to the southeast of the town centre of Oxford and may be located by Grid Reference SP 547 042.

2.1.2 A site location plan is included in Appendix 1, Figure A1.1.

2.2 Site Description

2.2.1 The site is rectangular, elongated northeast-southwest, with an area of approximately 0.08 Ha.

2.2.2 At the time of the investigation, the site was a concrete loading area. It was bound by fencing on three sides with the fourth bound by the Oxford Biomedica building.

2.2.3 The site was accessed via security gate off Alec Issigonis Way.

2.2.4 The site sloped gradually from the north to the centre of site where it plateaus.

2.2.5 There was a drainage run within the centre of site trending from the east to west with a soakaway located in the northwest of the site.

2.2.6 Two possible sources of off-site contamination could be from a large backup generator to the west of the works area and a Royal Mail garage to the immediate southwest of site.

2.2.7 An exploratory hole location plan is given in Appendix 1, Figure A1.2.

2.3 Site History

2.3.1 Based on the historical maps examined as part of the Phase 1 Preliminary Risk Assessment (report reference 2230917-(00) in February 2023). The site was historically part of the Oxford Military College until 1921 at which point the land occupying the site was incorporated into the Morris Motor Works. The site remained unchanged until 1994 when the Motor Works were no longer identified on the historical maps, suggesting the demolition of the buildings. The buildings that occupy the site currently were first identified on the 1999 map. The site has shown no significant change since this point.

2.3.2 The surrounding area was originally occupied by agricultural land. Over time, the land immediately adjacent to the site was developed as part of the Morris Motor Works. Land beyond the main Motor Works has become progressively more residential with an area of commercial / industrial buildings to the northwest of the site.

2.4 Geological Setting

2.4.1 Details of the geology underlying the site have been obtained from the relevant geological map of the area, ref. 9.1.

2.4.2 No superficial deposits are present beneath the site.

2.4.3 Bedrock of the Beckley Sand Member, part of the Kingston Formation, is present beneath the site which generally comprises grey, weathering to yellow, quartzose, fine to coarse grained sand, with calcareous sandstone beds and thin bioclastic limestone beds.

2.4.4 Although not indicated as present on the site from the geological maps, there is the possibility that Made Ground may exist on the site, as the site was previously a military college, and later a major Motor Works.

2.4.5 Local existing boreholes (BGS refs. SP50SW501, SP50SW502, SP50SW518, SP50SW519, SP50SW523) close to the site indicate the presence of Made Ground / Topsoil overlying sands. Frequent Limestone bands are noted within the sands. This information is based upon records provided by the British Geological Survey. (contains British Geological Survey materials © UKRI 2023)

3.0 SITE WORK

3.1 The site work was carried out between the 19th and 21st December 2022.

3.2 The locations of the exploratory holes have been positioned by IFA based on the proposed site layout of the development.

3.3 The site work has been carried out on the basis of the practices set out in BS 10175, ref. 9.3, BS 5930 ref. 9.4 and BS EN 1997-2, ref. 9.5.

3.4 The scope of works may be summarised as follows:

Exploratory Hole Type	Quantity	Hole Reference	Depths	Notes
Cable percussive boreholes	3	BH01 to BH03	1.20 m to 10.58 m	BH03 terminated at 1.20 mbgl due to concrete obstruction.
Slotted standpipe installations	2	BH01 and BH02	3.00 m to 10.00 m	Installed to monitor groundwater and gas levels, each with gas valve and flush cover fitted.

3.5 The positions of the above are shown on the exploratory hole location plan, Appendix 1, Figure A1.2.

3.6 The depths of the exploratory holes, descriptions of strata encountered and comments on groundwater conditions are given in the site work records in Appendix 2.

3.7 Each exploratory hole location was surveyed using ground penetrating radar (GPR) and a Cable Avoidance Tool (CAT) prior to any physical excavation.

3.8 At the location of boreholes concrete cores were undertaken through the hardstanding concrete and then an inspection pit was excavated by hand to a depth of 1.20 m below ground level to check for buried services.

3.9 Representative disturbed and 'undisturbed' samples were taken, ref. 9.7, at the depths shown on the exploratory hole records and dispatched to the laboratory. Samples for environmental purposes were collected in appropriate containers and retained in cool boxes for daily despatch to the analytical laboratory.

3.10 Standard penetration tests (SPT), ref.9.6, were carried out in the boreholes in the various strata to assess the relative density or consistency. The values of penetration resistance are given in the borehole records.

3.11 Samples recovered during the boring and trial pitting works were screened for volatile organic compounds (VOC's) using a photo ionisation detector (PID). The results of these tests are included in the exploratory hole records.

3.12 The coordinates and ground levels at the exploratory hole locations, reported on the records, were surveyed in based on OS National Grid.

3.13 Six gas and groundwater monitoring visits have been completed. The gas levels monitored were oxygen, carbon dioxide, methane, carbon monoxide and hydrogen sulphide. The flow rate of each borehole was also monitored. The results are given in Appendix 7.

4.0 LABORATORY TESTS

4.1 Geotechnical Testing

4.1.1 The suite of geotechnical analyses has been scheduled by IFA based upon the ground conditions encountered during site work and the proposed development.

4.1.2 All soil samples were prepared in accordance with relevant standards and representative sub-samples were taken for testing. The following tests were carried out:

5 No. Particle size distributions by wet sieving
5 No. Particle size distributions by sedimentation
2 No. BRE Suite B
4 No. BRE Suite D

4.1.3 The results of the geotechnical soil tests are given in Appendix 3, Test Report 2230917/1.

4.1.4 The results of the sulphate and pH tests are presented in Appendix 3, Test Reports 23/00082.

4.2 Chemical Testing

4.2.1 The suite of chemical analyses has been scheduled by IFA based upon the findings of the desk study, to investigate the potential sources of contamination identified in the conceptual model.

4.2.2 The chemical analyses were carried out on 12 samples of soil. The nature of the analyses is detailed below:

5 No. Metals suites:
- Arsenic, Boron (water soluble), Cadmium, Chromium (total), Copper, Lead, Mercury, Nickel, Selenium, Zinc

5 No. Total petroleum hydrocarbons (TPH) – CWG bandings
5 No. Polycyclic aromatic hydrocarbons (PAH) – USEPA 16 suite
5 No. Phenols – total monohydric
1 No. Polychlorinated biphenyls (PCB)
5 No. Volatile organic compounds (VOC)
5 No. Semi-volatile organic compounds (VOC)
5 No. Cyanide contents – total
5 No. Sulphate contents – water soluble
5 No. Sulphate contents – acid soluble
No. Sulphide contents
5 No. pH values
5 No. Organic matter contents
5 No. Asbestos screens

4.2.3 The soil testing was carried out in accordance with the MCERTS performance standard, ref. 9.11, and the results are shown in Appendix 4, Test Report 22/12590.

5.0 GROUND CONDITIONS ENCOUNTERED

5.1 Sequence

5.1.1 The sequence of the strata encountered during the investigation does generally reflect the anticipated geology as interpreted from the geological map.

5.1.2 The sequence and indicative thicknesses of strata are provided below:

Strata Encountered	Depth Encountered (mbgl)		Strata Thickness (m)
	From	To	
Made Ground	0.00	1.20 to 3.80	Base not encountered in BH03 (1.20 m)
Beckley Sand Member	3.00 and 3.80	8.80 and 10.56	Not determined

5.2 Made Ground

5.2.1 Made Ground deposits were encountered in all exploratory hole locations from ground level to depths of between 3.00 mbgl and 3.80 mbgl. BH03 was terminated at 1.20 mbgl due to concrete and brick obstruction.

5.2.2 The deposits comprised concrete (0.20 m to 0.30 m thick) overlying granular deposits of brown, medium dense sandy, clayey gravel and gravelly, clayey, silty sand. Gravel included brick, concrete, timber, textiles, and plastic. Ash was noted as part of the principal sand constituent of the deposit found between 1.65 mbgl and 3.80 mbgl in BH01.

5.3 Beckley Sand Member

5.3.1 Deposits considered to represent the Beckley Sand Member were present beneath the Made Ground deposits and comprised medium dense, yellowish brown becoming dark bluish grey, silty, clayey sand.

5.3.2 Horizons of brown and dark grey limestone / calcareous sandstone and sandstone were present in BH01 between 5.50 mbgl to 5.50 mbgl at 8.80 mbgl; and between 5.00 mbgl to 5.30 mbgl, 9.00 mbgl to 9.30 mbgl and 10.10 mbgl to 10.56 mbgl in BH02. Material from these strata were recovered as angular, fine to coarse gravel.

5.3.3 Both BH01 and BH02 were terminated within a sandstone bed at depths of 8.80 mbgl and 10.56 mbgl respectively.

5.4 Groundwater

5.4.1 Groundwater was not encountered in any of the exploratory holes during the drilling works.

5.4.2 Based on the results of the available monitoring data, groundwater was measured at depths between 2.92 and 4.20 mbgl.

6.0 GEOTECHNICAL ASSESSMENT

6.1 Introduction

6.1.1 The intention of this assessment is to determine the geotechnical properties of the strata encountered, and to review their influence on the ground engineering options for the proposed development.

6.2 Proposed Development

6.2.1 It is understood that the proposed development is to consist of a two-storey extension to the existing Oxbox building.

6.2.2 Precise structural details were not provided at the time of preparation of this report, therefore the following recommendations fall outside of the Eurocode 7 legislation.

6.2.3 Column loads in the region of 800 kN have been indicated by Booth King Partnership.

6.3 Assessment of Soil Condition

6.3.1 The superficial material encountered on the site was granular in nature, ranging from silty sands through to limestone gravels. Disturbed samples were recovered, and in-situ testing was carried out within this material.

6.3.2 The engineering parameters for the materials encountered have been based on the engineering descriptions, in-situ and laboratory tests, published data, and correlated with professional judgement.

6.3.3 Within the coarse soils, values such as may be made with reasonable confidence based on work carried out by Peck et al., ref. 9.12.

6.4 Made Ground

6.4.1 Below is a summary of the geotechnical parameters for the Made Ground derived from the investigation:

	Minimum	Maximum
Layer Thickness (m)	1.20	3.80
SPT 'N' value (full penetration achieved) (4 No. Tests)	16	21
Derived angle of shear resistance (°)	32	33
Water Soluble Sulphate Content (mg/l) (4 No. Tests)	82	1060
Acid Soluble Sulphate Content (%w/w) (4 No. Tests)	0.05	1.19

	Minimum	Maximum
Total Sulphur Content (%w/w) (4 No. Tests)	0.02	0.43
Water Soluble Chloride Content (mg/l) (4 No. Tests)	27	95
Water Soluble Nitrate Content (mg/l) (4 No. Tests)	<0.4	11.1
Water Soluble Magnesium Content (mg/l) (4 No. Tests)	<1	

6.4.1 Four SPT tests within Made Ground recorded N values of between N=16 and N=21 indicating descriptive medium dense in-situ densities. One SPT test undertaken at 2.00 m in BH01 did not penetrate the full 450 mm, resulting in a refusal (N=>50). It is possible that this test was undertaken on an unknown obstruction.

6.4.2 Based on the SPT N values, a characteristic angle of shearing resistance of between 32° and 33° may be determined for Made Ground material.

6.4.3 SPT N values remain generally consistent with increasing depth.

6.4.4 Particle Size Distribution analysis undertaken on the Made Ground from 2.00 mbgl in BH01 and 1.20 mbgl in BH02 recorded gravel content of 17% and 53%, sand content of 61% and 31%, silt content of 12% and clay content of 10% and 4%.

6.4.5 These results indicate that the Made Ground material is variable across the site as the sample from BH01 is a poorly graded sand while the sample from BH02 is a well graded gravel.

6.4.6 The deposits were generally poorly graded and were similar across the site.

6.5 Beckley Sand Member

6.5.1 Below is a summary of the geotechnical parameters derived from the laboratory and in-situ testing for the Beckley Sand Member during the investigation:

	Minimum	Maximum
Layer Thickness (m)	5.00	7.56
SPT 'N' value (Sand Layers) (7 No. Tests)	13	26
Derived angle of shear resistance	31	35
SPT 'N' Values (Limestone / Sandstone Layers) (6 No. Tests)	>50	
Water Soluble Sulphate Content (mg/l) (2 No. Tests)	78	89

	Minimum	Maximum
Acid Soluble Sulphate Content (%w/w) (2 No. Tests)	0.04	
Total Sulphur Content (%w/w) (2 No. Tests)	0.01	

6.5.2 Seven SPT tests within the sand layers of the Beckley Sand Member recorded N values of between N=13 and N=26 indicating descriptive medium dense in-situ densities.

6.5.3 Based on the SPT N values, a characteristic angle of shearing resistance of between 31° and 35° may be determined for Beckley Sand Member.

6.5.4 Four SPT tests were undertaken within the Limestone / Sandstone layers and did not penetrate the full 450 mm, resulting in a refusal (N=>50).

6.5.5 The deposits were generally poorly graded and were similar across the site.

6.6 Foundation Recommendations

6.6.1 Consideration may be given to the adoption of square pad to support the proposed structure; however, due to the thickness of Made Ground and depth to water in standpipes, it may be more economical to adopt a piled foundation solution.

6.6.2 Square pad footings may be taken through any Made Ground and placed in the underlying natural strata. This may require excavations in the order of 4.00 m deep.

6.6.3 Based on a pad foundation measuring 2.00 m x 2.00 m emplaced at a depth of 4.00 mbgl, an allowable bearing capacity of 250 kN/m^2 may be determined.

6.6.4 More detailed analysis should be carried out once final structural loads are available.

6.6.5 The bearing pressures indicated above have been calculated to provide an adequate factor of safety against shear failure and limit settlements to within 25 mm. However, settlement calculations should be undertaken once structural details are available.

6.6.6 The carrying capacity of piles depends not only on their size and the ground conditions but also on their method of installation. Pile design and installation are continuously evolving processes and state-of-the-art techniques are often employed before they reach the public domain, perhaps several years down the line. Therefore, it is recommended that specialist Piling Contractors be contacted as to the suitability and carrying capacity of their piles in the ground conditions pertaining to the site.

6.6.7 Additional boreholes to depths in the range 15 to 20 m may be required to finalise design of piles. It is recommended that discussions with piling contractors should be undertaken to ensure existing and proposed additional ground investigation provide sufficient information for final design.

6.6.8 It should be noted that limestone / sandstone horizons were identified within both BH01 and BH02 which could affect the installation of the piles.

6.6.9 The desk study indicates there to be only a low risk from solution features. However, it is recommended that the Building Control Officer at the local council is contacted as to whether they have any special design requirements in this area.

6.7 Ground Floor Slabs

6.7.1 The design of ground floor slabs should be considered in conjunction with design of foundations, proposed loadings and tolerable total and differential settlements.

6.7.2 Made Ground is generally not considered suitable for the support of loads due to potential variability in settlement and load bearing characteristics.

6.7.3 It may be appropriate to carry out ground improvement of made ground beneath floor slab areas and utilise a ground bearing floor slab.

6.7.4 If a piled solution is utilised then it may be more appropriate to suspend the ground floor slab, with loading transferred to the pile cap and beams, to minimise differential settlement between the foundations and the floor area.

6.7.5 A hybrid solution utilising piled foundations and a ground bearing floor slab, placed on material subjected to appropriate ground improvement, may be considered if differential settlements between floor and walls can be maintained within serviceability limits.

6.8 Excavations

6.8.1 On the basis of observations on site, together with the results of in-situ and laboratory tests, it is considered that excavations to less than 1.20 m may not stand unsupported in the short term. Side support for safety purposes should of course be provided to all excavations which appear unstable, and those in excess of 1.20 m deep, in accordance with Health and Safety Regulations, ref. 9.16.

6.8.2 Conventional mechanical plant should be suitable for excavations at the site. Vertical sided excavations where man entry is required will need support. Excavations should be designed and constructed in accordance with Health and Safety requirements.

6.8.3 As previously indicated in Section 5.4 groundwater was not encountered during the site works. Water levels of between 2.92 and 4.08 mbgl were recorded in the standpipes during post-sitework monitoring.

6.8.4 Should groundwater be encountered at the proposed foundation level, de-watering may be required to facilitate the placement of the footings.

6.8.5 Filters are recommended if pumping takes place from fine grained soils to minimise potential ground loss through removal of fines. Reference should be made to CIRIA Report C515, ref 9.17, for recommendations concerning groundwater.

6.8.6 Groundwater could be expected in excavations taken to depths in excess of 3.00 mbgl.

6.9 Chemical Attack on Buried Concrete

6.9.1 Made Ground beneath the site has been classified in accordance with BRE Special Digest 1, ref. 9.19, as brownfield that contains pyrite while the Beckley Sand Member has been classified as natural ground that contains pyrite and laboratory testing undertaken accordingly. It is recommended that the guidelines given in Special Digest 1 be adopted.

6.9.2 The results of chemical tests in the Made Ground indicate a sulphate concentration in the soil between 82 mg/l and 1060 mg/l as a 2:1 water/soil extract, a total sulphate concentration of between 0.05% and 1.19% and total sulphur of between 0.02% and 0.43%, with pH values in the range of 8.53 to 10.52.

6.9.3 The results of chemical tests in the Beckley Sand Member indicate a sulphate concentration in the soil of 78 mg/l and 89 mg/l as a 2:1 water/soil extract, a total sulphate concentration of 0.04%, and total sulphur of between 0.01%, with pH values of 8.94 and 9.31.

6.9.4 It is recommended that groundwater should be regarded as mobile.

6.9.5 The sample from BH01 at 0.50 m appears to be an outlier, having the highest pH (10.52) and sulphate concentration (1060 mg/l). As such, this sample will be considered separately in the below assessment.

6.9.6 Characteristic values for each strata have been derived from laboratory results for pH, 2:1 water/soil extract (WS), total (acid) soluble sulphate (AS), equivalent Total Potential Sulphate (TPS) and Oxidisable Sulphate (OS), and are presented in the table below, together with Design Sulphate Class and the ACEC Class: -

Stratum	pH	WS (mg/l)	AS (%)	TPS (%)	OS (%)	Groundwater Condition	DS	AC
Made Ground (excluding BH01 sample at 0.50 m)	9.11	235.3	0.10	0.13	0.03	Mobile	1	1

Stratum	pH	WS (mg/l)	AS (%)	TPS (%)	OS (%)	Groundwater Condition	DS	AC
Made Ground (BH01 sample at 0.50 m)	10.52	1060	0.14	1.29	0.10	Mobile	4	4
Beckley Sand Member	9.13	83.5	0.04	0.03	-0.01	Mobile	1	1

6.9.7 Values for OS greater than 0.30% indicate that pyrite is present and may be oxidised to sulphate where the ground is disturbed. Based on the above results, pyrite does not appear to be present on site.

6.9.8 On the basis of the laboratory test results it is considered that a Design Sulphate Class for the site may be taken as DS-4. The site conditions would suggest that an ACEC class for the site of AC-4 would be appropriate.

6.9.9 The above recommendation is based upon the laboratory test result from the 0.50 m sample from BH01. Additional testing may be undertaken from across the site in order to determine whether the pH and sulphate concentrations are representative of the site as a whole or whether they represent a 'hot spot'. This may enable the Design Sulphate Class to be revised.

7.0 GEOENVIRONMENTAL RISK ASSESSMENT

7.1 Contaminated Land

7.1.1 The definition of 'contaminated land', along with the relevant details on legislation and guidance is set out in Appendix 6.

7.2 Site History

7.2.1 Based on the historical maps examined as part of the Phase 1 Preliminary Risk Assessment (report reference 2230917-(00) in February 2023). The site was historically part of the Oxford Military College until 1921 at which point the land occupying the site was incorporated into the Morris Motor Works. The site remained unchanged until 1994 when the Motor Works were no longer identified on the historical maps, suggesting the demolition of the buildings. The buildings that occupy the site currently were first identified on the 1999 map. The site has shown no significant change since this point.

7.2.2 The surrounding area was originally occupied by agricultural land. Over time, the land immediately adjacent to the site was developed as part of the Morris Motor Works. Land beyond the main Motor Works has become progressively more residential with an area of commercial / industrial buildings to the northwest of the site.

7.3 Sampling and Testing Strategy

7.3.1 Exploratory hole locations were set out to provide an overview of ground conditions across the site in relation to the proposed construction, together with enabling the collection of samples to enable chemical characterisation of the underlying strata.

7.3.2 Representative samples for potential environmental testing were obtained from the exploratory of the various made ground strata to allow a representation of the materials encountered, with additional samples to be obtained if necessary where there was visual or olfactory evidence of contamination.

7.3.3 The analytical testing was based on a suite of commonly occurring inorganic and organic contaminants, taking into account the Conceptual Site Mode and the ground conditions encountered.

7.4 Risk Assessment – Human Health

7.4.1 The proposed development consists of a two-storey extension to the existing Oxbox building. The risk assessment has therefore been based on guidelines for a commercial / industrial end use. Should the proposed development be changed in the future then further risk assessment may be required, particularly should a more sensitive end-use be envisaged.

7.4.2 Made Ground comprised concrete (0.20 m to 0.30 m thick) overlying granular deposits of brown, medium dense sandy, clayey gravel and gravelly, clayey, silty sand There was no visual or olfactory evidence for any significant source of contamination identified from within the exploratory holes undertaken.

7.4.3 The results of all chemical analyses have been processed in accordance with the recommendations set out in the CIEH and CL:AIRE document 'Guidance on Comparing Soil Contamination Data with a Critical Concentration', ref. 9.28. The results have been compared to screening levels, ref. 9.26 and 9.29, derived in accordance with current legislation and guidance and those primarily used have been tabulated and detailed within Appendix 6.

7.4.4 Taking into account the most likely sensitive receptor, the human health risk assessment has been based on guidelines for a commercial / industrial end use. Screening levels derived using a Soil Organic Matter content of 1%, where relevant, have been used in the first instance.

7.4.5 Where the concentrations determined on site are at or below the respective Screening Level, they are considered not to pose a risk and are removed from further consideration, unless otherwise stated.

7.4.6 None of the results for the contaminants tested exhibited concentrations above the relevant screening level. It should also be noted that none of the contaminants exhibited concentrations above the screening level for residential with homegrown produce.

7.4.7 No detectable asbestos was identified in any of the samples screened.

7.5 Risk Assessment - Controlled Waters

7.5.1 The site is located on a Secondary A aquifer, is not within a groundwater source protection zone and there are no groundwater abstractions within 1 km of the site.

7.5.2 The nearest surface watercourse is an unnamed pond, located approximately 174 m to the east of the site.

7.5.3 Taking into consideration the ground conditions encountered, the proposed end-use (commercial premises with concrete floor covering the site) and the contaminant concentrations observed (all below screening criteria for residential end-use with homegrown produce), there is not considered to be any significant risk to controlled waters and no further assessment deemed necessary at this time.

7.6 Gas Generation

7.6.1 The PIR identified the potential for sources of ground gas on / off site in the form of a significant thickness of Made Ground beneath the site. The PIR however did not identify the site as falling within a radon affected area.

7.6.2 Taking into consideration the likely potential source of ground gases, limited to the presence of Made Ground, six monitoring visits have been proposed, in accordance with current guidance, as summarised in Appendix 7.

7.6.3 Maximum carbon dioxide concentrations of 2.4 v/v% and 0.4 v/v% were recorded in BH01 and BH02 respectively. Minimum oxygen concentrations of 7.8 v/v%. and 19.7 v/v% were recorded in BH01 and BH02 respectively, suggesting depleted conditions in BH01. No methane concentrations have been recorded above the Level of Detection (LoD).

7.6.4 Negligible flow rates have been observed in BH01 while a peak flow rate of -1.6 litres/hour was recorded in BH02. This stabilised at 0.0 litres/hour after 45 seconds.

7.6.5 Maximum VOC concentration was measured at 0.3 ppm in both standpipes.

7.6.6 Using these worst-case values, a carbon dioxide Gas Screening Value (GSV) of 0.0384 l/h and a methane GSV of 0.00 l/h have been calculated, which would place the site within Characteristic Situation 1, for which protection measures are not required.

7.6.7 On the basis of the monitoring undertaken, in line with current guidance, protection measures in relation to gas in ingress are not anticipated to be required.

7.7 Protection of Services

7.7.1 Guidance from the UKWIR, ref 9.35, sets out the material requirements for newly laid water supply pipes within Brownfield sites. However, the exact requirements should be clarified with the relevant local water utility supplier for the site.

7.8 Summary of Risk Evaluation

7.8.1 The above assessment has not identified any 'source – pathway – receptor' linkages on site.

7.8.2 The proposed development does not require the installation of gas protection measures. This conclusion is subject to revision upon completion of the monitoring period.

7.9 Waste

7.9.1 An initial assessment of the likely waste classification for any material to be disposed of has been conducted on the basis of the chemical test results obtained as part of the contamination risk assessment.

7.9.2 This assessment has been conducted using the HazWasteOnline^{tm} tool, ref. 9.36, the output sheets from which are included within Appendix 4. The results of

the assessment indicate that the soils tested can be classified as Non-Hazardous Waste under code 17 05 04.

7.9.3 Any unexpected visually contaminated material should be segregated for further classification testing prior to disposal.

8.0 MANAGEMENT OF CONTAMINATION

8.1 Remediation and Verification

8.1.1 The risk management framework set out in the Model Procedures for the Management of Land Contamination, CLR 11, ref.9.37, is applicable to the redevelopment of sites that may be affected by contamination.

8.1.2 The risk management process set out in the Model Procedures has three main components:

Risk assessment
Options appraisal
Implementation

8.1.3 An important part of the risk management process is identifying and informing all stakeholders with an interest in the outcome of the risk management project. To this end, if the regulators have not yet been contacted with regard to the redevelopment of this site, it is recommended that they be supplied with a copy of all relevant reports in order to enable liaison to be undertaken with them.

8.1.4 No Remediation Strategy is deemed necessary for the development. However, all conclusions and recommendations are subject to regulatory agreement, which should be sought at the earliest possible opportunity.

8.2 Management of Unidentified Sources of Contamination

8.2.1 There is the possibility that sources of contamination may be present on site that were not detected during the investigation. Should such contamination be identified or suspected during the site clearance or ground works, these should be dealt with accordingly. A number of options are available for handling this material, which include:

The removal from site and disposal to a suitably licensed tip of all material suspected of being contaminated. The material would need to be classified prior to disposal.

Short-term storage of the suspected material while undertaking verification testing for potential contamination. The storage area should be a contained area to ensure that contamination does not migrate and affect other areas of the site. Depending upon the amounts of material under consideration, this could be either a skip or a lined area.

Having a suitably experienced environmental engineer either on-call or with a watching brief for the visual and olfactory assessment of the material, and sampling for verification purposes.

8.3 Risk Management During Site Works

8.3.1 During ground works, some simple measures may have to be put in place to mitigate the risk of any contamination affecting the site workers and the environs. The majority of the proposed measures represent good practice for the construction industry and include:

Informing the site workers of any contamination on site and the potential health effects from exposure.

Where appropriate, the provision of suitable Personal Protective Equipment (PPE) for workers who may be potentially impacted by working in areas of the contamination.

Ensuring good hygiene is enforced on site and washing facilities are maintained on the site. Workers are discouraged from smoking, eating or drinking without washing their hands first.

Dust monitoring, and if necessary, suppression measures should be put into practice where contamination is becoming airborne.

8.3.2 Where contaminated materials are being removed from the site they should be disposed of at a suitably licensed landfill, with a 'duty of care' system in place and maintained throughout the disposal operations.

8.4 Consultation

8.4.1 During the development of a site, consultation may be required for a number of reasons with a number of regulatory Authorities. The following provides an indication as to the most likely Authorities with which consultation may be required.

Local Authority. There may be a planning condition regarding contamination and consultation will be required with a designated Contaminated Land Officer within the Environmental Health Department. The Local Authority is generally concerned with human health risks. Some Authorities now require 'Completion Certificates' to be signed off following remediation works.

Environment Agency. Where a site is within a groundwater protection zone or has been designated as a special site, the Environment Agency is likely to be involved to ensure that controlled waters are protected.

National House Building Council, NHBC. Section 4.1 of the NHBC Standards requires land management to be addressed. For a new housing development to be approved by the NHBC, any remediation will require a validation report.

8.4.2 Based on the results of any consultation, there may be specific remediation requirements imposed by one or more of the Authorities.

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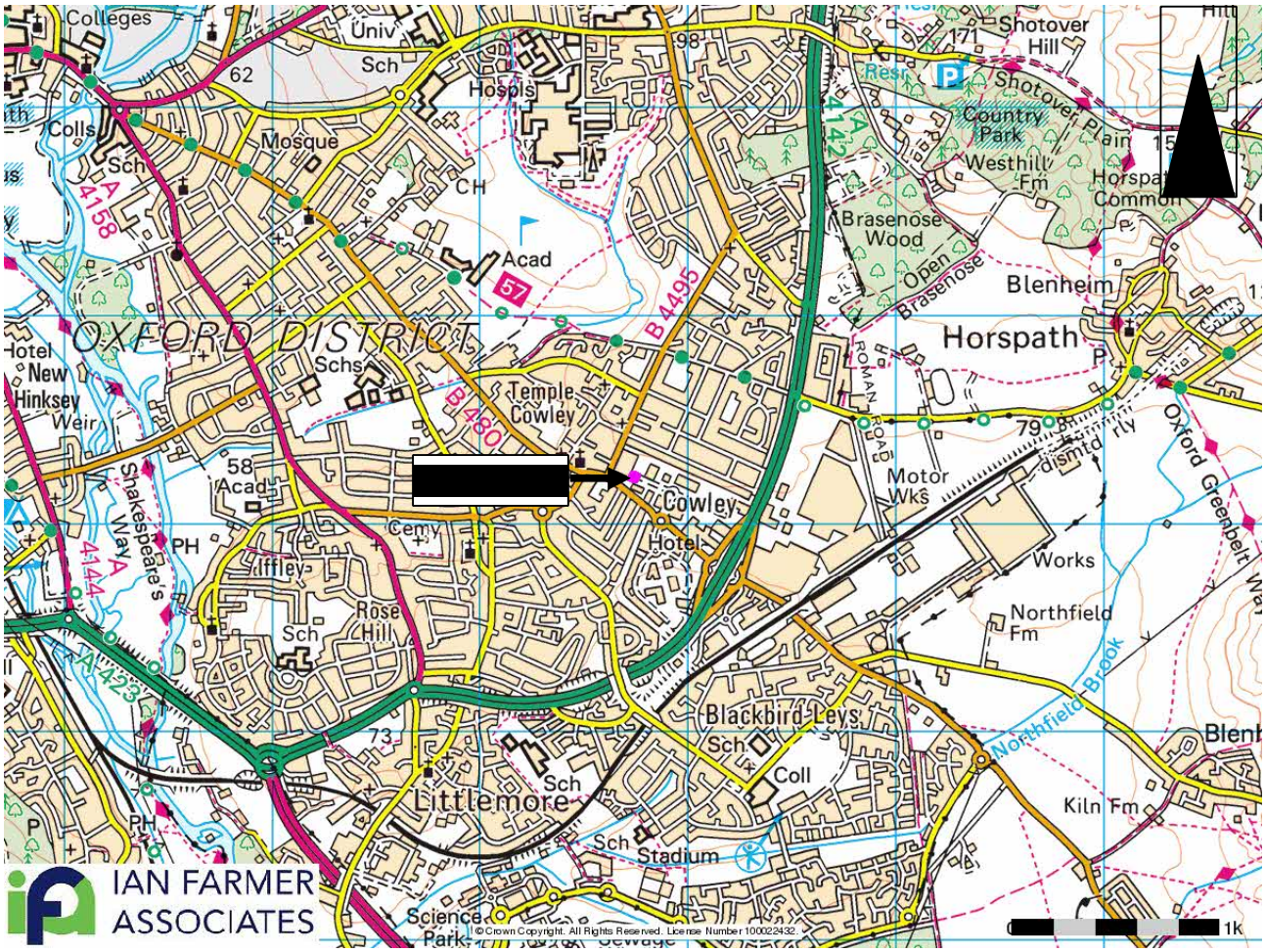
APPENDIX 1

DRAWINGS



PROJECT: 2230917 - Oxford Biomedica Oxbox	
FIGURE No. A1.1	**SCALE: Not to scale**
TITLE: Site Location Plan	
IAN FARMER ASSOCIATES	

Project Id:	2230917	Title:	Figure A 1.2: Exploratory Hole Location Plan
Project Title:	Oxford Biomedica Oxbox	Scale:	1:1000
		Engineer:	WHP Ltd.
Client:	Oxford Biomedica		

IAN FARMER ASSOCIATES

APPENDIX 2

SITE WORK

APPENDIX 2

GENERAL NOTES ON SITE WORKS

A2.1 SITE WORK

A2.1.1 General

Site work is carried out in general accordance with the guidelines given in BS EN 1997, 9.5 and BS 5930, ref 9.4, and BS 10175, ref.9.3.

A2.1.2 Light Cable Percussion Boring

The light cable percussion rig is generally employed for boring through soils and weak rocks, ref 9.4. It consists of a powered winch and tripod frame, with running wheels that are permanently attached so that the rig may be towed behind a suitable vehicle. The rig is towed into position and set up using its own winching system.

The locations of services are checked to make sure the borehole is not situated unacceptably near any services. Regardless of the proximity of services, a CAT scan is undertaken at the borehole location and an inspection pit dug to 1.20m by hand.

Boreholes are advanced in soil by the percussive action of the cable tool. The force of the cylindrical tool as it is dropped a short distance cuts a plug of cohesive soil that is removed by the tool.

In non-cohesive soils, the borehole is advanced by a 'shell', otherwise known as a 'bailer' or 'sand pump', which incorporates a clack valve. Material is transferred into the shell and retained by the clack valve. The water level in a borehole is maintained above that in the surrounding granular soil to allow for temporary reductions in the head of water as the shell is withdrawn from the borehole. Water should flow from the borehole into the surrounding soil at all times to prevent 'piping' and loosening the soil at the base of the hole. The casing is always advanced with the borehole in granular soil so that material is drawn from the base rather than the borehole sides.

Obstructions to boring are overcome by fitting a serrated chiselling ring to the base of the percussion tool. For large obstructions, a heavy chisel with a hardened cutting edge may have to be used.

Disturbed samples are taken in polythene bags, jars or tubs that are sealed against air or water loss.

Undisturbed samples are generally taken in cohesive materials at changes in strata and at one metre intervals to 5 metres then at 1.5 metre intervals to the full depths of the borehole. The open-tube sampler is suitable for firm to stiff clays, but is often used to retrieve disturbed samples of weak rocks, soft or hard clay and also clayey sand or silts. This has been adopted for routine use, and usually consists of a 100mm internal diameter tube (U100), which is capable of taking soil samples up to 450mm in length. The undisturbed samples are sealed at each end using micro-crystalline wax to prevent drying.

Standard penetration tests are generally carried out at frequencies similar to that of undisturbed sampling.

A2.2 IN-SITU TESTS

A2.2.1 Standard Penetration Test

The Standard Penetration Test is carried out in accordance with the proposals recommended by BS EN ISO 22476-3 ref 9.6.

The standard penetration test, **SPT**, covers the determination of the resistance of soils to the penetration of a split barrel sampler. A 50mm diameter split barrel sampler is driven 450mm into the soil using a 63.5kg hammer with a 760mm drop. The penetration resistance is expressed as the number of blows required to obtain 300mm penetration below an initial seating drive of 150mm through any disturbed ground at the bottom of the borehole. The number of blows to achieve the standard penetration of 300mm is reported as the 'N' value.

The 'N' value reported on the borehole logs is as measured but may be corrected for the energy ratio (E_r) of the specific test equipment to give a normalised N_{60} value.

E_r for the drilling apparatus used for this ground investigation is referenced within the exploratory hole records.

The test is generally carried out in fine soils, however, it may also be carried out in coarse granular soils, weak rocks and glacial tills using the same procedure as for the SPT but with a 50mm diameter, 60° apex solid cone replacing the split spoon sampler, **CPT.**

When attempting the standard penetration test in very dense material or weathered rocks it may be necessary to terminate the test before completion to prevent damage to the equipment. In these circumstances it is important to distinguish how the blow count relates to the penetration of the sampler. This may be achieved in the following manner:

Where the seating drive has been completed, the test drive is terminated if 50 blows are reached before the full penetration of 300mm is achieved. The penetration for 50 blows is recorded and an approximate N value obtained by linear extrapolation of the number of blows for the partial test drive.

If the seating drive of 150mm is not achieved within the first 25 blows, the penetration after 25 blows is recorded and the test drive then commenced.

For tests in soft rocks, the test drive should be terminated after 100 blows where the penetration of 300mm has not been achieved.

The N-value obtained from the Standard Penetration Test may be used to assess the relative density of sands and gravels with the general descriptions as follows:

Term	SPT N-Value : Blows/300mm Penetration
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	Over 50

A2.3 SAMPLES / TESTS

B represents large bulk disturbed samples

D represents small disturbed sample

ES represents environmental soil sample, consisting of amber jar, vial and plastic tub

$\underline{\nabla}$ represents water strike

$\underline{\blacktriangledown}$ represents level to which water rose

A2.4 DESCRIPTION OF SOILS

A2.4.1 General

The procedures and principles given in BS EN ISO 14688 Parts 1 and 2, ref 9.8, supplemented by section 6 of BS 5930, ref. 9.4 have been used in the soil descriptions contained within this report.

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING UK LTD
AINLEYS INDUSTRIAL ESTATE
ELLAND
WEST YORKSHIRE
HX5 9JP

SPT Hammer Ref:	LSI1
Test Date:	04/03/2022
Report Date:	04/03/2022
File Name:	LSI1.spt
Test Operator:	JL

Instrumented Rod Data

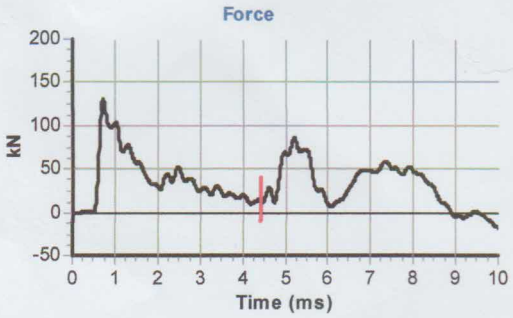
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.0
Assumed Modulus E_a (GPa):	200
Accelerometer No.1:	7080
Accelerometer No.2:	11609

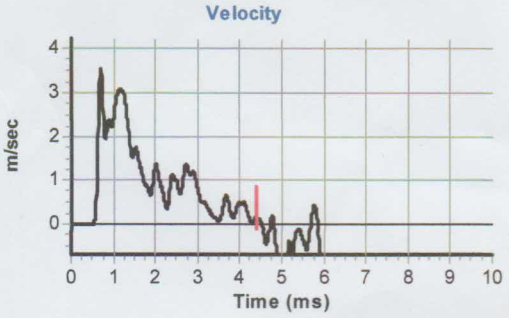
SPT Hammer Information

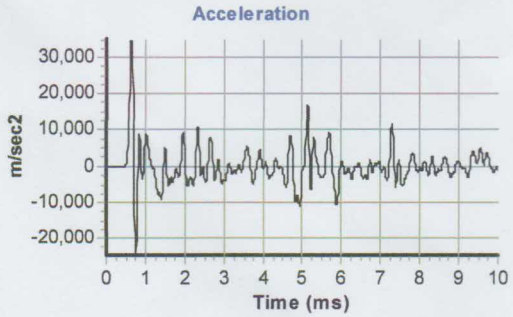
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	10.0

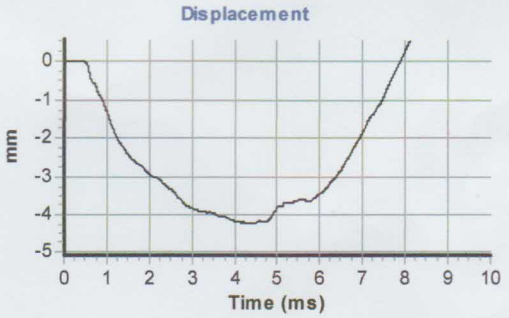
Comments / Location

LSI - 79461









Calculations

Area of Rod A (mm2):	905
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	290

Energy Ratio E_r (%): **61**

[redacted]

Signed: J.LOCK

Title: FITTER

The recommended calibration interval is 12 months

Samples & In Situ Testing			Strata Details			
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend
					MADE GROUND: CONCRETE.	
			77.68	0.25		
				(0.75)	MADE GROUND: Pale brown, sandy, angular to subrounded, fine to coarse GRAVEL with medium cobble content. Gravel includes concrete, timber, brick, textiles, and plastic. Cobbles are subangular to subrounded of brick and concrete.	
			76.93	1.00		
				(0.65)	MADE GROUND: Medium dense, brown, gravelly, fine to coarse SAND. Gravel is angular to subrounded, fine to coarse including brick, concrete, and plastic.	
			76.28	1.65		
				(2.15)	MADE GROUND: Medium dense, brown and yellowish brown, gravelly, clayey, silty, fine to coarse SAND. Gravel is angular to subangular, fine to coarse including brick, and sandstone. Occasional pockets of orangish brown, coarse sand. Sand includes ash. *Below 3.00m: becomes clayey, low cobble content, rounded of concrete.*	
			74.13	3.80		
				(1.20)	Medium dense, yellowish brown, silty, clayey, fine to medium SAND.	
			72.93	5.00		
				(0.50)	Brown SANDSTONE. No recovery.	
			72.43	5.50		
				(3.30)	Medium dense, yellowish brown slightly silty fine to medium SAND. *Below 6.50m: becomes silty.*	
			69.13	8.80		
			69.13		Brown SANDSTONE. No recovery. End of Borehole at 8.80m	

Samples & In Situ Testing			Strata Details			
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend
					MADE GROUND: CONCRETE.	
			77.56	0.20	MADE GROUND: Medium dense, brown, very sandy, slightly clayey, silty GRAVEL. Gravel is angular to subangular, fine to coarse including brick and concrete.	
				(1.60)		
			75.96	1.80	MADE GROUND: Medium dense, brown, gravelly, silty, fine to medium SAND. Gravel is angular to subangular, fine to coarse including brick and concrete.	
				(1.20)		
			74.76	3.00	Medium dense, light brown, silty, fine SAND.	
				(2.00)		
			72.76	5.00	Dark grey LIMESTONE / CALCAREOUS SANDSTONE recovered as angular, fine to coarse gravel.	
				(0.30)		
			72.46	5.30	Medium dense, light brown, silty, clayey, fine and medium SAND.	
				(3.70)		
			68.76	9.00	Dark grey LIMESTONE / CALCAREOUS SANDSTONE recovered as angular, fine to coarse gravel.	
				(0.30)		
			68.46	9.30	Dark blueish grey, silty, fine and medium SAND.	
				(0.80)		
					Continued next sheet	

Samples & In Situ Testing			Strata Details			
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend
			67.66	10.10	Dark blueish grey, silty, fine and medium SAND.	
				(0.46)	Dark grey SANDSTONE recovered as angular, fine to coarse gravel.	
			67.20	10.56	End of Borehole at 10.56m	

Samples & In Situ Testing			Strata Details			
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend
				(0.30)	MADE GROUND: CONCRETE.	
			77.83	0.30		
				(0.40)	MADE GROUND: Brown, gravelly, fine to coarse SAND. Gravel is angular to subrounded, fine to coarse including brick, sandstone, concrete, rubber.	
			77.43	0.70		
				(0.50)	MADE GROUND: CONCRETE and BRICK recovered as angular, coarse gravel.	
			76.93	1.20	End of Borehole at 1.20m	

APPENDIX 3

GEOTECHNICAL TESTS

APPENDIX 3

GENERAL NOTES ON LABORATORY TESTS

A3.1 Geotechnical Testing

A3.1.1 Geotechnical analysis was carried out to the testing procedures identified on the test reports.

A3.1.2 Subcontracted results are presented directly on headed paper from the subcontracting laboratory.

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Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, NE38 8QJ Tel: 0191 482 8500
washington@ianfarmer.co.uk www.ianfarmer.co.uk

F.A.O.

Final Test Report - 2230917 / 1

Site: P787-009-220817- Oxford

Job Number: 2230917

Originating Client: Oxford Biomedica

Originating Reference: 2230917

Date Sampled: 19/12/2022

Date Scheduled: 05/01/2023

Date Testing Started: 09/01/2023

Date Testing Finished: 13/01/2023

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By: [redacted]

Tim Robinson
Quality Supervisor

Report Issue Date: 13/01/2023

IAN FARMER ASSOCIATES

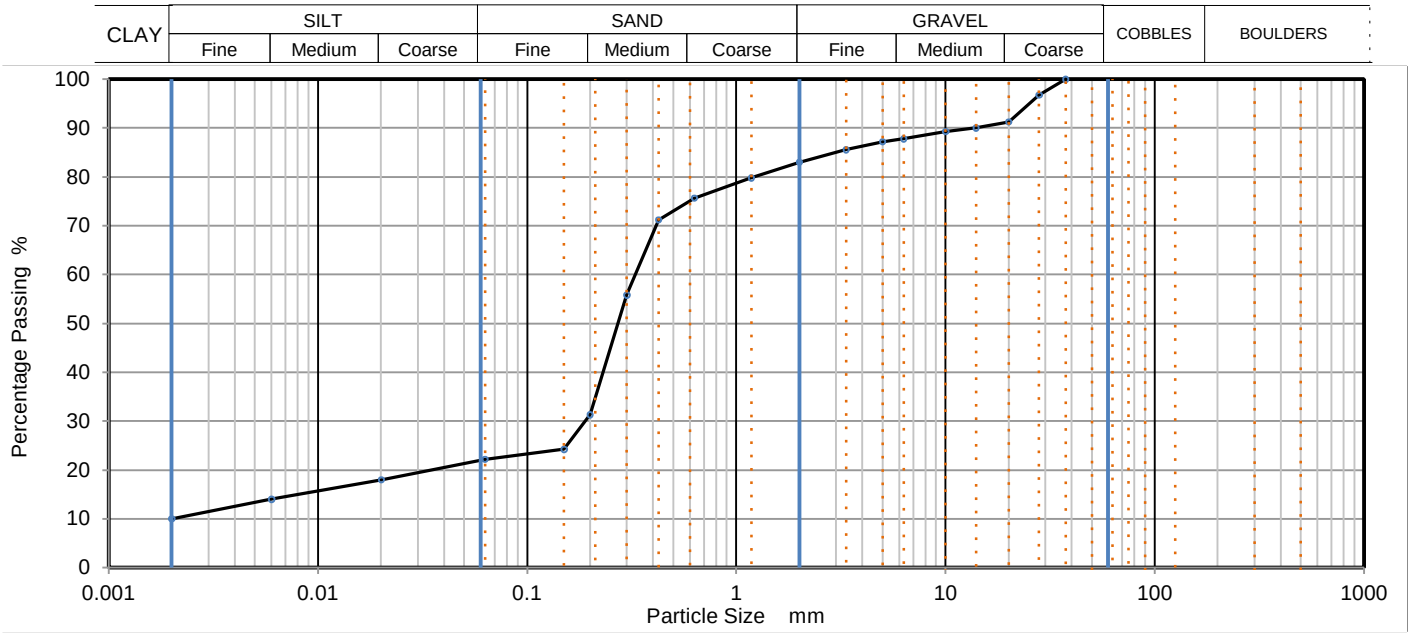
Laboratory Test Report	2230917 / 1

Site: P787-009-220817- Oxford **Job Number:** 2230917

Client: Oxford Biomedica **Page:** 2

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH01	2.00	B9	Wet Sieve + Pipette	Brown clayey, silty , gravelly SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	18
		0.0060	14
		0.0020	10
37.5	100		
28	97		
20	91		
14	90		
10	89		
6.3	88		
5	87		
3.35	86		
2	83	Particle density	(assumed)
1.18	80	2.65	Mg/m3
0.63	76		
0.425	71		
0.3	56		
0.2	31		
0.15	24		
0.063	22		

Dry Mass of sample, g: 1496

Sample Proportions	% dry mass
Very coarse	0
Gravel	17
Sand	61
Silt	12
Clay	10

Grading Analysis		
D100	mm	37.5
D60	mm	0.33
D30	mm	0.19
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

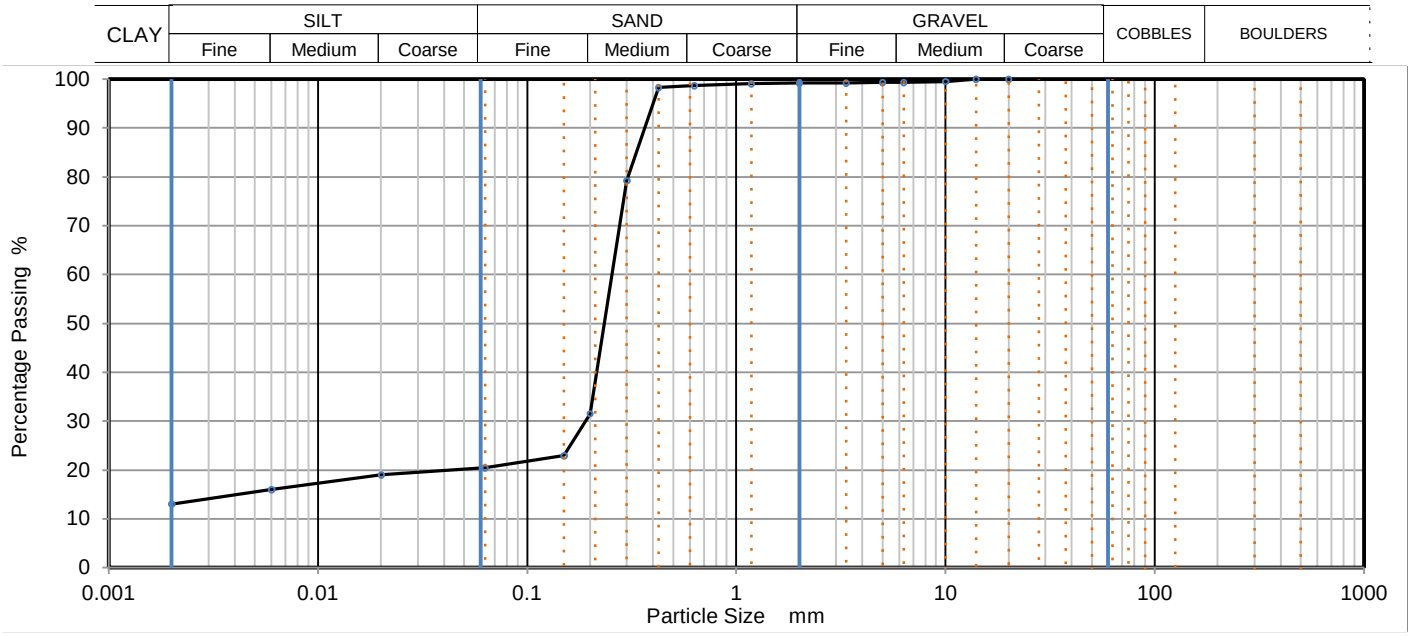
Laboratory Test Report	2230917 / 1

Site: P787-009-220817- Oxford **Job Number:** 2230917

Client: Oxford Biomedica **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH01	4.00	B15	Wet Sieve + Pipette	Light Brown slightly silty, clayey SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	19
		0.0060	16
		0.0020	13
20	100		
14	100		
10	100		
6.3	99		
5	99		
3.35	99		
2	99	Particle density	(assumed)
1.18	99	2.65	Mg/m3
0.63	99		
0.425	98		
0.3	79		
0.2	32		
0.15	23		
0.063	20		

Dry Mass of sample, g	622

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	79
Silt	8
Clay	13

Grading Analysis		
D100	mm	14
D60	mm	0.255
D30	mm	0.19
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

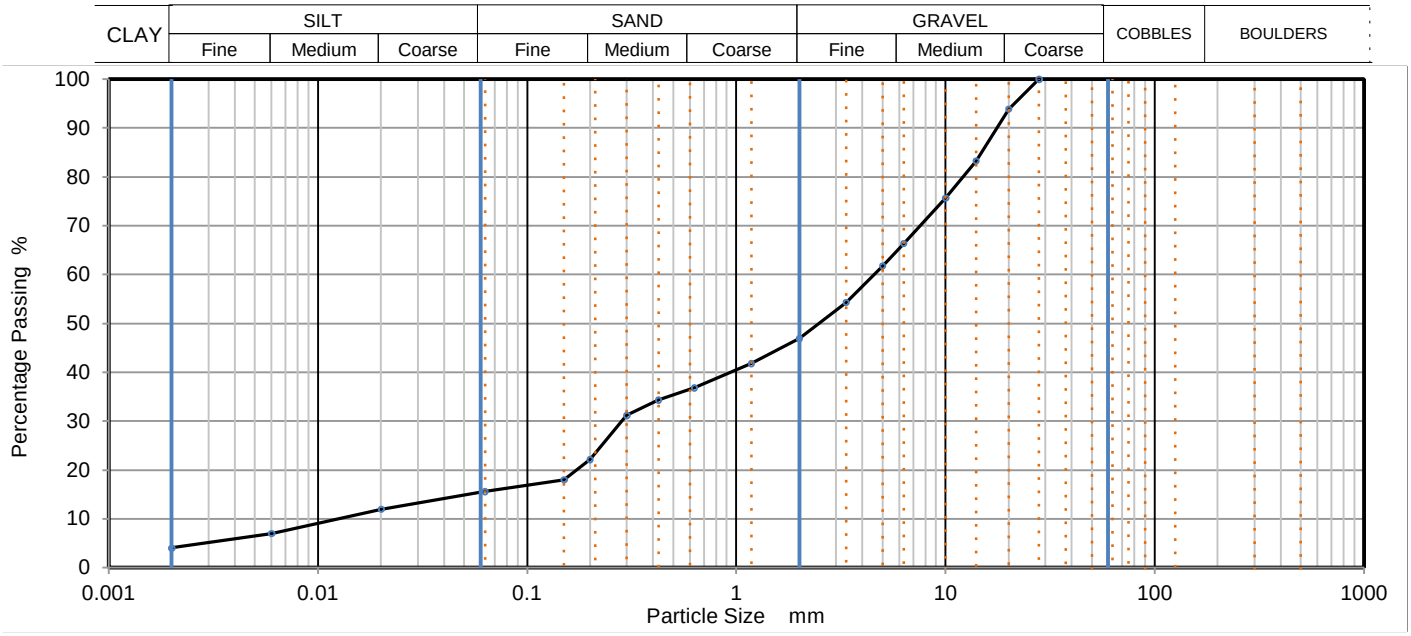
Laboratory Test Report	2230917 / 1

Site: P787-009-220817- Oxford **Job Number:** 2230917

Client: Oxford Biomedica **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH02	1.20	B5	Wet Sieve + Pipette	Brown silty, sandy GRAVEL



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	12
		0.0060	7
		0.0020	4
28	100		
20	94		
14	83		
10	76		
6.3	66		
5	62		
3.35	54		
2	47	Particle density	(assumed)
1.18	42	2.65	Mg/m3
0.63	37		
0.425	34		
0.3	31		
0.2	22		
0.15	18		
0.063	16		

Dry Mass of sample, g: 971

Sample Proportions	% dry mass
Very coarse	0
Gravel	53
Sand	31
Silt	12
Clay	4

Grading Analysis		
D100	mm	28
D60	mm	4.54
D30	mm	0.285
D10	mm	0.0128
Uniformity Coefficient		350
Curvature Coefficient		1.4

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

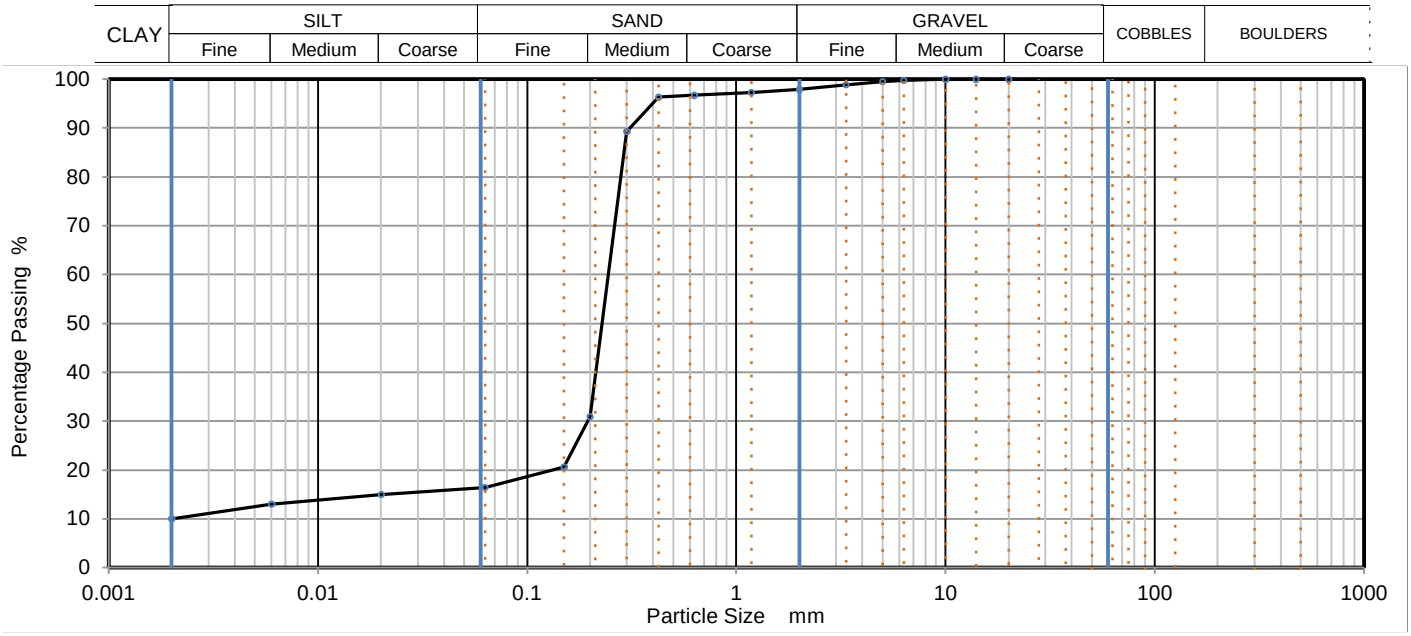
Laboratory Test Report	2230917 / 1

Site: P787-009-220817- Oxford **Job Number:** 2230917

Client: Oxford Biomedica **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH02	6.00	B18	Wet Sieve + Pipette	Light/Brown slightly silty, clayey SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	15
		0.0060	13
		0.0020	10
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	99		
2	98	Particle density	(assumed)
1.18	97	2.65	Mg/m3
0.63	97		
0.425	96		
0.3	89		
0.2	31		
0.15	21		
0.063	16		

Dry Mass of sample, g: 568

Sample Proportions	% dry mass
Very coarse	0
Gravel	2
Sand	82
Silt	6
Clay	10

Grading Analysis		
D100	mm	10
D60	mm	0.245
D30	mm	0.195
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

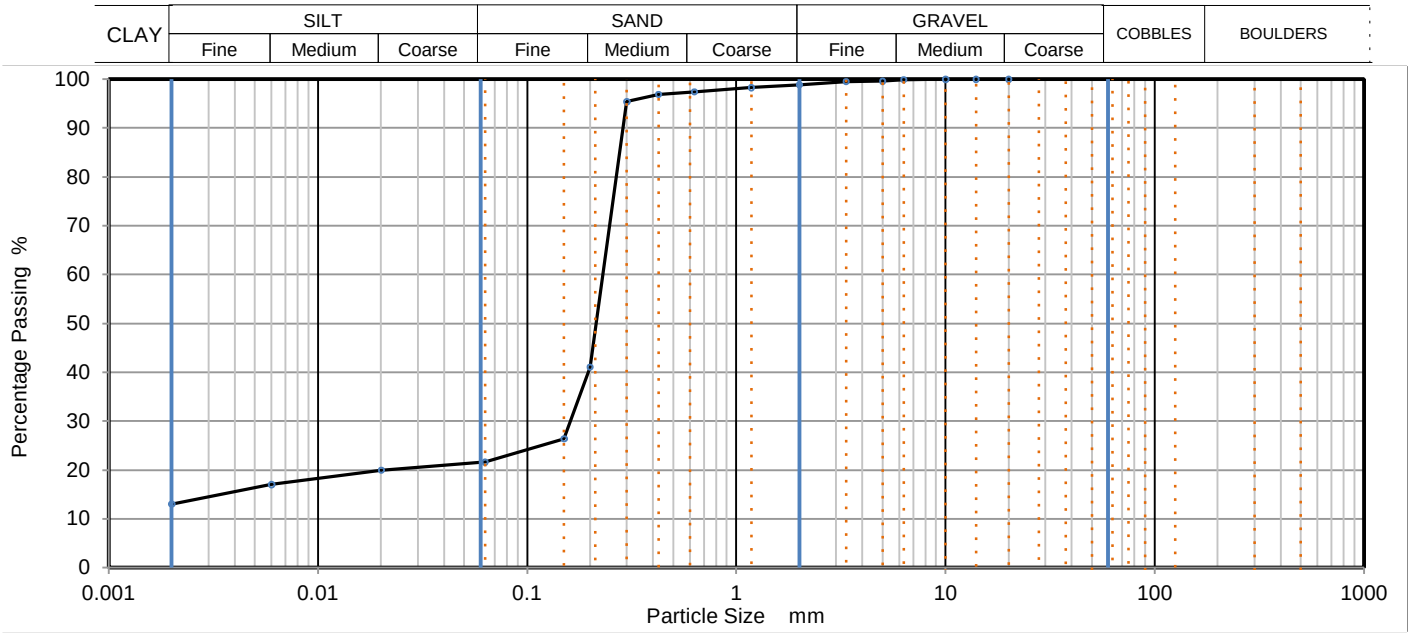
Laboratory Test Report	2230917 / 1

Site: P787-009-220817- Oxford **Job Number:** 2230917

Client: Oxford Biomedica **Page:** 6

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH02	7.50	B21	Wet Sieve + Pipette	Brown slightly silty, clayey SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	20
		0.0060	17
		0.0020	13
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	99	Particle density	(assumed)
1.18	98	2.65	Mg/m3
0.63	97		
0.425	97		
0.3	95		
0.2	41		
0.15	26		
0.063	22		

Dry Mass of sample, g: 595

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	77
Silt	9
Clay	13

Grading Analysis		
D100	mm	10
D60	mm	0.23
D30	mm	0.161
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

Final Test Report - 2230917 / 1

Site:	P787-009-220817- Oxford
Job Number:	2230917
Originating Client:	Oxford Biomedica

All opinions and interpretations contained within this report are outside of our Scope of Accreditation.

Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 13/01/2023

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 23/00082
Issue Number: 1 **Date:** 16 January, 2023

Client:
Ian Farmer Associates (Warrington)
14/15 Rufford Court
Hardwick Grange
Warrington
WA1 4RF

Project Manager: Joe Tant
Project Name: Oxford Biomedica
Project Ref: 2230917
Order No: P7534836
Date Samples Received: 05/01/23
Date Instructions Received: 06/01/23
Date Analysis Completed: 16/01/23

Approved by:

Gemma Berrisford
Client Manager

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 1247

Envirolab Job Number: 23/00082

Client Project Name: Oxford Biomedica

Client Project Ref: 2230917

Lab Sample ID	23/00082/1	23/00082/2	23/00082/3	23/00082/4	23/00082/5	23/00082/6		Units	Limit of Detection	Method ref
Client Sample No	5	10	4	6	19	13				
Client Sample ID	BH01	BH01	BH01	BH02	BH02	BH01				
Depth to Top	1.20	3.00	0.50	1.80	6.00	4.00				
Depth To Bottom	1.65	3.45	1.00		6.45	4.45				
Date Sampled	19-Dec-22	19-Dec-22	19-Dec-22	19-Dec-22	19-Dec-22	19-Dec-22				
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D				
Sample Matrix Code	4A	4AE	4AE	5A	5A	5A				
% Stones >10mm$_A$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		% w/w	0.1	A-T-044
pH BRE$_D^{M\#}$	8.53	9.32	10.52	9.48	8.94	9.31		pH	0.01	A-T-031s
Chloride BRE, SO4 equiv. (water sol 2:1)$_D^{M\#}$	27	39	84	95	-	-		mg/l	7	A-T-026s
Nitrate BRE, SO4 equiv. (water sol 2:1)$_D$	1.0	11.1	<0.4	1.4	-	-		mg/l	0.4	A-T-026s
Sulphate BRE (water sol 2:1)$_D^{M\#}$	82	281	1060	343	89	78		mg/l	10	A-T-026s
Sulphate BRE (acid sol)$_D^{M\#}$	0.05	0.14	1.19	0.12	0.04	0.04		% w/w	0.02	A-T-028s
Sulphur BRE (total)$_D$	0.02	0.06	0.43	0.05	0.01	0.01		% w/w	0.01	A-T-024s
Magnesium BRE (water sol 2:1)$_D$	<1	<1	<1	<1	-	-		mg/l	1	A-T-SOLMETS

REPORT NOTES

General

This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Warrington), 14/15 Rufford Court, Hardwick Grange, Warrington, WA1 4RF

Project: Oxford Biomedica

Clients Project No: 2230917

Project No: 23/00082

Date Received: 06/01/2023 (am)

Cool Box Temperatures (°C): 5.7

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	23/00082/1	23/00082/2	23/00082/3	23/00082/4	23/00082/5	23/00082/6
Client Sample No	5	10	4	6	19	13
Client Sample ID/Depth	BH01 1.20-1.65m	BH01 3.00-3.45m	BH01 0.50-1.00m	BH02 1.80m	BH02 6.00-6.45m	BH01 4.00-4.45m
Date Sampled	19/12/22	19/12/22	19/12/22	19/12/22	19/12/22	19/12/22
A-T-024s	11/01/2023	11/01/2023	11/01/2023	11/01/2023	16/01/2023	11/01/2023
A-T-026s	10/01/2023	10/01/2023	10/01/2023	10/01/2023	10/01/2023	10/01/2023
A-T-028s	11/01/2023	11/01/2023	11/01/2023	11/01/2023	16/01/2023	11/01/2023
A-T-031s	10/01/2023	10/01/2023	10/01/2023	10/01/2023	10/01/2023	10/01/2023
A-T-044	16/01/2023	16/01/2023	16/01/2023	16/01/2023	16/01/2023	16/01/2023
A-T-SOLMETS	11/01/2023	11/01/2023	11/01/2023	11/01/2023		

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

APPENDIX 4

GEOENVIRONMENTAL TESTS

APPENDIX 4

GENERAL NOTES ON GEOENVIRONMENTAL TESTS

A4.1 ACCREDITATION

A4.1.1 Testing has been carried out to either UKAS or MCERTS accreditation, as specified in the results tables.

A4.1.2 The unique reference for each sample is as stated on the relevant engineering log. Each sample is logged on a chain of custody and can be traced from exploratory hole to laboratory. The date of soil samples taken is as per the date shown on the engineering log.

A4.1.3 Subcontracted results are presented directly on headed paper from the subcontracting laboratory.

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/12590
Issue Number: 1 **Date:** 09 January, 2023

Client: Ian Farmer Associates (Warrington)
14/15 Rufford Court
Hardwick Grange
Warrington
WA1 4RF

Project Manager: Joe Tant
Project Name: Oxford Biomedica
Project Ref: 2230917
Order No: P7534816
Date Samples Received: 22/12/22
Date Instructions Received: 23/12/22
Date Analysis Completed: 09/01/23

Approved by:

Gemma Berrisford
Client Manager

Envirolab Job Number: 22/12590

Client Project Name: Oxford Biomedica

Client Project Ref: 2230917

Lab Sample ID	22/12590/1	22/12590/4	22/12590/6	22/12590/7	22/12590/9	22/12590/13		Units	Limit of Detection	Method ref
Client Sample No	2	7	14	2	4	2				
Client Sample ID	BH01	BH01	BH01	BH02	BH02	BH02				
Depth to Top	0.50	2.00	4.00	0.35	1.00	0.50				
Depth To Bottom										
Date Sampled	19-Dec-22	19-Dec-22	19-Dec-22	19-Dec-22	19-Dec-22	20-Dec-22				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES				
Sample Matrix Code	4A	4A	4	4A	4A	4ABE				
% Stones >10mm$_A$	36.1	16.0	<0.1	-	16.6	21.5		% w/w	0.1	A-T-044
pH$_D$[M#]	9.96	8.72	8.92	-	9.65	9.76		pH	0.01	A-T-031s
Sulphate (acid soluble)$_D$[M#]	12000	360	280	-	10000	9900		mg/kg	200	A-T-028s
Cyanide (total)$_A$[M#]	<1	<1	<1	-	<1	<1		mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	<0.2	<0.2	-	<0.2	<0.2		mg/kg	0.2	A-T-050s
Organic Matter$_D$[M#]	1.0	1.1	0.2	-	0.8	1.0		% w/w	0.1	A-T-032s
Arsenic$_D$[M#]	10	7	6	-	9	9		mg/kg	1	A-T-024s
Barium$_D$	52	89	13	-	70	89		mg/kg	1	A-T-024s
Beryllium$_D$	0.5	<0.5	<0.5	-	0.5	<0.5		mg/kg	0.5	A-T-024s
Boron (water soluble)$_D$	2.8	<1.0	<1.0	-	4.7	4.1		mg/kg	1	A-T-027s
Cadmium$_D$[M#]	0.6	0.6	<0.5	-	1.2	1.6		mg/kg	0.5	A-T-024s
Copper$_D$[M#]	86	16	4	-	61	155		mg/kg	1	A-T-024s
Chromium$_D$[M#]	14	12	9	-	17	93		mg/kg	1	A-T-024s
Lead$_D$[M#]	70	39	7	-	151	80		mg/kg	1	A-T-024s
Mercury$_D$	1.38	0.29	0.28	-	1.48	1.33		mg/kg	0.17	A-T-024s
Nickel$_D$[M#]	13	12	11	-	15	25		mg/kg	1	A-T-024s
Selenium$_D$[M#]	<1	<1	<1	-	<1	<1		mg/kg	1	A-T-024s
Vanadium$_D$[M#]	26	19	15	-	27	27		mg/kg	1	A-T-024s
Zinc$_D$[M#]	77	74	21	-	219	322		mg/kg	5	A-T-024s

Envirolab Job Number: 22/12590

Client Project Name: Oxford Biomedica

Client Project Ref: 2230917

Lab Sample ID	22/12590/1	22/12590/4	22/12590/6	22/12590/7	22/12590/9	22/12590/13		Units	Limit of Detection	Method ref
Client Sample No	2	7	14	2	4	2				
Client Sample ID	BH01	BH01	BH01	BH02	BH02	BH02				
Depth to Top	0.50	2.00	4.00	0.35	1.00	0.50				
Depth To Bottom										
Date Sampled	19-Dec-22	19-Dec-22	19-Dec-22	19-Dec-22	19-Dec-22	20-Dec-22				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES				
Sample Matrix Code	4A	4A	4	4A	4A	4ABE				
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_{D}^{\#}$	NAD	NAD	-	NAD	NAD	NAD				A-T-045
Asbestos Matrix (visual)$_{D}$	-	-	-	-	-	-				A-T-045
Asbestos Matrix (microscope)$_{D}$	-	-	-	-	-	-				A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_{D}$	N/A	N/A	-	N/A	N/A	N/A				A-T-045

Envirolab Job Number: 22/12590

Client Project Name: Oxford Biomedica

Client Project Ref: 2230917

Lab Sample ID	22/12590/1	22/12590/4	22/12590/6	22/12590/7	22/12590/9	22/12590/13		Units	Limit of Detection	Method ref
Client Sample No	2	7	14	2	4	2				
Client Sample ID	BH01	BH01	BH01	BH02	BH02	BH02				
Depth to Top	0.50	2.00	4.00	0.35	1.00	0.50				
Depth To Bottom										
Date Sampled	19-Dec-22	19-Dec-22	19-Dec-22	19-Dec-22	19-Dec-22	20-Dec-22				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES				
Sample Matrix Code	4A	4A	4	4A	4A	4ABE				
PAH-16MS										
Acenaphthene$_A^{M\#}$	<0.01	0.05	0.01	-	<0.01	<0.01		mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01		mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	<0.02	0.09	<0.02	-	<0.02	<0.02		mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	<0.04	0.23	0.07	-	<0.04	<0.04		mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	<0.04	0.40	0.07	-	<0.04	<0.04		mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	<0.05	0.36	0.09	-	<0.05	<0.05		mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	<0.05	0.32	<0.05	-	<0.05	<0.05		mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.07	0.14	<0.07	-	<0.07	<0.07		mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	<0.06	0.31	0.09	-	<0.06	<0.06		mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04	0.05	<0.04	-	<0.04	<0.04		mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	<0.08	0.55	0.17	-	<0.08	<0.08		mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	<0.01	0.04	0.01	-	<0.01	<0.01		mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	<0.03	0.32	0.04	-	<0.03	<0.03		mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	<0.03	<0.03	<0.03	-	<0.03	<0.03		mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	<0.03	0.40	0.11	-	<0.03	<0.03		mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	<0.07	0.56	0.16	-	<0.07	<0.07		mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	<0.08	3.82	0.82	-	<0.08	<0.08		mg/kg	0.01	A-T-019s

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Client Sample No	2	7	14	2	4	2				
Client Sample ID	BH01	BH01	BH01	BH02	BH02	BH02				
Depth to Top	0.50	2.00	4.00	0.35	1.00	0.50				
Depth To Bottom										
Date Sampled	19-Dec-22	19-Dec-22	19-Dec-22	19-Dec-22	19-Dec-22	20-Dec-22				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES				
Sample Matrix Code	4A	4A	4	4A	4A	4ABE				
Speciated PCB-WHO12										
PCB BZ 81$_{A}^{M\#}$	<0.005	-	-	-	-	-		mg/kg	0.005	A-T-004s
PCB BZ 105$_{A}^{M\#}$	<0.005	-	-	-	-	-		mg/kg	0.005	A-T-004s
PCB BZ 114$_{A}^{M\#}$	<0.005	-	-	-	-	-		mg/kg	0.005	A-T-004s
PCB BZ 118$_{A}^{M\#}$	<0.007	-	-	-	-	-		mg/kg	0.007	A-T-004s
PCB BZ 123$_{A}^{M\#}$	<0.005	-	-	-	-	-		mg/kg	0.005	A-T-004s
PCB BZ 126$_{A}^{M\#}$	<0.005	-	-	-	-	-		mg/kg	0.005	A-T-004s
PCB BZ 156$_{A}^{M\#}$	<0.005	-	-	-	-	-		mg/kg	0.005	A-T-004s
PCB BZ 157$_{A}^{M\#}$	<0.005	-	-	-	-	-		mg/kg	0.005	A-T-004s
PCB BZ 167$_{A}^{M\#}$	<0.005	-	-	-	-	-		mg/kg	0.005	A-T-004s
PCB BZ 169$_{A}^{M\#}$	<0.005	-	-	-	-	-		mg/kg	0.005	A-T-004s
PCB BZ 189$_{A}^{M\#}$	<0.005	-	-	-	-	-		mg/kg	0.005	A-T-004s
PCB BZ 77$_{A}^{M\#}$	<0.005	-	-	-	-	-		mg/kg	0.005	A-T-004s
Total Speciated PCB-WHO12$_{A}^{M\#}$	<0.007	-	-	-	-	-		mg/kg	0.005	A-T-004s

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Lab Sample ID	22/12590/1	22/12590/4	22/12590/6	22/12590/7	22/12590/9	22/12590/13		Units	Limit of Detection	Method ref
Client Sample No	2	7	14	2	4	2				
Client Sample ID	BH01	BH01	BH01	BH02	BH02	BH02				
Depth to Top	0.50	2.00	4.00	0.35	1.00	0.50				
Depth To Bottom										
Date Sampled	19-Dec-22	19-Dec-22	19-Dec-22	19-Dec-22	19-Dec-22	20-Dec-22				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES				
Sample Matrix Code	4A	4A	4	4A	4A	4ABE				
SVOC excluding PAH-16										
4-Bromophenyl phenyl ether$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
Hexachlorobenzene$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
Diethyl phthalate$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
Dimethyl phthalate$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
Dibenzofuran$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
Carbazole$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
Butylbenzyl phthalate$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
Bis(2-ethylhexyl)phthalate$_A$	<3000	<3000	<3000	-	<3000	<3000		µg/kg	500	A-T-052s
Bis(2-chloroethoxy)methane$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
Bis(2-chloroethyl)ether$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
4-Nitrophenol$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
3+4-Methylphenol$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
4-Chloro-3-methylphenol$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
2-Nitrophenol$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
2-Methylphenol$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
1,2,4-Trichlorobenzene$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
2-Chlorophenol$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
2,6-Dinitrotoluene$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
2,4-Dinitrotoluene$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
2,4-Dimethylphenol$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
2,4-Dichlorophenol$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
2,4,6-Trichlorophenol$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
2,4,5-Trichlorophenol$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
1,4-Dichlorobenzene$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
1,3-Dichlorobenzene$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
1,2-Dichlorobenzene$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
2-Chloronaphthalene$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
2-Methylnaphthalene$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
Bis(2-chloroisopropyl)ether$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
Phenol$_A$	<100	<100	<100	-	376	<100		µg/kg	100	A-T-052s
Pentachlorophenol$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
n-Nitroso-n-dipropylamine$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s

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Lab Sample ID	22/12590/1	22/12590/4	22/12590/6	22/12590/7	22/12590/9	22/12590/13		Units	Limit of Detection	Method ref
Client Sample No	2	7	14	2	4	2				
Client Sample ID	BH01	BH01	BH01	BH02	BH02	BH02				
Depth to Top	0.50	2.00	4.00	0.35	1.00	0.50				
Depth To Bottom										
Date Sampled	19-Dec-22	19-Dec-22	19-Dec-22	19-Dec-22	19-Dec-22	20-Dec-22				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES				
Sample Matrix Code	4A	4A	4	4A	4A	4ABE				
n-Dioctylphthalate$_A$	<500	<500	<500	-	<500	<500		µg/kg	500	A-T-052s
n-Dibutylphthalate$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
Nitrobenzene$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
Isophorone$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
Hexachloroethane$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
Hexachlorocyclopentadiene$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
Hexachlorobutadiene$_A$	<100	<100	<100	-	<100	<100		µg/kg	100	A-T-052s
Perylene$_A$	<100	115	<100	-	<100	<100		µg/kg	100	A-T-052s

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Client Sample No	2	7	14	2	4	2				
Client Sample ID	BH01	BH01	BH01	BH02	BH02	BH02				
Depth to Top	0.50	2.00	4.00	0.35	1.00	0.50				
Depth To Bottom										
Date Sampled	19-Dec-22	19-Dec-22	19-Dec-22	19-Dec-22	19-Dec-22	20-Dec-22				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES				
Sample Matrix Code	4A	4A	4	4A	4A	4ABE				
VOC										
Dichlorodifluoromethane$_{A}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
Chloromethane$_{A}$	<10	<10	<10	-	<10	<10		µg/kg	10	A-T-006s
Vinyl Chloride (Chloroethene)$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
Bromomethane$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
Chloroethane$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
Trichlorofluoromethane$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
1,1-Dichloroethene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
Carbon Disulphide$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
Dichloromethane$_{A}$	<5	<5	<5	-	<5	<5		µg/kg	5	A-T-006s
trans 1,2-Dichloroethene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
1,1-Dichloroethane$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
cis 1,2-Dichloroethene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
2,2-Dichloropropane$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
Bromochloromethane$_{A}^{\#}$	<5	<5	<5	-	<5	<5		µg/kg	5	A-T-006s
Chloroform$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
1,1,1-Trichloroethane$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
1,1-Dichloropropene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
Carbon Tetrachloride$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
1,2-Dichloroethane$_{A}^{\#}$	<2	<2	<2	-	<2	<2		µg/kg	2	A-T-006s
Benzene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
Trichloroethene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
1,2-Dichloropropane$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
Dibromomethane$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
Bromodichloromethane$_{A}^{\#}$	<10	<10	<10	-	<10	<10		µg/kg	10	A-T-006s
cis 1,3-Dichloropropene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
Toluene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
trans 1,3-Dichloropropene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
1,1,2-Trichloroethane$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
1,3-Dichloropropane$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
Tetrachloroethene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
Dibromochloromethane$_{A}^{\#}$	<3	<3	<3	-	<3	<3		µg/kg	3	A-T-006s
1,2-Dibromoethane$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s

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Lab Sample ID	22/12590/1	22/12590/4	22/12590/6	22/12590/7	22/12590/9	22/12590/13		Units	Limit of Detection	Method ref
Client Sample No	2	7	14	2	4	2				
Client Sample ID	BH01	BH01	BH01	BH02	BH02	BH02				
Depth to Top	0.50	2.00	4.00	0.35	1.00	0.50				
Depth To Bottom										
Date Sampled	19-Dec-22	19-Dec-22	19-Dec-22	19-Dec-22	19-Dec-22	20-Dec-22				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES				
Sample Matrix Code	4A	4A	4	4A	4A	4ABE				
Chlorobenzene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
1,1,1,2-Tetrachloroethane$_{A}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
Ethylbenzene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
m & p Xylene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
o-Xylene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
Styrene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
Bromoform$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
Isopropylbenzene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
1,1,2,2-Tetrachloroethane$_{A}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
1,2,3-Trichloropropane$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
Bromobenzene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
n-Propylbenzene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
2-Chlorotoluene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
1,3,5-Trimethylbenzene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
4-Chlorotoluene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
tert-Butylbenzene$_{A}^{\#}$	<2	<2	<2	-	<2	<2		µg/kg	2	A-T-006s
1,2,4-Trimethylbenzene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
sec-Butylbenzene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
4-Isopropyltoluene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
1,3-Dichlorobenzene$_{A}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
1,4-Dichlorobenzene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
n-Butylbenzene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
1,2-Dichlorobenzene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
1,2-Dibromo-3-chloropropane (DCBP)$_{A}$	<2	<2	<2	-	<2	<2		µg/kg	2	A-T-006s
1,2,4-Trichlorobenzene$_{A}$	<3	<3	<3	-	<3	<3		µg/kg	3	A-T-006s
Hexachlorobutadiene$_{A}^{\#}$	<1	<1	<1	-	<1	<1		µg/kg	1	A-T-006s
1,2,3-Trichlorobenzene$_{A}$	<3	<3	<3	-	<3	<3		µg/kg	3	A-T-006s

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Client Sample No	2	7	14	2	4	2				
Client Sample ID	BH01	BH01	BH01	BH02	BH02	BH02				
Depth to Top	0.50	2.00	4.00	0.35	1.00	0.50				
Depth To Bottom										
Date Sampled	19-Dec-22	19-Dec-22	19-Dec-22	19-Dec-22	19-Dec-22	20-Dec-22				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES				
Sample Matrix Code	4A	4A	4	4A	4A	4ABE				
TPH CWG with Clean Up										
Ali >C5-C6$_A^{\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01		mg/kg	0.01	A-T-022s
Ali >C6-C8$_A^{\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01		mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	<1	<1	<1	-	<1	<1		mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	<1	<1	<1	-	<1	<1		mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	<1	<1	<1	-	<1	<1		mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	1	<1	<1	-	2	2		mg/kg	1	A-T-055s
Ali >C21-C35$_A^{M\#}$	45	10	4	-	133	71		mg/kg	1	A-T-055s
Total Aliphatics$_A$	47	10	4	-	135	73		mg/kg	1	Calc-As Recd
Aro >C5-C7$_A^{\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01		mg/kg	0.01	A-T-022s
Aro >C7-C8$_A^{\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01		mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	2	2	1	-	4	3		mg/kg	1	A-T-055s
Aro >C10-C12$_A$	<1	<1	<1	-	<1	<1		mg/kg	1	A-T-055s
Aro >C12-C16$_A$	<1	<1	<1	-	<1	<1		mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	3	4	1	-	2	2		mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	5	11	5	-	3	7		mg/kg	1	A-T-055s
Total Aromatics$_A$	11	17	7	-	10	13		mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C35)$_A$	57	27	11	-	144	86		mg/kg	1	Calc-As Recd
BTEX - Benzene$_A^{\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01		mg/kg	0.01	A-T-022s
BTEX - Toluene$_A^{\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01		mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01		mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01		mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A^{\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01		mg/kg	0.01	A-T-022s
MTBE$_A^{\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01		mg/kg	0.01	A-T-022s

REPORT NOTES

General

This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Warrington), 14/15 Rufford Court, Hardwick Grange, Warrington, WA1 4RF

Project: Oxford Biomedica

Clients Project No: 2230917

Project No: 22/12590

Date Received: 23/12/2022 (am)

Cool Box Temperatures (°C): 7.3, 7.2, 7.3, 7.1

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/12590/1	22/12590/4	22/12590/6	22/12590/7	22/12590/9	22/12590/13
Client Sample No	2	7	14	2	4	2
Client Sample ID/Depth	BH01 0.50m	BH01 2.00m	BH01 4.00m	BH02 0.35m	BH02 1.00m	BH02 0.50m
Date Sampled	19/12/22	19/12/22	19/12/22	19/12/22	19/12/22	20/12/22
A-T-004s	05/01/2023					
A-T-006s	28/12/2022	28/12/2022	28/12/2022		28/12/2022	28/12/2022
A-T-019s	03/01/2023	03/01/2023	03/01/2023		03/01/2023	03/01/2023
A-T-022s	03/01/2023	03/01/2023	03/01/2023		03/01/2023	03/01/2023
A-T-024s	09/01/2023	09/01/2023	09/01/2023		09/01/2023	09/01/2023
A-T-027s	06/01/2023	06/01/2023	06/01/2023		06/01/2023	06/01/2023
A-T-028s	06/01/2023	06/01/2023	06/01/2023		06/01/2023	06/01/2023
A-T-031s	05/01/2023	05/01/2023	05/01/2023		05/01/2023	05/01/2023
A-T-032s	06/01/2023	06/01/2023	06/01/2023		06/01/2023	06/01/2023
A-T-042sTCN	23/12/2022	23/12/2022	23/12/2022		23/12/2022	23/12/2022
A-T-044	05/01/2023	05/01/2023	05/01/2023		05/01/2023	05/01/2023
A-T-045	03/01/2023	03/01/2023		03/01/2023	03/01/2023	03/01/2023
A-T-050s	03/01/2023	03/01/2023	03/01/2023		03/01/2023	03/01/2023
A-T-052s	03/01/2023	03/01/2023	03/01/2023		03/01/2023	03/01/2023
A-T-055s	04/01/2023	04/01/2023	04/01/2023		04/01/2023	04/01/2023
Calc-As Recd	04/01/2023	04/01/2023	04/01/2023		04/01/2023	04/01/2023

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

Waste Classification Report

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

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

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

9NO8V-WQGD4-BCPQ8

Job name

2230917 Oxford Biomedica Oxbox

Description/Comments

Project

2230917

Site

Oxford Biomedica Oxbox

Classified by

Name:
Victoria Tickner
Date:
26 Jan 2023 16:43 GMT
Telephone:
01582 460018

Company:
Ian Farmer Associates
1A Baford Mill
Lower Luton Road
Harpenden
AL5 5BZ

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

HazWasteOnline™ Certification: **CERTIFIED**

Course	Date
Hazardous Waste Classification	05 Aug 2021

Next 3 year Refresher due by Aug 2024

Purpose of classification

2 - Material Characterisation

Address of the waste

Oxford Biomedica Oxbox, Alec Issigonis Way **Post Code** OX4 2ZY

SIC for the process giving rise to the waste

41201 Construction of commercial buildings

Description of industry/producer giving rise to the waste

Development of two storey extension to existing building

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

Wast created during the excavation of soils for development of the proposed extension

Description of the waste

Made Ground comprising sandy, clayey gravel and gravelly, clayey, silty sand including brick, concrete, timber, textiles, and plastic and natural soil comprising silty, clayey sand

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	BH01	0.50	Non Hazardous		3
2	BH01[2]	2.00	Non Hazardous		6
3	BH01[3]	4.00	Non Hazardous		9
4	BH02	1.00	Non Hazardous		12
5	BH02[2]	0.50	Non Hazardous		15

Related documents

#	Name	Description
1	New Template 2022 (2)	waste stream template used to create this Job

Report

Created by: Victoria Tickner

Created date: 26 Jan 2023 16:43 GMT

Classification of sample: BH01

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

Sample details

Sample name:
BH01
Sample Depth:
0.50 m

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

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	pH			PH		9.96	pH		9.96	pH	9.96 pH		
2	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<LOD
3	phenol	604-001-00-2	203-632-7	108-95-2		<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		<LOD
4	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		10	mg/kg	1.32	13.203	mg/kg	0.00132 %		
5	barium { barium sulphide }	016-002-00-X	244-214-4	21109-95-5		52	mg/kg	1.233	64.142	mg/kg	0.00641 %		
6	beryllium { beryllium chloride }			7787-47-5		0.5	mg/kg	8.868	4.434	mg/kg	0.000443 %		
7	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		2.8	mg/kg	3.22	9.016	mg/kg	0.000902 %		
8	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.6	mg/kg	1.142	0.685	mg/kg	0.0000685 %		
9	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		86	mg/kg	1.126	96.826	mg/kg	0.00968 %		
10	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		14	mg/kg	1.462	20.462	mg/kg	0.00205 %		
11	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	70	mg/kg	1.56	109.187	mg/kg	0.007 %		
12	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		1.38	mg/kg	1.353	1.868	mg/kg	0.000187 %		
13	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		13	mg/kg	2.976	38.691	mg/kg	0.00387 %		
14	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		<LOD
15	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		26	mg/kg	1.785	46.415	mg/kg	0.00464 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
16		zinc { zinc chromate }				77	mg/kg	2.774	213.609	mg/kg	0.0214 %		
		024-007-00-3	236-878-9	13530-65-9									
17		acenaphthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			201-469-6	83-32-9									
18		acenaphthylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-917-1	208-96-8									
19		anthracene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<**LOD**
			204-371-1	120-12-7									
20		benzo[a]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-033-00-9	200-280-6	56-55-3									
21		benzo[a]pyrene; benzo[def]chrysene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-032-00-3	200-028-5	50-32-8									
22		benzo[b]fluoranthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
		601-034-00-4	205-911-9	205-99-2									
23		benzo[ghi]perylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
			205-883-8	191-24-2									
24		benzo[k]fluoranthene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		<**LOD**
		601-036-00-5	205-916-6	207-08-9									
25		chrysene				<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<**LOD**
		601-048-00-0	205-923-4	218-01-9									
26		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
27		fluoranthene				<0.08	mg/kg		<0.08	mg/kg	<0.000008 %		<**LOD**
			205-912-4	206-44-0									
28		fluorene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			201-695-5	86-73-7									
29		indeno[123-cd]pyrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			205-893-2	193-39-5									
30		naphthalene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
		601-052-00-2	202-049-5	91-20-3									
31		phenanthrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			201-581-5	85-01-8									
32		pyrene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		<**LOD**
			204-927-3	129-00-0									
33		polychlorobiphenyls; PCB				<0.007	mg/kg		<0.007	mg/kg	<0.0000007 %		<**LOD**
		602-039-00-4	215-648-1	1336-36-3									
34		TPH (C6 to C40) petroleum group				57	mg/kg		57	mg/kg	0.0057 %		
				TPH									
35		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		603-181-00-X	216-653-1	1634-04-4									
36		benzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-020-00-8	200-753-7	71-43-2									
37		toluene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-021-00-3	203-625-9	108-88-3									
38		ethylbenzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-023-00-4	202-849-4	100-41-4									
39		xylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
										Total:	0.0642 %		

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

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Solid, not liquid. Not deemed flammable at concentrations observed. Inert soil threshold adopted.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0057%)

Classification of sample: BH01[2]

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

Sample details

Sample name:
BH01[2]
Sample Depth:
2.00 m

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

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	pH			PH		8.72 pH		8.72 pH	8.72 pH		
2	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<LOD
3	phenol	604-001-00-2	203-632-7	108-95-2		<0.2 mg/kg		<0.2 mg/kg	<0.00002 %		<LOD
4	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		7 mg/kg	1.32	9.242 mg/kg	0.000924 %		
5	barium { barium sulphide }	016-002-00-X	244-214-4	21109-95-5		89 mg/kg	1.233	109.781 mg/kg	0.011 %		
6	beryllium { beryllium chloride }			7787-47-5		<0.5 mg/kg	8.868	<4.434 mg/kg	<0.000443 %		<LOD
7	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		<1 mg/kg	3.22	<3.22 mg/kg	<0.000322 %		<LOD
8	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.6 mg/kg	1.142	0.685 mg/kg	0.0000685 %		
9	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		16 mg/kg	1.126	18.014 mg/kg	0.0018 %		
10	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		12 mg/kg	1.462	17.539 mg/kg	0.00175 %		
11	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	39 mg/kg	1.56	60.833 mg/kg	0.0039 %		
12	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.29 mg/kg	1.353	0.393 mg/kg	0.0000393 %		
13	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		12 mg/kg	2.976	35.715 mg/kg	0.00357 %		
14	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<LOD
15	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		19 mg/kg	1.785	33.919 mg/kg	0.00339 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
16		zinc { zinc chromate }				74	mg/kg	2.774	205.287	mg/kg	0.0205 %		
		024-007-00-3	236-878-9	13530-65-9									
17		acenaphthene				0.05	mg/kg		0.05	mg/kg	0.000005 %		
			201-469-6	83-32-9									
18		acenaphthylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-917-1	208-96-8									
19		anthracene				0.09	mg/kg		0.09	mg/kg	0.000009 %		
			204-371-1	120-12-7									
20		benzo[a]anthracene				0.23	mg/kg		0.23	mg/kg	0.000023 %		
		601-033-00-9	200-280-6	56-55-3									
21		benzo[a]pyrene; benzo[def]chrysene				0.4	mg/kg		0.4	mg/kg	0.00004 %		
		601-032-00-3	200-028-5	50-32-8									
22		benzo[b]fluoranthene				0.36	mg/kg		0.36	mg/kg	0.000036 %		
		601-034-00-4	205-911-9	205-99-2									
23		benzo[ghi]perylene				0.32	mg/kg		0.32	mg/kg	0.000032 %		
			205-883-8	191-24-2									
24		benzo[k]fluoranthene				0.14	mg/kg		0.14	mg/kg	0.000014 %		
		601-036-00-5	205-916-6	207-08-9									
25		chrysene				0.31	mg/kg		0.31	mg/kg	0.000031 %		
		601-048-00-0	205-923-4	218-01-9									
26		dibenz[a,h]anthracene				0.05	mg/kg		0.05	mg/kg	0.000005 %		
		601-041-00-2	200-181-8	53-70-3									
27		fluoranthene				0.55	mg/kg		0.55	mg/kg	0.000055 %		
			205-912-4	206-44-0									
28		fluorene				0.04	mg/kg		0.04	mg/kg	0.000004 %		
			201-695-5	86-73-7									
29		indeno[123-cd]pyrene				0.32	mg/kg		0.32	mg/kg	0.000032 %		
			205-893-2	193-39-5									
30		naphthalene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
		601-052-00-2	202-049-5	91-20-3									
31		phenanthrene				0.4	mg/kg		0.4	mg/kg	0.00004 %		
			201-581-5	85-01-8									
32		pyrene				0.56	mg/kg		0.56	mg/kg	0.000056 %		
			204-927-3	129-00-0									
33		TPH (C6 to C40) petroleum group				27	mg/kg		27	mg/kg	0.0027 %		
				TPH									
34		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		603-181-00-X	216-653-1	1634-04-4									
35		benzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-020-00-8	200-753-7	71-43-2									
36		toluene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-021-00-3	203-625-9	108-88-3									
37		ethylbenzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-023-00-4	202-849-4	100-41-4									
38		xylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
										Total:	0.0513 %		

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

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Solid, not liquid. Not deemed flammable at concentrations observed. Inert soil threshold adopted.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0027%)

Classification of sample: BH01[3]

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

Sample details

Sample name:
BH01[3]

Sample Depth:
4.00 m

LoW Code:

Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)

Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	pH			PH		8.92 pH		8.92 pH	8.92 pH		
2	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<**LOD**
3	phenol	604-001-00-2	203-632-7	108-95-2		<0.2 mg/kg		<0.2 mg/kg	<0.00002 %		<**LOD**
4	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		6 mg/kg	1.32	7.922 mg/kg	0.000792 %		
5	barium { barium sulphide }	016-002-00-X	244-214-4	21109-95-5		13 mg/kg	1.233	16.035 mg/kg	0.0016 %		
6	beryllium { beryllium chloride }			7787-47-5		<0.5 mg/kg	8.868	<4.434 mg/kg	<0.000443 %		<**LOD**
7	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		<1 mg/kg	3.22	<3.22 mg/kg	<0.000322 %		<**LOD**
8	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		<0.5 mg/kg	1.142	<0.571 mg/kg	<0.0000571 %		<**LOD**
9	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		4 mg/kg	1.126	4.504 mg/kg	0.00045 %		
10	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		9 mg/kg	1.462	13.154 mg/kg	0.00132 %		
11	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	7 mg/kg	1.56	10.919 mg/kg	0.0007 %		
12	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.28 mg/kg	1.353	0.379 mg/kg	0.0000379 %		
13	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		11 mg/kg	2.976	32.739 mg/kg	0.00327 %		
14	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<**LOD**
15	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		15 mg/kg	1.785	26.778 mg/kg	0.00268 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
16		zinc { zinc chromate }				21	mg/kg	2.774	58.257	mg/kg	0.00583 %		
		024-007-00-3	236-878-9	13530-65-9									
17		acenaphthene				0.01	mg/kg		0.01	mg/kg	0.000001 %		
			201-469-6	83-32-9									
18		acenaphthylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-917-1	208-96-8									
19		anthracene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<**LOD**
			204-371-1	120-12-7									
20		benzo[a]anthracene				0.07	mg/kg		0.07	mg/kg	0.000007 %		
		601-033-00-9	200-280-6	56-55-3									
21		benzo[a]pyrene; benzo[def]chrysene				0.07	mg/kg		0.07	mg/kg	0.000007 %		
		601-032-00-3	200-028-5	50-32-8									
22		benzo[b]fluoranthene				0.09	mg/kg		0.09	mg/kg	0.000009 %		
		601-034-00-4	205-911-9	205-99-2									
23		benzo[ghi]perylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
			205-883-8	191-24-2									
24		benzo[k]fluoranthene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		<**LOD**
		601-036-00-5	205-916-6	207-08-9									
25		chrysene				0.09	mg/kg		0.09	mg/kg	0.000009 %		
		601-048-00-0	205-923-4	218-01-9									
26		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
27		fluoranthene				0.17	mg/kg		0.17	mg/kg	0.000017 %		
			205-912-4	206-44-0									
28		fluorene				0.01	mg/kg		0.01	mg/kg	0.000001 %		
			201-695-5	86-73-7									
29		indeno[123-cd]pyrene				0.04	mg/kg		0.04	mg/kg	0.000004 %		
			205-893-2	193-39-5									
30		naphthalene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
		601-052-00-2	202-049-5	91-20-3									
31		phenanthrene				0.11	mg/kg		0.11	mg/kg	0.000011 %		
			201-581-5	85-01-8									
32		pyrene				0.16	mg/kg		0.16	mg/kg	0.000016 %		
			204-927-3	129-00-0									
33		TPH (C6 to C40) petroleum group				11	mg/kg		11	mg/kg	0.0011 %		
				TPH									
34		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		603-181-00-X	216-653-1	1634-04-4									
35		benzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-020-00-8	200-753-7	71-43-2									
36		toluene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-021-00-3	203-625-9	108-88-3									
37		ethylbenzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-023-00-4	202-849-4	100-41-4									
38		xylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
										Total:	0.0192 %		

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

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"
Force this Hazardous property to non hazardous because Solid, not liquid. Not deemed flammable at concentrations observed. Inert soil threshold adopted.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0011%)

Classification of sample: BH02

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

Sample details

Sample name:
BH02
Sample Depth:
1.00 m

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

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	pH			PH		9.65 pH		9.65 pH	9.65 pH		
2	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<LOD
3	phenol	604-001-00-2	203-632-7	108-95-2		<0.2 mg/kg		<0.2 mg/kg	<0.00002 %		<LOD
4	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		9 mg/kg	1.32	11.883 mg/kg	0.00119 %		
5	barium { barium sulphide }	016-002-00-X	244-214-4	21109-95-5		70 mg/kg	1.233	86.345 mg/kg	0.00863 %		
6	beryllium { beryllium chloride }			7787-47-5		0.5 mg/kg	8.868	4.434 mg/kg	0.000443 %		
7	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		4.7 mg/kg	3.22	15.133 mg/kg	0.00151 %		
8	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		1.2 mg/kg	1.142	1.371 mg/kg	0.000137 %		
9	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		61 mg/kg	1.126	68.679 mg/kg	0.00687 %		
10	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		17 mg/kg	1.462	24.846 mg/kg	0.00248 %		
11	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	151 mg/kg	1.56	235.532 mg/kg	0.0151 %		
12	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		1.48 mg/kg	1.353	2.003 mg/kg	0.0002 %		
13	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		15 mg/kg	2.976	44.644 mg/kg	0.00446 %		
14	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<LOD
15	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		27 mg/kg	1.785	48.2 mg/kg	0.00482 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
16		zinc { zinc chromate }				219	mg/kg	2.774	607.538	mg/kg	0.0608 %		
		024-007-00-3	236-878-9	13530-65-9									
17		acenaphthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
			201-469-6	83-32-9									
18		acenaphthylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
			205-917-1	208-96-8									
19		anthracene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
			204-371-1	120-12-7									
20		benzo[a]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
		601-033-00-9	200-280-6	56-55-3									
21		benzo[a]pyrene; benzo[def]chrysene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
		601-032-00-3	200-028-5	50-32-8									
22		benzo[b]fluoranthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		601-034-00-4	205-911-9	205-99-2									
23		benzo[ghi]perylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
			205-883-8	191-24-2									
24		benzo[k]fluoranthene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		<LOD
		601-036-00-5	205-916-6	207-08-9									
25		chrysene				<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<LOD
		601-048-00-0	205-923-4	218-01-9									
26		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
27		fluoranthene				<0.08	mg/kg		<0.08	mg/kg	<0.000008 %		<LOD
			205-912-4	206-44-0									
28		fluorene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
			201-695-5	86-73-7									
29		indeno[123-cd]pyrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
			205-893-2	193-39-5									
30		naphthalene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
		601-052-00-2	202-049-5	91-20-3									
31		phenanthrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
			201-581-5	85-01-8									
32		pyrene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		<LOD
			204-927-3	129-00-0									
33		TPH (C6 to C40) petroleum group				144	mg/kg		144	mg/kg	0.0144 %		
				TPH									
34		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		603-181-00-X	216-653-1	1634-04-4									
35		benzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-020-00-8	200-753-7	71-43-2									
36		toluene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-021-00-3	203-625-9	108-88-3									
37		ethylbenzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-023-00-4	202-849-4	100-41-4									
38		xylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
										Total:	0.122 %		

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

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Solid, not liquid. Not deemed flammable at concentrations observed. Inert soil threshold adopted.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0144%)

Classification of sample: BH02[2]

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

Sample details

Sample name:
BH02[2]
Sample Depth:
0.50 m

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

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	pH			PH		9.76	pH		9.76	pH	9.76 pH		
2	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<**LOD**
3	phenol	604-001-00-2	203-632-7	108-95-2		<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		<**LOD**
4	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		9	mg/kg	1.32	11.883	mg/kg	0.00119 %		
5	barium { barium sulphide }	016-002-00-X	244-214-4	21109-95-5		89	mg/kg	1.233	109.781	mg/kg	0.011 %		
6	beryllium { beryllium chloride }			7787-47-5		<0.5	mg/kg	8.868	<4.434	mg/kg	<0.000443 %		<**LOD**
7	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		4.1	mg/kg	3.22	13.201	mg/kg	0.00132 %		
8	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		1.6	mg/kg	1.142	1.828	mg/kg	0.000183 %		
9	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		155	mg/kg	1.126	174.513	mg/kg	0.0175 %		
10	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		93	mg/kg	1.462	135.925	mg/kg	0.0136 %		
11	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	80	mg/kg	1.56	124.785	mg/kg	0.008 %		
12	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		1.33	mg/kg	1.353	1.8	mg/kg	0.00018 %		
13	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		25	mg/kg	2.976	74.407	mg/kg	0.00744 %		
14	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		<**LOD**
15	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		27	mg/kg	1.785	48.2	mg/kg	0.00482 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
16		zinc { zinc chromate }				322	mg/kg	2.774	893.275	mg/kg	0.0893 %		
		024-007-00-3	236-878-9	13530-65-9									
17		acenaphthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
			201-469-6	83-32-9									
18		acenaphthylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
			205-917-1	208-96-8									
19		anthracene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
			204-371-1	120-12-7									
20		benzo[a]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
		601-033-00-9	200-280-6	56-55-3									
21		benzo[a]pyrene; benzo[def]chrysene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
		601-032-00-3	200-028-5	50-32-8									
22		benzo[b]fluoranthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		601-034-00-4	205-911-9	205-99-2									
23		benzo[ghi]perylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
			205-883-8	191-24-2									
24		benzo[k]fluoranthene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		<LOD
		601-036-00-5	205-916-6	207-08-9									
25		chrysene				<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<LOD
		601-048-00-0	205-923-4	218-01-9									
26		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
27		fluoranthene				<0.08	mg/kg		<0.08	mg/kg	<0.000008 %		<LOD
			205-912-4	206-44-0									
28		fluorene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
			201-695-5	86-73-7									
29		indeno[123-cd]pyrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
			205-893-2	193-39-5									
30		naphthalene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
		601-052-00-2	202-049-5	91-20-3									
31		phenanthrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
			201-581-5	85-01-8									
32		pyrene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		<LOD
			204-927-3	129-00-0									
33		TPH (C6 to C40) petroleum group				86	mg/kg		86	mg/kg	0.0086 %		
				TPH									
34		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		603-181-00-X	216-653-1	1634-04-4									
35		benzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-020-00-8	200-753-7	71-43-2									
36		toluene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-021-00-3	203-625-9	108-88-3									
37		ethylbenzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-023-00-4	202-849-4	100-41-4									
38		xylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
										Total:	0.164 %		

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

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"
Force this Hazardous property to non hazardous because Solid, not liquid. Not deemed flammable at concentrations observed. Inert soil threshold adopted.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0086%)

Appendix A: Classifier defined and non GB MCL determinands

- **pH** (CAS Number: PH)

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

- **salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex**

GB MCL index number: 006-007-00-5
Description/Comments: Conversion factor based on a worst case compound: sodium cyanide
Additional Hazard Statement(s): EUH032 >= 0.2 %
Reason for additional Hazards Statement(s):
20 Nov 2021 - EUH032 >= 0.2 % hazard statement sourced from: WM3, Table C12.2

- **barium sulphide** (EC Number: 244-214-4, CAS Number: 21109-95-5)

GB MCL index number: 016-002-00-X
Description/Comments:
Additional Hazard Statement(s): EUH031 >= 0.8 %
Reason for additional Hazards Statement(s):
20 Nov 2021 - EUH031 >= 0.8 % hazard statement sourced from: WM3, Table C12.2

- **beryllium chloride** (CAS Number: 7787-47-5)

Description/Comments: Data from C&L Inventory Database; No entries in Registered Substances Database, IARC or Pesticide Properties Database
Data source: http://clp-inventory.echa.europa.eu/SummaryOfClassAndLabelling.aspx?SubstanceID=27264&HarmOnly=no?fc=true&lang=en
Data source date: 02 Jun 2014
Hazard Statements: Acute Tox. 3; H301 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Skin Sens. 1; H317 , Carc. 1B; H350 , STOT RE 1; H372 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

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

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

- **divanadium pentaoxide; vanadium pentoxide** (EC Number: 215-239-8, CAS Number: 1314-62-1)

GB MCL index number: 023-001-00-8
Description/Comments:
Additional Hazard Statement(s): Carc. 1B; H350 , Acute Tox. 3; H301 , Acute Tox. 2; H330
Reason for additional Hazards Statement(s):
20 Sep 2022 - Carc. 1B; H350 hazard statement sourced from: ATP 18 (Regulation (EU) 2022/692) considers vanadium pentoxide to be Carc. 1B; H350. The GB MCL Agency has reached the same opinion [but is yet to formerly make this change to the MCL List]. Substance has therefore been self-classified.
28 Sep 2022 - Acute Tox. 3; H301 hazard statement sourced from: ATP 18 (Regulation (EU) 2022/692) considers vanadium pentoxide to be "Acute tox 3; H301". The GB MCL Agency has reached the same opinion [but is yet to formerly make this change to the MCL List]. Substance has therefore been self-classified.
28 Sep 2022 - Acute Tox. 2; H330 hazard statement sourced from: ATP 18 (Regulation (EU) 2022/692) considers vanadium pentoxide to be "Acute tox 2; H330". The GB MCL Agency has reached the same opinion [but is yet to formerly make this change to the MCL List]. Substance has therefore been self-classified.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

polychlorobiphenyls; PCB (EC Number: 215-648-1, CAS Number: 1336-36-3)

GB MCL index number: 602-039-00-4
Description/Comments: Worst Case: IARC considers PCB Group 1; Carcinogenic to humans; POP specific threshold from ATP1 (Regulation 756/2010/EU) to POPs Regulation (Regulation 850/2004/EC). Where applicable, the calculation method laid down in European standards EN 12766-1 and EN 12766-2 shall be applied.
Additional Hazard Statement(s): Carc. 1A; H350
Reason for additional Hazards Statement(s):
20 Nov 2021 - Carc. 1A; H350 hazard statement sourced from: IARC Group 1 (23, Sup 7, 100C) 2012

TPH (C6 to C40) petroleum group (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Flam. Liq. 3; H226 , Asp. Tox. 1; H304 , STOT RE 2; H373 , Muta. 1B; H340 , Carc. 1B; H350 , Repr. 2; H361d , Aquatic Chronic 2; H411

ethylbenzene (EC Number: 202-849-4, CAS Number: 100-41-4)

GB MCL index number: 601-023-00-4
Description/Comments:
Additional Hazard Statement(s): Carc. 2; H351
Reason for additional Hazards Statement(s):
20 Nov 2021 - Carc. 2; H351 hazard statement sourced from: IARC Group 2B (77) 2000

Appendix B: Rationale for selection of metal species

cyanides {salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex}

Harmonised group entry used as most reasonable case as complex cyanides and those specified elsewhere in the annex are not likely to be present in this soil: [Note conversion factor based on a worst case compound: sodium cyanide]

arsenic {arsenic trioxide}

Reasonable case CLP species based on hazard statements/molecular weight and most common (stable) oxide of arsenic. Industrial sources include: smelting; main precursor to other arsenic compounds (edit as required)

barium {barium sulphide}

Significant concentrations of chromium not present that would indicate Cr VI present in significant quantities to form compounds.

beryllium {beryllium chloride}

Worst case species

boron {diboron trioxide; boric oxide}

Reasonable case CLP species based on hazard statements/ molecular weight, physical form and low solubility. Industrial sources include: fluxing agent for glass/enamels; additive for fibre optics, borosilicate glass (edit as required)

cadmium {cadmium oxide}

Reasonable case CLP species based on hazard statements/molecular weight, very low solubility in water. Industrial sources include: electroplating baths, electrodes for storage batteries, catalysts, ceramic glazes, phosphors, pigments and nematocides. (edit as required) Worst case compounds in CLP: cadmium sulphate, chloride, fluoride & iodide not expected as either very soluble and/or compound's industrial usage not related to site history (edit as required)

copper {dicopper oxide; copper (I) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Industrial sources include: oxidised copper metal, brake pads, pigments, antifouling paints, fungicide. (edit as required) Worse case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected. (edit as required)

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

Reasonable case species based on hazard statements/molecular weight. Industrial sources include: tanning, pigment in paint, inks and glass (edit as required)

lead {lead chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

mercury {mercury dichloride}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

nickel {nickel chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

selenium {nickel selenate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

vanadium {divanadium pentaoxide; vanadium pentoxide}

Worst case species

zinc {zinc chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.2.GB - Oct 2021
HazWasteOnline Classification Engine Version: 2023.25.5511.10206 (25 Jan 2023)
HazWasteOnline Database: 2023.25.5511.10206 (25 Jan 2023)

This classification utilises the following guidance and legislation:
WM3 v1.2.GB - Waste Classification - 1stEditionv1.2.GB-Oct2021
CLP Regulation - Regulation1272/2008/ECof16December2008
1st ATP - Regulation790/2009/ECof10August2009
2nd ATP - Regulation286/2011/ECof10March2011
3rd ATP - Regulation618/2012/EUof10July2012
4th ATP - Regulation487/2013/EUof8May2013
Correction to 1st ATP - Regulation758/2013/EUof7August2013
5th ATP - Regulation944/2013/EUof2October2013
6th ATP - Regulation605/2014/EUof5June2014
WFD Annex III replacement - Regulation1357/2014/EUof18December2014
Revised List of Waste 2014 - Decision2014/955/EUof18December2014
7th ATP - Regulation2015/1221/EUof24July2015
8th ATP - Regulation(EU)2016/918of19May2016
9th ATP - Regulation(EU)2016/1179of19July2016
10th ATP - Regulation(EU)2017/776of4May2017
HP14 amendment - Regulation(EU)2017/997of8June2017
13th ATP - Regulation(EU)2018/1480of4October2018
14th ATP - Regulation(EU)2020/217of4October2019
15th ATP - Regulation(EU)2020/1182of19May2020
The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit) Regulations 2020 - UK:2020No.1567of16thDecember2020
The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1540 of 16th December 2020
GB MCL List - version1.1of09June2021

APPENDIX 5

DESIGN CONSIDERATIONS

APPENDIX 5

GEOTECHNICAL DESIGN CONSIDERATIONS

A5.1 ASSESSMENT OF GRANULAR SOIL CONDITION

A5.1.1 SPT 'N' values reported on the borehole logs are as measured and uncorrected.

A5.1.2 However for general design in sands the 'N' values should be normalised to 60% by the following equation:-

A5.1.3 N60 = Er/60.N where:-

N is the blow count and

Er is the energy ratio of the specific test equipment

A5.1.4 Further corrections for rod length and overburden pressure in sands may be applied in accordance with BS EN ISO 22476-3, ref 9.6.

A5.2 ASSESSMENT OF COHESIVE SOIL CONDITION

A5.2.1 In accordance with BS EN ISO 22475-1, ref. 9.7, and BS5930, ref. 9.4, the thick walled U100 sample is considered as a Class B sampling technique and will only produce Class 3 to 5 quality samples in accordance with EN 1997-2:2007, ref. 9.5.

A5.2.2 Laboratory strength and consolidation testing can only be carried out on Class 1 quality samples, which can be obtained from a Class A sampling technique. This is due to possible disturbance during sampling, giving a weaker strength in testing.

A5.2.3 Therefore values for c_u and m_v derived for use in this report can only be used as guidance and not used to determine the shear strength properties of the clay and is not used to give a descriptive strength in the borehole records.

A5.2.4 Work undertaken by Stroud, ref. 9.12, determined a relationship between SPT 'N' values and the undrained shear strengths of many over-consolidated clays. Further work by Stroud and Butler, ref. 9.14, in which data was analysed from sites covering a wide range of glacial deposits, confirmed there to be a correlation between the 'N' value and undrained shear strength.

A5.2.5 The relationship was of the form:

$c_u = f_1 \times N$

and $m_v = 1/(f_2 \times N)$

Where c_u = Un-drained shear strength

m_v = Coefficient of compressibility

f_1 and f_2 = Factors

A5.2.6 It was determined by Stroud that f_1 varied between 4kPa for material of high plasticity and 6kPa for material of low plasticity. Similarly f_2 varied between 400kPa and 600kPa.

APPENDIX 6

GEOENVIRONMENTAL ASSESSMENT

APPENDIX 6

GENERAL NOTES ON GEOENVIRONMENTAL ASSESSMENT

A6.1 STATUTORY FRAMEWORK AND DEFINITIONS

A6.1.1 The statutory definition of contaminated land is defined in the Environmental Protection Act 1990, ref. 9.21, which was introduced by the Environment Act 1995, ref. 9.22;

'Land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that –

(a) significant harm is being caused or there is a significant possibility of such harm being caused; or

(b) pollution of controlled waters is being, or is likely to be, caused.'

A6.1.2 The UK guidance on the assessment of contaminated has developed as a direct result of the introduction of these two Acts. The technical guidance supporting the new legislation has been summarised in a number of key documents collectively known as the Contaminated Land Reports (CLRs), a proposed series of twelve documents. Seven were originally published in March 1994, four more were published in April 2002, while the last remaining guidance document, CLR 11, ref. 9.37 was published in 2004. In 2008 CLR reports 7 to 10 were withdrawn by DEFRA and the Environment Agency and updated version of CLR 9 and 10 were produced in the form of Science Reports SR2, ref. 9.23 and SR3, ref. 9.24.

A6.1.3 In establishing whether a site fulfils the statutory definition of 'contaminated land' it is necessary to identify, whether a pollutant linkage exists in respect of the land in question and whether the pollutant linkage:

is resulting in significant harm being caused to the receptor in the pollutant linkage,

presents a significant possibility of significant harm being caused to that receptor,

is resulting in the pollution of the controlled waters which constitute the receptor, or

is likely to result in such pollution.

A6.1.4 A *'pollutant linkage'* may be defined as the link between a contaminant *'source'* and a *'receptor'* by means of a *'pathway'*.

A6.2 ASSESSMENT METHODOLOGY

A6.2.1 The guidance proposes a four-stage assessment process for identifying potential pollutant linkages on a site. These stages are set out in the table below:

No.	Process	Description
1	Hazard Identification	Establishing contaminant sources, pathways and receptors (the conceptual model).
2	Hazard Assessment	Analysing the potential for unacceptable risks (what linkages could be present, what could be the effects).
3	Risk Estimation	Trying to establish the magnitude and probability of the possible consequences (what degree of harm might result and to what receptors, and how likely is it).
4	Risk Evaluation	Deciding whether the risk is unacceptable.

A6.2.2 Stages 1 and 2 develop a *'conceptual model'* based upon information collated from desk based studies, and frequently a walkover of the site. The walkover survey should be

conducted in general accordance with CLR 2, ref. 9.38. The formation of a conceptual model is an iterative process and as such, it should be updated and refined throughout each stage of the project to reflect any additional information obtained.

A6.2.3 The extent of the desk studies and enquiries to be conducted should be in general accordance with CLR 3, ref. 9.39. The information from these enquiries is presented in a desk study report with recommendations, if necessary, for further work based upon the conceptual model. Specific DoE 'Industry Profiles' provide guidance on the nature of contaminants relating to specific industrial processes.

A6.2.4 If potential pollutant linkages are identified within the conceptual model, a Phase 2 site investigation and report will be recommended. The investigation should be planned in general accordance with CLR 4, ref. 9.1. The number of exploratory holes and samples collected for analysis should be consistent with the size of the site and the level of risk envisaged. This will enable a contamination risk assessment to be conducted, at which point the conceptual model can be updated and relevant pollutant linkages can be identified.

A6.2.5 A two-stage investigation may be more appropriate where time constraints are less of an issue. The first stage investigation being conducted as an initial assessment for the presence of potential sources, a second being a more refined investigation to delineate wherever possible the extent of the identified contamination.

A6.2.6 All site works should be in general accordance with the British Standards, BS 5930:2015, ref. 9.4, ISO 1997, ref. 9.5 and BS 10175:2011, ref. 9.3.

A6.2.7 The generic contamination risk assessment screens the results of the chemical analysis against generic guidance values which are dependent on the proposed end-use of the development.

A6.2.8 The end-use may be defined as one of the following ref. 9.29;

Residential with homegrown produce – domestic low rise and low density housing with gardens where vegetable may be grown for home consumption

Residential without homegrown produce – domestic low density and low density housing where no gardens are present.

Allotments – specific areas where vegetables are grown for home consumption.

Public open space in close proximity to residential housing – includes the predominantly grassed area adjacent to high density housing and the central green area around which houses are developed. This land-use includes the smaller areas commonly incorporated in newer developments as informal grassed areas or more formal landscaped areas with a mixture of open space and covered soil with planting.

Public open space in use as general parkland – provided for recreational use and may be used for family visits and picnics, children's play area, sports grounds and dig walking.

Commercial – industrial premises where there is limited exposure to soil.

A6.2.9 Exposure pathways for each type of end-use are given below:

Standard Land Use	Oral Routes			Dermal Routes		Inhalation Routes			
	Direct soil & dust ingestion	Consumption of homegrown produce	Soil attached to homegrown produce	Indoor	Outdoor	Indoor dust	Outdoor dust	Indoor vapour	Outdoor vapour
Residential with homegrown produce	Π	Π	Π	Π	Π	Π	Π	Π	Π
Residential without homegrown produce	Π	X	X	Π	Π	Π	Π	Π	Π
Allotments	Π	Π	Π	X	Π	X	Π	Π	Π
Public open space – adjacent to dwellings	Π	X	X	Π	Π	Π	Π	X	Π
Public open space – parkland	Π	X	X	X	Π	X	Π	X	Π
Commercial	Π	X	X	Π	X	Π	X	Π	X

A6.2.1 In the first instance, soils will be compared to Suitable 4 Use Levels (S4ULs) published by LQM ref. **9.26**. Screening levels for lead are taken from guidance published by DEFRA as no S4UL has been derived, ref. 9.29.

A6.2.2 The decision to use S4ULs is based on the fact that C4SLs are primarily intended for use under Part 2A of the Environmental Protection Act 1990 in determining when land is not contaminated land as defined under the Act. By its definition, this implies a lower standard of protection than the previous SGVs due to their use of a "Low Level of Toxicological Concern", as opposed to the minimal or tolerable level of risk. As such, it was considered that, excepting lead, S4ULs are suitable in evaluating this site.

A6.2.3 Where no S4UL or C4SL is available, the assessment criteria (AC) may be generated using the Contaminated Land Exposure Assessment (CLEA) Software Version 1.07, ref. 9.27. Toxicological and physico-chemical/fate and transport data used to generate the AC has been derived from a hierarchy of data sources as follows:

1. Environment Agency or Department of Environment Food and Rural Affairs

   (DEFRA) documents;

2. Other documents produced by UK Government or state organisations;

3. European institution documents;

4. International organisation documents;

5. Foreign government institutions.

A6.2.4 In the case of the majority of contaminants considered, the toxicological data has been drawn from the relevant CLR 9 TOX report, or updated toxicological data published by the Environment Agency (2009), ref. 9.25, where available. Where no TOX report is available reference has been made to the health criteria values, derived for use in Land Quality Press (2006), ref. 9.30, as this is considered to represent a peer reviewed data source. Similarly, fate and transport data has been derived in the first instance from Environment Agency (2003), ref. 9.40 and for contaminants not considered in this document the fate and transport data used in previous versions of the CLEA model has been used.

A6.2.5 Chemical laboratory test results are processed as follows. A statistical analysis of the results is conducted, as detailed in CIEH and CL:AIRE 'Guidance on Comparing Soil Contamination Data with a Critical Concentration', ref. 9.28. Individual concentrations are compared to the selected guideline values to identify concentrations of contaminants that are above the selected screening criteria.

A6.2.6 Where the risk estimation identifies significant concentrations of one or more contaminants, a further risk evaluation needs to be undertaken.

A6.3 RISK EVALUATION

A6.3.1 The risk evaluation is a qualitative method for interpreting the data from the hazard estimation stage. It involves the classification of the:

magnitude of the potential 'consequence' (severity) of the risk occurring and:

magnitude of the 'probability' (likelihood) of the risk occurring.

A6.3.2 These are defined in the following sections:

A6.4 CLASSIFICATION OF CONSEQUENCE

Classification	Definition	Examples
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 (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. Catastrophic damage to buildings property. A short-term risk to a particular ecosystem, or organism forming part of such ecosystem (note: the definitions of ecological systems within the Draft Circular on Contaminated Land, DETR, 2000).	High Concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site into controlled water. Explosion, causing building collapse can also equate to a short-term human health risk if buildings are occupied.
Medium	Chronic damage to Human Health ('significant harm' as defined in DETR, 2000). Pollution of sensitive water resources (note: Water Resources Act contains no scope for considering significance of pollution). A significant change in a particular ecosystem, or organism forming part of such ecosystem, (note: the definitions of ecological systems within Draft Circular on Contaminated Land, DETR, 2000).	Concentrations of a contaminant from site exceed the generic, or site-specific assessment criteria. Leaching of contaminants from a site to a major or minor aquifer. Death of a 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 the *Draft Circular on Contaminated Land*, DETR 2000). Damage to sensitive buildings/ structures/services or the environment.	Pollution of non-classified ground water. Damage to building rendering it unsafe to occupy (eg foundation damage resulting in instability).
Minor	Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc). Easily repairable effects of damage to buildings, structures and services.	The presence of contaminants at such concentrations that protective equipment is required during site works. The loss of plants in landscaping scheme. Discoloration of concrete

A6.4.1 In theory, both severe and medium classification can result in death. The differential is that severe relates to short term risk while medium relates to long-term risk. Therefore, the classification of severe requires urgent action while medium may require urgent action but usually long term action would be sufficient.

A6.5 CLASSIFICATION OF PROBABILITY

Classification	Definition
High likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low likelihood	There is a pollution linkage and circumstances are possible under which an event could occur However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term

A6.6 COMPARISON OF CONSEQUENCE AGAINST PROBABILITY

A6.6.1 These classifications are compared to indicate the risk presented by each pollutant linkage. Once the consequence and probability have been classified they can be used to produce a risk category as below:

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability	High likelihood	Very high risk	High risk	Moderate risk	Moderate/low risk
	Likely	High risk	Moderate risk	Moderate/low risk	Low risk
	Low likelihood	Moderate risk	Moderate/low risk	Low risk	Very low risk
	Unlikely	Moderate/low risk	Low risk	Very low risk	Very low risk

A6.6.2 The action required for the classified risks are as follows:

Very high risk	There is a high probability that severe harm could pose a risk to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required
High risk	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 (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the longer term
Moderate risk	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 is more likely that the harm would be relatively mild Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term
Low risk	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 risk	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.

A6.6.3 The risk evaluation will address the potential pollutant linkages between an identified source of contamination and the likely receptors both on and off site.

A6.6.4 The potential receptors include:

1) Humans – current site occupants, construction workers, future site users and neighbouring site users.

2) Controlled Waters – surface water and groundwater resources

3) Plants – current and future site vegetation

4) Building materials

A6.6.5 The potential hazards to be considered in relation to contamination are:

a) Ingestion and inhalation.

b) Uptake of contaminants via cultivated vegetables.

c) Dermal contact

d) Phytotoxicity (the prevention or inhibition of plant growth)

e) Contamination of water resources

f) Chemical attack on building materials and services

g) Fire and explosion

A6.6.6 Dependent on the outcome of the initial, generic contamination risk assessment, further detailed assessment of the identified risks may be required.

A6.7 Generic Guidance Values Used Within Contamination Risk Assessment

Residential End Use with Homegrown Produce

Residential with Homegrown Produce	Determinant	Guidance Value (mg/kg)	Guidance Value (mg/kg)	Guidance Value (mg/kg)	Primary Data Source
		1% SOM	2.5% SOM	6% SOM	
PAH	Acenaphthene	210	510	1100	LQM/CIEH S4UL
	Acenaphthylene	170	420	920	LQM/CIEH S4UL
	Anthracene	2400	5400	11000	LQM/CIEH S4UL
	Benzo(a)anthracene	7.2	11	13	LQM/CIEH S4UL
	Benzo(a)pyrene	2.2	2.7	3	LQM/CIEH S4UL
	Benzo(b)fluoranthene	2.6	3.3	3.7	LQM/CIEH S4UL
	Benzo(ghi)perylene	320	340	350	LQM/CIEH S4UL
	Benzo(k)fluoranthene	77	93	100	LQM/CIEH S4UL
	Chrysene	15	22	27	LQM/CIEH S4UL
	Dibenzo(ah)anthracene	0.24	0.28	0.30	LQM/CIEH S4UL
	Fluoranthene	280	560	890	LQM/CIEH S4UL
	Fluorene	170	400	860	LQM/CIEH S4UL
	Indeno(123-cd)pyrene	27	36	41	LQM/CIEH S4UL
	Naphthalene	2.3f	5.6f	13f	LQM/CIEH S4UL
	Phenanthrene	95	220	440	LQM/CIEH S4UL
	Pyrene	620	1200	2000	LQM/CIEH S4UL
Other Organics	Phenol	280	550	1100	LQM/CIEH S4UL
Metals	Arsenic	37	37	37	LQM/CIEH S4UL
	Beryllium	1.7	1.7	1.7	LQM/CIEH S4UL
	Boron	290	290	290	LQM/CIEH S4UL
	Cadmium	11	11	11	LQM/CIEH S4UL
	Chromium (III)	910	910	910	LQM/CIEH S4UL
	Chromium (VI)	6	6	6	LQM/CIEH S4UL
	Copper	2400	2400	2400	LQM/CIEH S4UL
	Lead	200	200	200	EA C4SL
	Mercury	40	40	40	LQM/CIEH S4UL
	Nickel	180f	180	180	LQM/CIEH S4UL
	Selenium	250	250	250	LQM/CIEH S4UL
	Vanadium	410e	410	410	LQM/CIEH S4UL
	Zinc	3700	3700	3700	LQM/CIEH S4UL

d = Based on inhalation exposure compared with inhalation ID
e = Based on oral and dermal exposure with oral TDI
f = Based on comparison of exposure from all pathways with TDI oral

Residential with Homegrown Produce	Guidance Value (mg/kg)	Guidance Value (mg/kg)	Guidance Value (mg/kg)	Primary Data Source
	1% SOM	2.5% SOM	6% SOM	
Aliphatic				
EC 5-6	42	78	160	LQM/CIEH S4UL
EC >6-8	100	230	530	LQM/CIEH S4UL
EC >8-10	27	65	150	LQM/CIEH S4UL
EC >10-12	130 (48)	330 (118)	770 (283)	LQM/CIEH S4UL
EC >12-16	1100 (24)	2400 (59)	4400 (142)	LQM/CIEH S4UL
EC >16-35	65000 (8.48)	92000 (21)	110000	LQM/CIEH S4UL
EC >35-44	65000 (8.48)	92000 (21)	110000	LQM/CIEH S4UL
Aromatic				
EC 5-7 (benzene)	70	140	300	LQM/CIEH S4UL
EC >7-8 (toluene)	130	290	660	LQM/CIEH S4UL
EC >8-10	34	83	190	LQM/CIEH S4UL
EC >10-12	74	180	380	LQM/CIEH S4UL
EC >12-16	140	330	660	LQM/CIEH S4UL
EC >16-21	260f	540f	930f	LQM/CIEH S4UL
EC >21-35	1100f	1500f	1700f	LQM/CIEH S4UL
EC >35-44	1100f	1500f	1700f	LQM/CIEH S4UL
Aliphatic and Aromatic				
EC >44-70	1600f	1800f	1900f	LQM/CIEH S4UL
BTEX				
Benzene	0.087	0.17	0.37	LQM/CIEH S4UL
Toluene	130	290	660	LQM/CIEH S4UL
Ethylbenzene	47	110	260	LQM/CIEH S4UL
p Xylenes	56	130	310	LQM/CIEH S4UL
m Xylenes	59	140	320	LQM/CIEH S4UL
o Xylene	60	140	330	LQM/CIEH S4UL

SOM = Soil Organic Matter
Values in brackets indicate the solubility or vapour saturation limit where this is exceeded by the GAC

Commercial End Use

Commercial	Determinant	Guidance Value (mg/kg)	Guidance Value (mg/kg)	Guidance Value (mg/kg)	Primary Data Source
		1% SOM	2.5% SOM	6% SOM	
PAH	Acenaphthene	85000	97000	100000	LQM/CIEH S4UL
	Acenaphthylene	84000	97000	100000	LQM/CIEH S4UL
	Anthracene	520000	540000	540000	LQM/CIEH S4UL
	Benzo(a)anthracene	170	170	180	LQM/CIEH S4UL
	Benzo(a)pyrene	35	35	36	LQM/CIEH S4UL
	Benzo(b)fluoranthene	44	44	45	LQM/CIEH S4UL
	Benzo(ghi)perylene	3900	4000	400	LQM/CIEH S4UL
	Benzo(k)fluoranthene	1200	1200	1200	LQM/CIEH S4UL
	Chrysene	350	350	350	LQM/CIEH S4UL
	Dibenzo(ah)anthracene	3.5	3.6	3.6	LQM/CIEH S4UL
	Fluoranthene	23000	23000	23000	LQM/CIEH S4UL
	Fluorene	63000	68000	71000	LQM/CIEH S4UL
	Indeno(123-cd)pyrene	500	510	510	LQM/CIEH S4UL
	Naphthalene	190	460	1100	LQM/CIEH S4UL

Commercial	Determinant	Guidance Value (mg/kg)	Guidance Value (mg/kg)	Guidance Value (mg/kg)	Primary Data Source
		1% SOM	2.5% SOM	6% SOM	
	Phenanthrene	22000	22000	2300	LQM/CIEH S4UL
	Pyrene	54000	54000	54000	LQM/CIEH S4UL
Other Organics	Phenol	760	1500	3200	LQM/CIEH S4UL
Metals	Arsenic	640	640	640	LQM/CIEH S4UL
	Beryllium	12	12	12	LQM/CIEH S4UL
	Boron	240000	240000	240000	LQM/CIEH S4UL
	Cadmium	190	190	190	LQM/CIEH S4UL
	Chromium (III)	8600	8600	8600	LQM/CIEH S4UL
	Chromium (VI)	49	49	49	LQM/CIEH S4UL
	Copper	68000	68000	68000	LQM/CIEH S4UL
	Lead	2330	2330	2330	EA C4SL
	Mercury	58	58	58	LQM/CIEH S4UL
	Nickel	980	980	980	LQM/CIEH S4UL
	Selenium	12000	12000	12000	LQM/CIEH S4UL
	Vanadium	9000	9000	9000	LQM/CIEH S4UL
	Zinc	730000	730000	730000	LQM/CIEH S4UL

Commercial	Guidance Value (mg/kg)	Guidance Value (mg/kg)	Guidance Value (mg/kg)	Primary Data Source
	1% SOM	2.5% SOM	6% SOM	
Aliphatic				
EC 5-6	3200 (304)	5900 (558)	12000 (1150)	LQM/CIEH S4UL
EC >6-8	7800 (144)	17000 (322)	40000 (736)	LQM/CIEH S4UL
EC >8-10	2000 (78)	4800 (190)	11000 (451)	LQM/CIEH S4UL
EC >10-12	9700 (48)	23000 (118)	47000 (283)	LQM/CIEH S4UL
EC >12-16	59000 (24)	82000 (59)	90000 (142)	LQM/CIEH S4UL
EC >16-35	1600000	1700000	1800000	LQM/CIEH S4UL
EC >35-44	1600000	1700000	1800000	LQM/CIEH S4UL
Aromatic				
EC 5-7 (benzene)	26000 (1220)	46000 (2260)	86000 (4710)	LQM/CIEH S4UL
EC >7-8 (toluene)	56000 (869)	110000 (1920)	180000 (4360)	LQM/CIEH S4UL
EC >8-10	3500 (613)	8100 (1500)	17000 (3580)	LQM/CIEH S4UL
EC >10-12	16000 (364)	28000 (899)	34000 (2150)	LQM/CIEH S4UL
EC >12-16	36000 (169)	37000	38000	LQM/CIEH S4UL
EC >16-21	28000	28000	28000	LQM/CIEH S4UL
EC >21-35	28000	8000	28000	LQM/CIEH S4UL
EC >35-44	28000	28000	28000	LQM/CIEH S4UL
Aliphatic and Aromatic				
EC >44-70	28000	28000	28000	LQM/CIEH S4UL
BTEX				
Benzene	27	47	90	LQM/CIEH S4UL
Toluene	56000	110000	180000	LQM/CIEH S4UL
Ethylbenzene	5700	13000	27000	LQM/CIEH S4UL
m/p Xylenes	5900	14000	30000	LQM/CIEH S4UL
o Xylene	17000	24000	33000	LQM/CIEH S4UL

SOM = Soil Organic Matter
Values in brackets indicate the vapour saturation limit where this is exceeded by the GAC or SG

APPENDIX 7

GAS GENERATION

APPENDIX 7

GENERAL NOTES ON GAS GENERATION

A7.1 GENERAL

A7.1.1 In the past, a series of guidance documents were published by CIRIA, ref. 9.41, providing advice on hazards associated with methane. This earlier guidance was consolidated in CIRIA Document C659 to provide a risk based approach to gas contaminated land. This was subsequently re-issued as CIRIA Document C665, ref 9.42. In 2007, British Standard, BS8485, ref 9.43, dealing with ground gas was published. It is recommended that guidance in C665 and BS8485 is adopted to provide a consistent approach in dealing with ground gas contamination, the principal details being as follows.

A7.1.2 This guidance is based on a similar approach to that for dealing with contaminated soil. The presence of hazardous gases could be deemed to be the 'source' in a 'pollutant linkage' that could lead to the conclusion that significant harm is or could be caused to people, buildings or the environment. In such circumstances the land could be deemed 'contaminated', ref. 9.21.

A7.1.3 Should a potential source of gas be identified in the conceptual model, a gas risk assessment should be carried out, sufficient to demonstrate to the local authority that the proposals mitigate any hazards associated with ground gas. The authority enforces compliance with Approved Document Part C of the Building Regulations, ref. 9.44.

A7.2 APPROACH

A7.2.1 A flow chart detailing the approach to assessing a site is given in CIRIA document C665, Figure 1.1. This may be summarised as follows.

Carry out Phase 1 desk study, including initial conceptual model

Assess site, potential presence of gas / potential unacceptable risk / identify further action, if necessary

Monitor gas concentrations

Assessment of Risk

Recommendations / remediation

Validation

A7.3 POLLUTANT LINKAGE ASSESSMENT

A7.3.1 A pollutant linkage assessment is presented in Appendix 3 of the Phase 1 Desk Study Report.

A7.3.2 Using the risk model in the desk study, the pollutant linkage can be identified and a preliminary estimate of risk undertaken. If there is no relevant pollutant linkage identified there is likely to be negligible risk. If there is a very low risk, it is likely that no further assessment is required. If further assessment is necessary, then gas monitoring is required.

A7.4 SITE MONITORING

A7.4.1 For sites with low generation potential, giving consistently low concentrations of soil gas under the worst-case conditions, a limited programme of monitoring would be appropriate. Where high or variable concentrations are anticipated or recorded, an extended programme of monitoring would be appropriate. The following guidance has been proposed, ref. 9.46.

Table A7.1

		Generation potential of source				
Sensitivity of development		**Very low**	**Low**	**Moderate**	**High**	**Very high**
	Low (Commercial)	4/1	6/2	6/3	12/6	12/12
	Moderate (Flats)	6/2	6/3	9/6	12/12	24/24
	High (Residential with gardens)	6/3*	9/6	12/6	24/12	24/24

Notes

1. First number is minimum number of readings and second number is minimum period in months, for example 4/1 – Four sets of readings over 1 month.

2. At least two sets of readings must be at low and falling atmospheric pressure (but not restricted to periods below <1000mb) known as worst case conditions (see NHBC, ref 9.48).

3. The frequency and period stated are considered to represent typical minimum requirements. Depending on specific circumstances fewer or additional readings may be required (e.g. any such variation subject to site specific justification). The NHBC guidance is also recommending these periods/frequency of monitoring.

4. Historical data can be used as part of the data set.

5. Not all sites will require gas monitoring however, this would need to be confirmed with demonstrable evidence.

6. Placing high sensitivity end use on a high hazard site is not normally acceptable unless the source is removed or treated to reduce its gassing potential. Under such circumstances long-term monitoring may not be appropriate or required.

A7.4.2 Before taking any readings, zero the instrument, record atmospheric pressure and temperature.

A7.4.3 Gas flow should be recorded, giving the range of pressures, ensuring positive or negative flow is recorded.

A7.4.4 Record gas levels, recording peak and steady. Where steady state not obtained within 3 minutes, record change in concentration, where concentrations are decreasing, always record peak value. For very high concentrations, record for longer period of up to 10 minutes.

A7.5 ASSESSMENT OF RISK AND RECOMMENDATIONS

A7.5.1 The main method of characterising a site is the method described by Wilson and Card, ref. 9.47 and is termed Situation A. This can be used for all types of development except conventional low-rise housing with suspended ground floor and ventilated underfloor void.

A7.5.2 Low rise housing, Situation B, was developed by Boyle and Witherington for the NHBC, ref. 9.48, for classifying gassing sites for houses with suspended ground floor slab with ventilated void.

A7.5.3 Although the Code of Practice, ref 9.43, assesses the characteristic gas situation as CIRIA recommend for Situation A, see Table A7.2 below, their solution for gas protection systems is different, see section A7.10.

A7.6 SITUATION A - ASSESSMENT

A7.6.1 This system proposed by Wilson and Card was originally developed in CIRIA Report 149, ref. 9.41.

A7.6.2 The method uses both gas concentrations and borehole flow rate for methane and carbon dioxide to define a Characteristic Situation for a site.

A7.6.3 Gas Screening Value (litre/hr) = borehole flow rate (litre/hr) x gas concentration (%). The GSV is determined for methane and carbon dioxide and the worst case adopted. The Characteristic Situation can then be determined from the table below. The GSV can be exceeded if the conceptual model indicates it is safe to do so, and other factors may lead to a change in the Characteristic Situation.

Table A7.2

Characteristic Situation	Risk Classification	Gas screening value (CH_4 or CO_2(1/hr)[1]	Additional factors	Typical source of generation
1	Very low risk	<0.07	Typically methane ≤1% and/or carbon dioxide ≤5%. Otherwise consider increase to Situation 2	Natural soils with low organic content "Typical" Made Ground
2	Low risk	<0.7	Borehole air flow rate not to exceed 70l/hr. Otherwise consider increase to Characteristic Situation 3	Natural soil, high peat/organic content. "Typical" Made Ground
3	Moderate risk	<3.5		Old landfill, inert waste, mineworking flooded
4	Moderate to high risk	<15	Quantitative risk assessment required to evaluate scope of protective measures	Mineworking – susceptible to flooding, completed landfill (WMP 26B criteria)
5	High risk	<70		Mineworking unflooded inactive with shallow workings near surface
6	Very high risk	>70		Recent landfill site

1. Site characterisation should be based on gas monitoring of concentrations and borehole flow rates for the minimum periods defined in Table A7.1

2. Source of gas and generation potential/performance must be identified.

3. If there is no detectable flow use the limit of detection of the instrument.

A7.7 SITUATION A – SOLUTION

A7.7.1 The Characteristic Situation can be used to define the scope of gas protective measures required.

A7.7.2 The CIRIA approach uses the characteristic situation to define the level of gas protection as follows:

Table A7.3

Characteristic situation	**Residential building (Not low-rise traditional housing)**		**Office/commercial/industrial development**	
	Number of levels of protection	**Typical scope of protective measures**	**Number of levels of protection**	**Typical scope of protective measures**
1	None	No special precautions	None	No special precautions
2	2	a) Reinforced concrete cast in situ floor slab (suspended non-suspended or raft) with at least 1200g DPM and underfloor venting b) Beam and block or pre-cast concrete and 2000g DPM / reinforced gas membrane and underfloor venting All joints and penetrations sealed	1 to 2	a) Reinforced concrete cast in-situ floor slab (suspended non-suspended or raft) with at least 1200g DPM b) Beam and block or pre cast concrete slab and minimum 2000g DPM/reinforced gas membrane c) Possibly underfloor venting or pressurisation in combination with a) and b) depending on use All joints and penetrations sealed
3	2	All types of floor slab as above. All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised underfloor sub-space	1 to 2	All types of floor slab as above. All joints and penetrations sealed. Minimum 2000g/reinforced gas proof membrane and passively ventilated underfloor sub-space or positively pressurised underfloor sub-space
4	3	All types of floor slab as above.	2 to 3	All types of floor slab as above.

Characteristic situation	Residential building (Not low-rise traditional housing)		Office/commercial/industrial development	
		All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated underfloor subspace or positively pressurised underfloor sub-space, oversite capping or blinding and in ground venting layer		All joints and penetration sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised underfloor sub-space with monitoring facility
5	4	Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft). All joints and penetrations sealed. Proprietary gas resistant membrane and ventilated or positively pressurised underfloor sub-space, oversite capping and in ground venting wells or barriers	3 to 4	Reinforced concrete cast in-situ floor slab (suspended, non-suspended or raft). All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised underfloor sub-space with monitoring facility. In ground venting wells or barriers
6	5	Not suitable unless gas regime is reduced first and quantitative risk assessment carried out to assess design of protection measures in conjunction with foundation design	4 to 5	Reinforced concrete cast in-situ floor slab (suspended, non-suspended or raft). All joints and penetrations sealed. Proprietary gas resistant membrane and actively ventilated or positively pressurised underfloor sub-space with monitoring facility, with monitoring. In ground venting wells and reduction of gas regime.

1. Typical scope of protective measures may be rationalised for specific developments on the basis of quantitative risk assessments.

2. Note the type of protection is given for illustration purposes only. Information on the detailing and construction of passive protection measures is given in BR414, ref. 9.45.

3. In all cases there should be minimum penetration of ground slabs by services and minimum number of confined spaces such as cupboards above the ground slab. Any confined spaces should be ventilated.

4. Foundation design must minimise differential settlement particularly between structural elements and ground-bearing slabs.

5. Commercial buildings with basement car parks, provided with ventilation in accordance with the Building Regulations, may not require gas protection for characteristic situations 3 and 4.

6. Floor slabs should provide an acceptable formation on which to lay the gas membrane. If a block and beam floor is used it should be well detailed so it has no voids in it that membranes have to span, and all holes for service penetrations should be filled. The minimum density of the blocks should be 600kg/m^3 and the top surface should have a 4:1 sand cement grout brushed into all joints before placing any membrane (this is also good practice to stabilise the floor and should be carried out regardless of the need for gas membrane).

7. The gas-resistant membrane can also act as the damp-proof membrane.

A7.8 SITUATION B -ASSESSMENT

A7.8.1 The NHBC has developed a characterisation system that is similar to Situation A but is specific to low-rise housing development with a clear ventilated underfloor void. The gas emission rates are compared to generic 'Traffic Lights'.

A7.8.2 The Traffic Lights include a Typical Maximum Concentration that is used for initial screening purposes. Where the Typical Maximum Concentration is exceeded the risk-based Gas Screening Value, GSV, should be adopted. The GSVs are determined for the 'model' low rise development and where they differ from this model, the GSV should be reassessed, ref. 9.42.

A7.8.3 The calculations should be made for both methane and carbon dioxide, and the worst case adopted. The GSV is only a guideline.

Table A7.4

Traffic light	Methane		Carbon dioxide	
	Typical maximum concentration[2] (% v/v)	**Gas screening value (GSV)[3] (litres per hour)**	**Typical maximum concentration[2] (% v/v)**	**Gas screening value (GSV)[1,2] (litres per hour)**
Green				
	1	**0.16**	5	**0.78**
Amber 1				
	5	**0.63**	10	**1.56**
Amber 2				
	20	**1.56**	30	**3.13**
Red				

1. Generic GSVs are based on guidance contained within latest revision of Department of the Environment and the Welsh Office (2004 edition) "The Building Regulations: Approved Document C" and used a sub-floor void of 150mm thickness.

2. The Typical Maximum Concentrations can be exceeded in certain circumstances should the conceptual site model indicate it is safe to do so. This is where professional judgement will be required, based on a thorough understanding of the gas-regime identified at the site where monitoring in the worst temporal conditions has occurred.

3. The GSV thresholds should not generally be exceeded without completion of a detailed gas risk assessment taking into account site-specific conditions.

A7.9 SITUATION B – SOLUTION

A7.9.1 On the basis of this Traffic Light classification the following protection should be applied to low-rise housing.

Table A7.5

Traffic Light Classification	Protection measures required
Green	Negligible gas regime identified and gas protection measures are not considered necessary.
Amber 1	Low to intermediate gas regime identified, which requires low-level gas protection measures, comprising a membrane and ventilated sub-floor void to create a permeability contrast to limit the ingress of gas into buildings. Gas protection measures should be as prescribed in BRE Report 414. Ventilation of the sub-floor void should facilitate a minimum of one complete volume change per 24 hours.
Amber 2	Intermediate to high gas regime identified, which requires high-level gas protection measures, comprising a membrane and ventilated sub-floor void to create a permeability contrast to prevent the ingress of gas into buildings. Gas protection measures should be as prescribed in BRE Report 414. A specialist contractor should always fit membranes. As with Amber 1, ventilation of the sub-floor void should facilitate a minimum of one complete volume change per 24 hours. Certification that these passive protection measures have been installed correctly should be provided.
Red	High gas regime identified. It is considered that standard residential housing would not normally be acceptable without a further Gas Risk Assessment and/or possible remedial mitigation measures to reduce and/or remove the source of gas.

A7.10 CODE OF PRACTICE – SOLUTIONS

A7.10.1 The Characteristic Gas Situation is determine in a similar manner to that recommended by CIRIA, see Table A7.2 above.

A7.10.2 Having selected the Characteristic Gas Situation, the appropriate gas protection could be selected for the building. The tables below give a guide as to the relative performance of the various designs and systems.

A7.10.3 A guidance value for the required gas protection, in the range 0 to 7 should be obtained from Table A7.6 below. Then, a combination of ventilation and/or barrier system should be chosen from Table A7.7 to meet that requirement.

Table A7.6

Characteristic gas situation, CS	NHBC *traffic light*	Required gas protection			
		Non-managed property, e.g. private housing	**Public building [A)]**	**Commercial buildings**	**Industrial buildings [B)]**
1	*Green*	0	0	0	0
2	*Amber 1*	3	3	2	1[C)]
3	*Amber 2*	4	3	2	2
4	*Red*	6[D)]	5[D)]	4	3
			6[E)]	5	4
				7	6

NOTE: Traffic light indications are taken from NHBC Report no.: 10627-R01 (04) [3] and are mainly applicable to low-rise residential housing. These are for comparative purposes but the boundaries between the traffic light indications and CS values do not coincide.

A) Public buildings include, for example, managed apartments, schools and hospitals.
B) Industrial buildings are generally open and well ventilated. However, areas such as office pods might require a separate assessment and may be classified as commercial buildings and require a different scope of gas protection to the main building.
C) Maximum methane concentration 20% otherwise consider an increase to CS3.
D) Residential building on higher traffic light/CS sites is not recommended unless the type of construction or site circumstances allow additional levels of protection to be incorporated, e.g. high-performance ventilation or pathway intervention measures, and an associated sustainable system of management of maintenance of the gas control system, e.g. in institutional and/or fully serviced contractual situations.
E) Consideration of issues such as ease of evacuation and how false alarms will be handled are needed when completing the design specification of any protection scheme.

A7.10.4 Having determined the appropriate guidance value from Table A7.6, an element or combination of elements from a), b), c) or d) in Table A7.7, should be chosen to achieve the required level of protection .

Table A7.7

PROTECTION ELEMENT/SYSTEM		SCORE	COMMENTS
a) Venting/dilution			
Passive sub floor ventilation (venting layer can be a clear void or formed using gravel, geocomposites, polystyrene void formers, etc.)[A)]	Very good performance	2.5	*Ventilation performance in accordance with Annex A, ref. 9.43*
	Good performance	1	*If passive ventilation is poor this is generally unacceptable and some form of active system will be required*

PROTECTION ELEMENT/SYSTEM		SCORE	COMMENTS
Subfloor ventilation with active abstraction/pressurization (venting layer can be a clear void or formed using gravel, geocomposites, polystyrene void formers, etc.)[A)]		2.5	*There have to be robust management systems in place to ensure the continued maintenance of any ventilation system.* *Active ventilation can always be designed to meet good performance.* *Mechanically assisted systems come in two main forms: extraction and positive pressurization.*
Ventilated car park (basement or undercroft)		4	*Assumes car park is vented to deal with car exhaust fumes, designed to Building Regulations Document F and IstructE guidance*
b) Barriers			
Floor slabs			
Block and beam floor slab		0	*It is good practice to install ventilation in all foundation systems to effect pressure relief as a minimum.* *Breached in floor slabs such as joints have to be effectively sealed against gas ingress in order to maintain these performances*
Reinforced concrete ground bearing floor slab		0.5	
Reinforced concrete ground bearing foundation raft with limited service penetrations that are cast into slab		1.5	
Reinforced concrete cast in situ suspended slab with minimal service penetrations and water bars around all slab penetrations and at joints		1.5	
Fully tanked basement		2	
c) Membranes			
Taped and sealed membrane to reasonable levels of workmanship/in line with current good practice with validation[B), C)]		0.5	*The performance of membranes is heavily dependent on the quality and design of the installation, resistance to damage after installation, and the integrity of joints*
Proprietary gas resistant membrane to reasonable levels of workmanship/in line with current good practice under independent inspection (CQA)[B), C)]		1	
Proprietary gas resistant membrane installed to reasonable levels of workmanship/in line with current good practice under CQA with integrity testing and independent validation		2	
d) Monitoring and detection (not applicable to non-managed property, or in isolation)			
Intermittent monitoring using hand held equipment		0.5	*Where fitted, permanent monitoring systems ought to be installed in the underfloor venting/dilution system in the first instance but can also be provided within the occupied space as a fail safe.*
Permanent monitoring and alarm system[A)]	Installed in the underfloor venting/ dilution system	2	
	Installed in the building	1	
e) Pathway intervention			

PROTECTION ELEMENT/SYSTEM	SCORE	COMMENTS
Pathway intervention	-	*This can consist of site protection measures for off-site or on-site sources (see Annex A, ref. 9.43)*

NOTE: In practice the choice of materials might well rely on factors such as construction method and the risk of damage after installation. It is important to ensure that the chosen combination gives an appropriate level of protection

A) It is possible to test ventilation systems by installing monitoring probes for post installation validation.

B) If a 1200 g DPM material is to function as a gas barrier it should be installed according to BRE 414, ref. 9.45 being taped and sealed to all penetrations.

C) Polymeric Materials >1200g can be used to improve confidence in the barrier. Remember that their gas resistance is little more than the standard 1200g (proportional to thickness) but their physical properties mean that they are more robust and resistant to site damage.

IAN FARMER ASSOCIATES

Gas and Groundwater Monitoring Results

Contract Number:	*2230917*	**Gas Monitor:**	*GFM436*
Contract Name:	*Oxford Biomedica Oxbox*	**Readings Taken By:**	*AC*
Date:	*19/01/2023 (Visit 1)*	**Checked By:**	*AC*
Borehole No:	*BH01 (50 mm)*		

Background Readings:	Weather Conditions:	*Sunny, cold, dry*	
	Ground Conditions (dry / wet etc):	*Damp*	
	Atmospheric Pressure:	*1000 (0.00) mb*	

O_2% v/v	CO_2% v/v	CH_4% v/v	CO ppm	H_2S ppm
20.0	*0.0*	*0.0*	*0*	*0*

Time secs	Flow Rate l/hr	O_2% v/v	CO_2% v/v	CH_4% v/v	H_2S ppm	CO ppm
0	*0.0*	*19.6*	*0.0*	*0.0*	*0*	*0*
15	*0.0*	*14.5*	*1.8*	*0.0*	*0*	*0*
30	*0.0*	*8.5*	*2.0*	*0.0*	*0*	*0*
45	*0.0*	*8.0*	*2.0*	*0.0*	*0*	*0*
60	*0.0*	*7.9*	*2.0*	*0.0*	*0*	*0*
90	*0.0*	*7.8*	*2.1*	*0.0*	*0*	*0*
120	*0.0*	*7.8*	*2.1*	*0.0*	*0*	*0*
150	*0.0*	*7.8*	*2.1*	*0.0*	*0*	*0*
180	*0.0*	*7.8*	*2.1*	*0.0*	*0*	*0*
210	*0.0*	*7.8*	*2.1*	*0.0*	*0*	*0*
240	*0.0*	*7.8*	*2.1*	*0.0*	*0*	*0*
270	*0.0*	*7.8*	*2.1*	*0.0*	*0*	*0*
300	*0.0*	*7.8*	*2.1*	*0.0*	*0*	*0*
Min	*0.0*	*7.8*	*0.0*	*0.0*	*0*	*0*
Max	*0.0*	*19.6*	*2.1*	*0.0*	*0*	*0*
Steady	*0.0*	*7.8*	*2.1*	*0.0*	*0*	*0*

VOC ppm	*0.0*	Depth to base of well	*3.06*	SWL	*2.92*	LNAPL or DNAPL	*NR*	Start time:	*11:44*
	Steady		mBGL		mBGL		mBGL	Finish Time:	*11:53*

>>>> = Flow above detection limit of 30 l/hr, <<< = Negative flow greater than -10 l/hr. >Max = In excess of lower explosive limit. NR = Not Recorded. ND = Not Detected.

Remarks: *None.*

IAN FARMER ASSOCIATES

Gas and Groundwater Monitoring Results

Contract Number:	*2230917*	**Gas Monitor:**	*GFM436*
Contract Name:	*Oxford Biomedica Oxbox*	**Readings Taken By:**	*AC*
Date:	*19/01/2023 (Visit 1)*	**Checked By:**	*AC*
Borehole No:	*BH02 (50 mm)*		
Background Readings:	Weather Conditions:	*Sunny, cold, dry*	
	Ground Conditions (dry / wet etc):	*Damp*	
	Atmospheric Pressure:	*1000 (0.00) mb*	

O_2% v/v	*20.1*	CO_2% v/v	*0.0*	CH_4% v/v	*0.0*	CO ppm	*0*	H_2S ppm	*0*

Time secs	Flow Rate l/hr	O_2% v/v	CO_2% v/v	CH_4% v/v	H_2S ppm	CO ppm
0	*-1.6*	*19.8*	*0.0*	*0.0*	*0*	*0*
15	*-0.8*	*19.8*	*0.2*	*0.0*	*0*	*0*
30	*-0.2*	*14.2*	*0.3*	*0.0*	*0*	*0*
45	*0.0*	*13.7*	*0.3*	*0.0*	*0*	*0*
60	*0.0*	*13.6*	*0.3*	*0.0*	*0*	*0*
90	*0.0*	*13.5*	*0.3*	*0.0*	*0*	*0*
120	*0.0*	*13.4*	*0.3*	*0.0*	*0*	*0*
150	*0.0*	*13.4*	*0.3*	*0.0*	*0*	*0*
180	*0.0*	*13.4*	*0.3*	*0.0*	*0*	*0*
210	*0.0*	*13.5*	*0.3*	*0.0*	*0*	*0*
240	*0.0*	*13.5*	*0.3*	*0.0*	*0*	*0*
270	*0.0*	*13.5*	*0.3*	*0.0*	*0*	*0*
300	*0.0*	*13.5*	*0.3*	*0.0*	*0*	*0*
Min	*-1.6*	*13.4*	*0.0*	*0.0*	*0*	*0*
Max	*0.0*	*19.8*	*0.3*	*0.0*	*0*	*0*
Steady	*0.0*	*13.5*	*0.3*	*0.0*	*0*	*0*

VOC ppm	*0.0*	Depth to base of well	*8.69*	SWL	*3.99*	LNAPL or DNAPL	*NR*	Start time:	*12:06*
	Steady		mBGL		mBGL		mBGL	Finish Time:	*12:19*

>>>> = Flow above detection limit of 30 l/hr, <<< = Negative flow greater than -10 l/hr. >Max = In excess of lower explosive limit. NR = Not Recorded. ND = Not Detected.

Remarks: *Brown sediment in base of pipe.*

IAN FARMER ASSOCIATES

Gas and Groundwater Monitoring Results

Contract Number:	*2230917*	**Gas Monitor:**	*GFM436*
Contract Name:	*Oxford Biomedica Oxbox*	**Readings Taken By:**	*AC*
Date:	*01/02/2023 (Visit 2)*	**Checked By:**	*AC*
Borehole No:	*BH01 (50 mm)*		

Background Readings:			
Weather Conditions:	*Cloudy, cool, dry*		
Ground Conditions (dry / wet etc):	*Dry*		
Atmospheric Pressure:	*1016 (0.00) mb*		

O_2% v/v	*20.4*	CO_2% v/v	*0.0*	CH_4% v/v	*0.0*	CO ppm	*0*	H_2S ppm	*0*

Time secs	Flow Rate l/hr	O_2% v/v	CO_2% v/v	CH_4% v/v	H_2S ppm	CO ppm
0	*0.0*	*20.3*	*0.1*	*0.0*	*0*	*0*
15	*0.0*	*10.3*	*1.8*	*0.0*	*0*	*0*
30	*0.0*	*8.7*	*1.9*	*0.0*	*0*	*0*
45	*0.0*	*8.5*	*1.9*	*0.0*	*0*	*0*
60	*0.0*	*8.4*	*1.9*	*0.0*	*0*	*0*
90	*0.0*	*8.4*	*1.9*	*0.0*	*0*	*0*
120	*0.0*	*8.4*	*1.9*	*0.0*	*0*	*0*
150	*0.0*	*8.4*	*1.9*	*0.0*	*0*	*0*
180	*0.0*	*8.4*	*1.9*	*0.0*	*0*	*0*
210	*0.0*	*8.4*	*1.9*	*0.0*	*0*	*0*
240	*0.0*	*8.4*	*1.9*	*0.0*	*0*	*0*
270	*0.0*	*8.4*	*1.9*	*0.0*	*0*	*0*
300	*0.0*	*8.4*	*1.9*	*0.0*	*0*	*0*
Min	*0.0*	*8.4*	*0.1*	*0.0*	*0*	*0*
Max	*0.0*	*20.3*	*1.9*	*0.0*	*0*	*0*
Steady	*0.0*	*8.4*	*1.9*	*0.0*	*0*	*0*

VOC ppm	*0.0*	Depth to base of well	*3.06*	SWL	*Dry*	LNAPL or DNAPL	*NR*	Start time:	*11:28*
	Steady		mBGL		mBGL		mBGL	Finish Time:	*11:36*

>>>> = Flow above detection limit of 30 l/hr, <<< = Negative flow greater than -10 l/hr. >Max = In excess of lower explosive limit. NR = Not Recorded. ND = Not Detected.

Remarks: *None.*

IAN FARMER ASSOCIATES

Gas and Groundwater Monitoring Results

Contract Number:	*2230917*	**Gas Monitor:**	*GFM436*
Contract Name:	*Oxford Biomedica Oxbox*	**Readings Taken By:**	*AC*
Date:	*01/02/2023 (Visit 2)*	**Checked By:**	*AC*
Borehole No:	*BH02 (50 mm)*		

Background Readings:			
Weather Conditions:	*Cloudy, cool, dry*		
Ground Conditions (dry / wet etc):	*Dry*		
Atmospheric Pressure:	*1016 (0.00) mb*		

O_2% v/v	*20.4*	CO_2% v/v	*0.0*	CH_4% v/v	*0.0*	CO ppm	*0*	H_2S ppm	*0*

Time secs	Flow Rate l/hr	O_2% v/v	CO_2% v/v	CH_4% v/v	H_2S ppm	CO ppm
0	*0.0*	*20.3*	*0.0*	*0.0*	*0*	*0*
15	*0.0*	*18.8*	*0.1*	*0.0*	*0*	*0*
30	*0.0*	*18.4*	*0.1*	*0.0*	*0*	*0*
45	*0.0*	*18.5*	*0.1*	*0.0*	*0*	*0*
60	*0.0*	*18.6*	*0.1*	*0.0*	*0*	*0*
90	*0.0*	*18.9*	*0.1*	*0.0*	*0*	*0*
120	*0.0*	*19.2*	*0.1*	*0.0*	*0*	*0*
150	*0.0*	*19.4*	*0.0*	*0.0*	*0*	*0*
180	*0.0*	*19.4*	*0.0*	*0.0*	*0*	*0*
210	*0.0*	*19.6*	*0.0*	*0.0*	*0*	*0*
240	*0.0*	*19.6*	*0.0*	*0.0*	*0*	*0*
270	*0.0*	*19.7*	*0.0*	*0.0*	*0*	*0*
300	*0.0*	*19.7*	*0.0*	*0.0*	*0*	*0*
Min	*0.0*	*18.4*	*0.0*	*0.0*	*0*	*0*
Max	*0.0*	*20.3*	*0.1*	*0.0*	*0*	*0*
Steady	*0.0*	*19.7*	*0.0*	*0.0*	*0*	*0*

VOC ppm	*0.0*	Depth to base of well	*8.52*	SWL	*4.08*	LNAPL or DNAPL	*NR*	Start time:	*11:42*
	Steady		mBGL		mBGL		mBGL	Finish Time:	*11:50*

>>>> = Flow above detection limit of 30 l/hr, <<< = Negative flow greater than -10 l/hr. >Max = In excess of lower explosive limit. NR = Not Recorded. ND = Not Detected.

Remarks: *Light brown sediment in base of pipe.*

IAN FARMER ASSOCIATES

Gas and Groundwater Monitoring Results

Contract Number:	*2230917*	**Gas Monitor:**	*GFM436*
Contract Name:	*Oxford Biomedica Oxbox*	**Readings Taken By:**	*AC*
Date:	*15/02/2023 (Visit 3)*	**Checked By:**	*AC*
Borehole No:	*BH01 (50 mm)*		

Background Readings:	Weather Conditions:	*Sunny, cool, dry*	
	Ground Conditions (dry / wet etc):	*Damp*	
	Atmospheric Pressure:	*1014 (0.00) mb*	

O_2% v/v	CO_2% v/v	CH_4% v/v	CO ppm	H_2S ppm
20.6	*0.0*	*0.0*	*0*	*0*

Time secs	Flow Rate l/hr	O_2% v/v	CO_2% v/v	CH_4% v/v	H_2S ppm	CO ppm
0	*0.0*	*20.0*	*0.0*	*0.0*	*0*	*0*
15	*0.0*	*19.9*	*1.3*	*0.0*	*0*	*0*
30	*0.0*	*10.3*	*1.8*	*0.0*	*0*	*0*
45	*0.0*	*9.7*	*1.8*	*0.0*	*0*	*0*
60	*0.0*	*9.5*	*1.8*	*0.0*	*0*	*0*
90	*0.0*	*9.4*	*1.8*	*0.0*	*0*	*0*
120	*0.0*	*9.4*	*1.8*	*0.0*	*0*	*0*
150	*0.0*	*9.4*	*1.8*	*0.0*	*0*	*0*
180	*0.0*	*9.3*	*1.8*	*0.0*	*0*	*0*
210	*0.0*	*9.3*	*1.8*	*0.0*	*0*	*0*
240	*0.0*	*9.2*	*1.9*	*0.0*	*0*	*0*
270	*0.0*	*9.2*	*1.9*	*0.0*	*0*	*0*
300	*0.0*	*9.1*	*1.9*	*0.0*	*0*	*0*
330	*0.0*	*9.1*	*1.9*	*0.0*	*0*	*0*
Min	*0.0*	*9.1*	*0.0*	*0.0*	*0*	*0*
Max	*0.0*	*20.0*	*1.9*	*0.0*	*0*	*0*
Steady	*0.0*	*9.1*	*1.9*	*0.0*	*0*	*0*

VOC ppm	*0.0*	Depth to base of well	*3.05*	SWL	*Dry*	LNAPL or DNAPL	*NR*	Start time:	*11:47*
	11:56		mBGL		mBGL		mBGL	Finish Time:	*11:56*

>>>> = Flow above detection limit of 30 l/hr, <<< = Negative flow greater than -10 l/hr. >Max = In excess of lower explosive limit. NR = Not Recorded. ND = Not Detected.

Remarks: *None.*

IAN FARMER ASSOCIATES

Gas and Groundwater Monitoring Results

Contract Number:	*2230917*	**Gas Monitor:**	*GFM436*
Contract Name:	*Oxford Biomedica Oxbox*	**Readings Taken By:**	*AC*
Date:	*15/02/2023 (Visit 3)*	**Checked By:**	*AC*
Borehole No:	*BH02 (50 mm)*		

Background Readings:	
Weather Conditions:	*Sunny, cool, dry*
Ground Conditions (dry / wet etc):	*Damp*
Atmospheric Pressure:	*1015 (0.00) mb*

O_2% v/v	*20.6*	CO_2% v/v	*0.0*	CH_4% v/v	*0.0*	CO ppm	*0*	H_2S ppm	*0*

Time secs	Flow Rate l/hr	O_2% v/v	CO_2% v/v	CH_4% v/v	H_2S ppm	CO ppm
0	*0.0*	*20.0*	*0.1*	*0.0*	*0*	*0*
15	*0.0*	*19.7*	*0.1*	*0.0*	*0*	*0*
30	*0.0*	*19.7*	*0.1*	*0.0*	*0*	*0*
45	*0.0*	*19.9*	*0.1*	*0.0*	*0*	*0*
60	*0.0*	*20.0*	*0.1*	*0.0*	*0*	*0*
90	*0.0*	*20.1*	*0.0*	*0.0*	*0*	*0*
120	*0.0*	*20.0*	*0.0*	*0.0*	*0*	*0*
150	*0.0*	*20.1*	*0.0*	*0.0*	*0*	*0*
180	*0.0*	*20.2*	*0.0*	*0.0*	*0*	*0*
210	*0.0*	*20.0*	*0.1*	*0.0*	*0*	*0*
240	*0.0*	*20.2*	*0.0*	*0.0*	*0*	*0*
270	*0.0*	*20.3*	*0.0*	*0.0*	*0*	*0*
300	*0.0*	*20.2*	*0.0*	*0.0*	*0*	*0*
Min	*0.0*	*19.7*	*0.0*	*0.0*	*0*	*0*
Max	*0.0*	*20.3*	*0.1*	*0.0*	*0*	*0*
Steady	*0.0*	*20.2*	*0.0*	*0.0*	*0*	*0*

VOC ppm	*0.0*	Depth to base of well	*8.46*	SWL	*4.18*	LNAPL or DNAPL	*NR*	Start time:	*12:01*
	Steady		mBGL		mBGL		mBGL	Finish Time:	*12:13*

>>>> = Flow above detection limit of 30 l/hr, <<< = Negative flow greater than -10 l/hr. >Max = In excess of lower explosive limit. NR = Not Recorded. ND = Not Detected.

Remarks: *Light brown sediment in base of pipe.*

IAN FARMER ASSOCIATES

Gas and Groundwater Monitoring Results

Contract Number:	*2230917*	**Gas Monitor:**	*GFM436*
Contract Name:	*Oxford Biomedica Oxbox*	**Readings Taken By:**	*AC*
Date:	*13/03/2023 (Visit 4)*	**Checked By:**	*AC*
Borehole No:	*BH01 (50 mm)*		

Background Readings:	Weather Conditions:	*Cloudy, cool, windy, dry*	
	Ground Conditions (dry / wet etc):	*Dry*	
	Atmospheric Pressure:	*979 (+0.01) mb*	

O_2% v/v	*20.7*	CO_2% v/v	*0.0*	CH_4% v/v	*0.0*	CO ppm	*0*	H_2S ppm	*0*

Time secs	Flow Rate l/hr	O_2% v/v	CO_2% v/v	CH_4% v/v	H_2S ppm	CO ppm
0	*0.3*	*20.1*	*0.1*	*0.0*	*0*	*0*
15	*0.0*	*11.1*	*2.1*	*0.0*	*0*	*0*
30	*0.0*	*10.0*	*2.1*	*0.0*	*0*	*0*
45	*0.0*	*9.7*	*2.1*	*0.0*	*0*	*0*
60	*0.0*	*9.6*	*2.1*	*0.0*	*0*	*0*
90	*0.0*	*9.6*	*2.2*	*0.0*	*0*	*0*
120	*0.0*	*9.6*	*2.2*	*0.0*	*0*	*0*
150	*0.0*	*9.6*	*2.2*	*0.0*	*0*	*0*
180	*0.0*	*9.5*	*2.2*	*0.0*	*0*	*0*
210	*0.0*	*9.5*	*2.2*	*0.0*	*0*	*0*
240	*0.0*	*9.5*	*2.2*	*0.0*	*0*	*0*
270	*0.0*	*9.5*	*2.1*	*0.0*	*0*	*0*
300	*0.0*	*9.5*	*2.1*	*0.0*	*0*	*0*
Min	*0.0*	*9.5*	*0.1*	*0.0*	*0*	*0*
Max	*0.3*	*20.1*	*2.2*	*0.0*	*0*	*0*
Steady	*0.0*	*9.5*	*2.1*	*0.0*	*0*	*0*

VOC ppm	*0.3*	Depth to base of well	*3.03*	SWL	*Dry*	LNAPL or DNAPL	*ND*	Start time:	*12:52*
	Steady		mBGL		mBGL		mBGL	Finish Time:	*13;00*

>>>> = Flow above detection limit of 30 l/hr, <<< = Negative flow greater than -10 l/hr. >Max = In excess of lower explosive limit. NR = Not Recorded. ND = Not Detected.

Remarks: *None.*

IAN FARMER ASSOCIATES

Gas and Groundwater Monitoring Results

Contract Number:	*2230917*	**Gas Monitor:**	*GFM436*
Contract Name:	*Oxford Biomedica Oxbox*	**Readings Taken By:**	*AC*
Date:	*13/03/2023 (Visit 4)*	**Checked By:**	*AC*
Borehole No:	*BH02 (50 mm)*		
Background Readings:	Weather Conditions:	*Cloudy, cool, windy, dry*	
	Ground Conditions (dry / wet etc):	*Dry*	
	Atmospheric Pressure:	*978 (0.00) mb*	

O_2% v/v	*20.7*	CO_2% v/v	*0.0*	CH_4% v/v	*0.0*	CO ppm	*0*	H_2S ppm	*0*

Time secs	Flow Rate l/hr	O_2% v/v	CO_2% v/v	CH_4% v/v	H_2S ppm	CO ppm
0	*0.0*	*20.0*	*0.0*	*0.0*	*0*	*0*
15	*0.0*	*20.5*	*0.0*	*0.0*	*0*	*0*
30	*0.0*	*20.5*	*0.0*	*0.0*	*0*	*0*
45	*0.0*	*20.5*	*0.0*	*0.0*	*0*	*0*
60	*0.0*	*20.5*	*0.0*	*0.0*	*0*	*0*
90	*0.0*	*20.6*	*0.0*	*0.0*	*0*	*0*
120	*0.0*	*20.5*	*0.0*	*0.0*	*0*	*0*
150	*0.0*	*20.6*	*0.0*	*0.0*	*0*	*0*
180	*0.0*	*20.6*	*0.0*	*0.0*	*0*	*0*
210	*0.0*	*20.5*	*0.0*	*0.0*	*0*	*0*
240	*0.0*	*20.5*	*0.0*	*0.0*	*0*	*0*
270	*0.0*	*20.5*	*0.0*	*0.0*	*0*	*0*
300	*0.0*	*20.6*	*0.0*	*0.0*	*0*	*0*
Min	*0.0*	*20.0*	*0.0*	*0.0*	*0*	*0*
Max	*0.0*	*20.6*	*0.0*	*0.0*	*0*	*0*
Steady	*0.0*	*20.6*	*0.0*	*0.0*	*0*	*0*

VOC ppm	*0.1*	Depth to base of well	*8.47*	SWL	*4.20*	LNAPL or DNAPL	*ND*	Start time:	*13:05*
	Steady		mBGL		mBGL		mBGL	Finish Time:	*13:15*

>>>> = Flow above detection limit of 30 l/hr, <<< = Negative flow greater than -10 l/hr. >Max = In excess of lower explosive limit. NR = Not Recorded. ND = Not Detected.

Remarks: *Brownish grey sediment in base of pipe.*

IAN FARMER ASSOCIATES

Gas and Groundwater Monitoring Results

Contract Number:	*2230917*	**Gas Monitor:**	*GFM436*
Contract Name:	*Oxford Biomedica Oxbox*	**Readings Taken By:**	*AC*
Date:	*11/04/2023 (Visit 5)*	**Checked By:**	*JT*
Borehole No:	*BH01 (50 mm)*		

Background Readings:	
Weather Conditions:	*Cloudy, cool, dry*
Ground Conditions (dry / wet etc):	*Dry*
Atmospheric Pressure:	*1001 (0.00) mb*

O_2% v/v	*20.7*	CO_2% v/v	*0.0*	CH_4% v/v	*0.0*	CO ppm	*0*	H_2S ppm	*0*

Time secs	Flow Rate l/hr	O_2% v/v	CO_2% v/v	CH_4% v/v	H_2S ppm	CO ppm
0	*0.0*	*20.0*	*0.0*	*0.0*	*0*	*0*
15	*0.0*	*12.3*	*2.2*	*0.0*	*0*	*0*
30	*0.0*	*9.8*	*2.2*	*0.0*	*0*	*0*
45	*0.0*	*9.6*	*2.2*	*0.0*	*0*	*0*
60	*0.0*	*9.5*	*2.2*	*0.0*	*0*	*0*
90	*0.0*	*9.5*	*2.3*	*0.0*	*0*	*0*
120	*0.0*	*9.4*	*2.3*	*0.0*	*0*	*0*
150	*0.0*	*9.4*	*2.3*	*0.0*	*0*	*0*
180	*0.0*	*9.4*	*2.3*	*0.0*	*0*	*0*
210	*0.0*	*9.4*	*2.3*	*0.0*	*0*	*0*
240	*0.0*	*9.4*	*2.3*	*0.0*	*0*	*0*
270	*0.0*	*9.4*	*2.3*	*0.0*	*0*	*0*
300	*0.0*	*9.4*	*2.3*	*0.0*	*0*	*0*
Min	*0.0*	*9.4*	*0.0*	*0.0*	*0*	*0*
Max	*0.0*	*20.0*	*2.3*	*0.0*	*0*	*0*
Steady	*0.0*	*9.4*	*2.3*	*0.0*	*0*	*0*

VOC ppm	*0.0*	Depth to base of well	*3.04*	SWL	*Dry*	LNAPL or DNAPL	*ND*	Start time:	*12:35*
	Steady		mBGL		mBGL		mBGL	Finish Time:	*12:43*

>>>> = Flow above detection limit of 30 l/hr, <<< = Negative flow greater than -10 l/hr. >Max = In excess of lower explosive limit. NR = Not Recorded. ND = Not Detected.

Remarks: *None.*

IAN FARMER ASSOCIATES

Gas and Groundwater Monitoring Results

Contract Number:	*2230917*	**Gas Monitor:**	*GFM436*
Contract Name:	*Oxford Biomedica Oxbox*	**Readings Taken By:**	*AC*
Date:	*11/04/2023 (Visit 5)*	**Checked By:**	*JT*
Borehole No:	*BH02 (50 mm)*		

Background Readings:	Weather Conditions:	*Cloudy, cool, dry*	
	Ground Conditions (dry / wet etc):	*Dry*	
	Atmospheric Pressure:	*1001 (0.00) mb*	

O_2% v/v	CO_2% v/v		CH_4% v/v		CO ppm		H_2S ppm	
20.7		*0.0*		*0.0*		*0*		*0*

Time secs	Flow Rate l/hr	O_2% v/v	CO_2% v/v	CH_4% v/v	H_2S ppm	CO ppm
0	*0.0*	*20.4*	*0.0*	*0.0*	*0*	*0*
15	*0.0*	*20.3*	*0.0*	*0.0*	*0*	*0*
30	*0.0*	*20.4*	*0.0*	*0.0*	*0*	*0*
45	*0.0*	*20.5*	*0.0*	*0.0*	*0*	*0*
60	*0.0*	*20.5*	*0.0*	*0.0*	*0*	*0*
90	*0.0*	*20.5*	*0.0*	*0.0*	*0*	*0*
120	*0.0*	*20.5*	*0.0*	*0.0*	*0*	*0*
150	*0.0*	*20.5*	*0.0*	*0.0*	*0*	*0*
180	*0.0*	*20.6*	*0.0*	*0.0*	*0*	*0*
210	*0.0*	*20.6*	*0.0*	*0.0*	*0*	*0*
240	*0.0*	*20.6*	*0.0*	*0.0*	*0*	*0*
270	*0.0*	*20.6*	*0.0*	*0.0*	*0*	*0*
300	*0.0*	*20.6*	*0.0*	*0.0*	*0*	*0*
Min	*0.0*	*20.3*	*0.0*	*0.0*	*0*	*0*
Max	*0.0*	*20.6*	*0.0*	*0.0*	*0*	*0*
Steady	*0.0*	*20.6*	*0.0*	*0.0*	*0*	*0*

VOC ppm	*0.0*	Depth to base of well	*7.94*	SWL	*3.96*	LNAPL or DNAPL	*NR*	Start time:	*12:46*
	Steady		mBGL		mBGL		mBGL	Finish Time:	*12:54*

>>>> = Flow above detection limit of 30 l/hr, <<< = Negative flow greater than -10 l/hr. >Max = In excess of lower explosive limit. NR = Not Recorded. ND = Not Detected.

Remarks: *Silty base.*

IAN FARMER ASSOCIATES

Gas and Groundwater Monitoring Results

Contract Number:	*2230917*	**Gas Monitor:**	*GFM436*
Contract Name:	*Oxford Biomedica Oxbox*	**Readings Taken By:**	*AC*
Date:	*23/05/2023 (Visit 6)*	**Checked By:**	*AC*
Borehole No:	*BH01 (50 mm)*		

Background Readings:			
Weather Conditions:	*Cloudy, warm, dry*		
Ground Conditions (dry / wet etc):	*Dry*		
Atmospheric Pressure:	*1018 (0.00) mb*		

O_2% v/v	*20.9*	CO_2% v/v	*0.0*	CH_4% v/v	*0.0*	CO ppm	*0*	H_2S ppm	*0*

Time secs	Flow Rate l/hr	O_2% v/v	CO_2% v/v	CH_4% v/v	H_2S ppm	CO ppm
0	*0.0*	*20.5*	*0.0*	*0.0*	*0*	*0*
15	*0.0*	*12.3*	*2.2*	*0.0*	*0*	*0*
30	*0.0*	*9.7*	*2.3*	*0.0*	*0*	*0*
45	*0.0*	*9.5*	*2.3*	*0.0*	*0*	*0*
60	*0.0*	*9.4*	*2.3*	*0.0*	*0*	*0*
90	*0.0*	*9.4*	*2.4*	*0.0*	*0*	*0*
120	*0.0*	*9.4*	*2.4*	*0.0*	*0*	*0*
150	*0.0*	*9.3*	*2.4*	*0.0*	*0*	*0*
180	*0.0*	*9.3*	*2.4*	*0.0*	*0*	*0*
210	*0.0*	*9.4*	*2.4*	*0.0*	*0*	*0*
240	*0.0*	*9.3*	*2.4*	*0.0*	*0*	*0*
270	*0.0*	*9.3*	*2.4*	*0.0*	*0*	*0*
300	*0.0*	*9.3*	*2.4*	*0.0*	*0*	*0*
Min	*0.0*	*9.3*	*0.0*	*0.0*	*0*	*0*
Max	*0.0*	*20.5*	*2.4*	*0.0*	*0*	*0*
Steady	*0.0*	*9.3*	*2.4*	*0.0*	*0*	*0*

VOC ppm	*0.0*	Depth to base of well	*3.00*	SWL	*Dry*	LNAPL or DNAPL	*ND*	Start time:	*11:42*
	Steady		mBGL		mBGL		mBGL	Finish Time:	*11:50*

>>>> = Flow above detection limit of 30 l/hr, <<< = Negative flow greater than -10 l/hr. >Max = In excess of lower explosive limit. NR = Not Recorded. ND = Not Detected.

Remarks: *None.*

IAN FARMER ASSOCIATES

Gas and Groundwater Monitoring Results

Contract Number:	*2230917*	**Gas Monitor:**	*GFM436*
Contract Name:	*Oxford Biomedica Oxbox*	**Readings Taken By:**	*AC*
Date:	*23/05/2023 (Visit 6)*	**Checked By:**	*AC*
Borehole No:	*BH02 (50 mm)*		

Background Readings:	Weather Conditions:	*Cloudy, warm, dry*	
	Ground Conditions (dry / wet etc):	*Dry*	
	Atmospheric Pressure:	*1019 (0.00) mb*	

O_2% v/v	CO_2% v/v	CH_4% v/v	CO ppm	H_2S ppm
20.9	*0.0*	*0.0*	*0*	*0*

Time secs	Flow Rate l/hr	O_2% v/v	CO_2% v/v	CH_4% v/v	H_2S ppm	CO ppm
0	*0.0*	*20.6*	*0.4*	*0.0*	*0*	*0*
15	*0.0*	*20.1*	*0.0*	*0.0*	*0*	*0*
30	*0.0*	*20.7*	*0.0*	*0.0*	*0*	*0*
45	*0.0*	*20.8*	*0.0*	*0.0*	*0*	*0*
60	*0.0*	*20.8*	*0.0*	*0.0*	*0*	*0*
90	*0.0*	*20.8*	*0.0*	*0.0*	*0*	*0*
120	*0.0*	*20.8*	*0.0*	*0.0*	*0*	*0*
150	*0.0*	*20.8*	*0.0*	*0.0*	*0*	*0*
180	*0.0*	*20.8*	*0.0*	*0.0*	*0*	*0*
210	*0.0*	*20.8*	*0.0*	*0.0*	*0*	*0*
240	*0.0*	*20.9*	*0.0*	*0.0*	*0*	*0*
270	*0.0*	*20.9*	*0.0*	*0.0*	*0*	*0*
300	*0.0*	*20.9*	*0.0*	*0.0*	*0*	*0*
Min	*0.0*	*20.1*	*0.0*	*0.0*	*0*	*0*
Max	*0.0*	*20.9*	*0.4*	*0.0*	*0*	*0*
Steady	*0.0*	*20.9*	*0.0*	*0.0*	*0*	*0*

VOC ppm	*0.0*	Depth to base of well	*8.19*	SWL	*3.95*	LNAPL or DNAPL	*ND*	Start time:	*11:56*
	Steady		mBGL		mBGL		mBGL	Finish Time:	*12:05*

>>>> = Flow above detection limit of 30 l/hr, <<< = Negative flow greater than -10 l/hr. >Max = In excess of lower explosive limit. NR = Not Recorded. ND = Not Detected.

Remarks: *Silty base.*