

Phase 2 Site Investigation

Plot H5 Manchester Airport

for

MAG Property Ltd



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16/01/2025



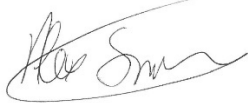
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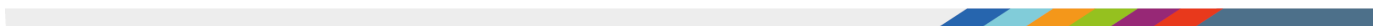
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1.0 Introduction

1.1 Background

- 1.1.1 RoC Consulting has been appointed by MAG Property Ltd to conduct a Phase 2 Site Investigation across Plot H5, Manchester Airport (the site). It is understood that the site is to be redeveloped for use as an 8-storey Hotel with associated refuse / plant building. A copy of the proposed development layout plan (collated by 5Plus Architects) is provided within Appendix A (ref: H5PI-5PA-00-00-DR-A-021200).
- 1.1.2 The following assessment has been completed to support design and planning requirements for the sites redevelopment and follows on from a number of site investigations relating to the development site, specifically:
- 1) Brownfield Solutions 2014 (DMG/C2315/4577)
 - 2) RoC Consulting (2016) Supplementary Site Wide Site Investigation (JB/AS/p2 3276)
 - 3) RoC Consulting (2020) Plot H3 Phase 2 Site Investigation (ROCP Ltd/RM/AS/P2 4013 R1)
 - 4) RoC Consulting (2024) Phase 1 Desktop Study (4700-ROC-ZZ-XX-RP-G-P1DS1)
- 1.1.3 It is recommended reference be made to the abovementioned report(s) when reviewing the current assessment.
- 1.1.4 The scope of the report and its assessment has been based around the sites redevelopment proposals as outlined in the aforementioned architect plans. It should be noted that any subsequent revision of the proposed redevelopment or site boundary away from the above-mentioned drawing may result in the full or partial re-interpretation of this report and assessment.

1.2 Terms of Reference

- 1.2.1 The Phase 2 Site Investigation was carried out following receipt of an instruction from Emily Fleet of MAG Property.

1.3 Objectives

- 1.3.1 The scope of works has been tailored to meet both planning and design requirements to assist with the redevelopment of the site. These considerations include:
- 1) Design a programme of site investigation works to establish ground conditions beneath the site and target known or suspected sources of contamination (as revealed by the Phase 1 desktop study).
 - 2) Completion of site investigation field works including the formation of 2x rotary cored boreholes and 5x window sample boreholes to establish the site geology, as well as 5x DCP tests to inform road and pavement design as well as slab design for the future buildings.



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- 3) Completion of geo-environmental and geotechnical laboratory analysis of soil and rock samples to determine physical and chemical characteristics.
- 4) Laboratory analysis of site soils to assess the hazardous waste potential and likely Waste Acceptance Criteria of made ground soils at the site. This testing provides indicative information only.
- 5) Completion of up to 6 ground gas and groundwater monitoring visits to establish the ground gas and groundwater conditions at the site.
- 6) Completion of a geotechnical assessment of site conditions to inform new building foundation design. The scope of this assessment will also include reference to the findings and result of previous site investigation works.
- 7) Completion of a geo-environmental assessment utilising information provided by both the current and previous phases of site investigation works sufficient in its scope to assist with the discharge of contaminated land related planning conditions.

2.0 Limitations of Study Assessment

- 2.0.1 The report has been produced by RoC Consulting for the client solely for the purposes of a review of information for the above-mentioned site. It may not be used by any person for any other purpose other than that specified without the express written permission of RoC Consulting. Any liability arising out of its use by a third party for purposes not wholly connected with the above shall be the responsibility of that party who shall indemnify RoC Consulting against all claims, costs, damages and losses arising out of such use.
- 2.0.2 This report is written in the context of an agreed scope of work and should not be used in a different context. The report should be read in its entirety. Furthermore, new information, improved practices and changes in legislation may require re-interpretation of this report in whole or in part after its original issue. RoC Consulting reserve the right to alter their conclusions and recommendations in the light of further information that may become available.
- 2.0.3 Ground conditions can change rapidly, especially in areas of made ground, however, it is assumed that the ground conditions observed are typical a representative of the site as a whole. The ground conditions have been determined from a limited number of exploratory holes formed across the property, therefore, only a small percentage of the total area of the property has been investigated. Interpolation between exploratory holes has enabled a general picture of the subsurface conditions to be produced.
- 2.0.4 Conclusions drawn from the ground investigation should be read in this context. RoC Consulting cannot accept responsibility for any situations resulting from locally unforeseen ground conditions occurring between exploratory holes.
- 2.0.5 RoC Consulting has exercised all reasonable due skill, care and diligence when collating the design and subsequent execution of ground investigation works. It should be noted we cannot anticipate the requirements and actions of the regulatory authorities when designing and implementing ground investigation works and, whilst thorough consideration has been given to all geo-environmental and geotechnical concerns; further additional fieldworks or assessment may be required at their request.
- 2.0.6 RoC Consulting cannot confirm that all ground conditions which may be uncovered during the works have been identified, rather this report is intended as an informative for use by experienced professionals and contractors.
- 2.0.7 Whilst the investigation and report has been scoped in accordance with our understanding of typical regulatory authority requirements, we cannot confirm that on submission regulators may require additional in situ testing or investigation.

3.0 Background Information

- 3.0.1 The overview below outlines the most salient points and considerations, and it is recommended reference be made to the complete findings of previous site investigation reports for additional information and / or clarification.

3.1 Site Description

- 3.1.1 Covering an area of 0.26ha, the site forms an irregularly shaped plot of land to the north of Manchester Airport centred around OS national grid ref: 381882, 385549. The northern portion of the site is currently occupied by a taxi and coach drop off area serving the nearby Tribe Hotel (located immediately to the north of the site). The southern portion of the site is occupied by an access road. The northern and eastern boundary of the site is formed by the Tribe Hotel (Plot H3) and car parking, the southern boundary is formed by an access road with Voyager House (an office building beyond) and the western boundary is formed by car parking. Nearby development includes hotel buildings, car parking, Voyager House (an office building) and the Manchester Airport public transport terminal comprising, a bus, tram and train station with further hotels and airport infrastructure outside the immediate vicinity of the site.
- 3.1.2 Topographically speaking the site is relatively flat with some locally minor engineered changes in levels to facilitate drainage of the hardstanding roads and car parking. There is no water courses present on site with a 100% hard standing coverage noted and piped drainage network in operation.
- 3.1.3 Land uses within 250m of the site to the south, east and west include offices, car parking, public transport terminals and airport terminals. Land use to the north of the site predominantly comprises car parking highways and vacant land.
- 3.1.4 No specific sources of contamination, or potentially contaminative industrial activities, were noted on or adjacent the site at the time of inspection during the Phase 1 Desk Study or throughout the fieldworks that form part of this report.

3.2 Geological Characteristics

- 3.2.1 Review of publicly available BGS geological map records indicate the site is underlain by the following:
- Drift Geology:** Devensian Till – Diamicton (DT)
- Solid Geology:** Bollin Mudstone Member - Mudstone & Siltstone (BM)
- 3.2.2 There are no geological faults indicated within 500m of the site.
- 3.2.3 Geology at the site, particularly the Bollin Mudstone Member could potentially be pyritic based on the guidance detailed in Building Research Establishment (BRE) Special Digest 1: 2005 'Concrete in Aggressive Ground' to establish a design sulphate class (DS) and the 'aggressive Chemical Environment for Concrete' (ACEC).

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- 3.2.4 The Envirocheck report (Appendix C) indicates that the site is not located in an area which may be affected by historic Coal Mining and a Coal Authority report is not required.
- 3.2.5 The Envirocheck report states that the site is located within an area which may be affected by historic brine pumping, and it is recommended a CON29M report is procured. However, noting the BGS map records indicate the site is underlain by the Bollin Mudstone formation, which is not known to be used for the production of Brine, we are of the opinion the ground subsidence risks are low.
- 3.2.6 According to the environmental database search, the site is located within a lower probability radon area (less than 1% of homes are estimated to be at or above the action level) and therefore no radon protection measures are necessary in the construction of new buildings.

3.3 Site History and Environmental Characteristics

- 3.3.1 The site has had a limited history of development, having been occupied by agricultural fields associated with Woodhouse Farm up until the 1990's when the site was developed as a car park associated with Manchester Airport and the Voyager building construction. In 2022 the northern portion of the site became part of the construction compound used for storage of materials and site cabins for the development of the Tribe Hotel (Plot H3) immediately adjacent the northern boundary of the site, the hotel had just recently been completed at the time of writing.
- 3.3.2 From the 1870/80s the site was predominantly surrounded by farmland with a number of farmhouses and ponds located within 500m of the site. The site surroundings largely remained dominated by agricultural land use up until the mid to late 1900s when the expansion of Manchester Airport began and its associated infrastructure. A number of potentially contaminative land uses are noted in the general vicinity of the site associated with airport infrastructure including electricity substations, fuel stations and the Manchester Airport Integrated Public Transport Interchange. The ponds that were historically located within close proximity to the site have all been infilled over time to facilitate development in the surrounding area.
- 3.3.3 The Envirocheck Groundwater Vulnerability Map indicates the drift geology (DT) is classified as a Secondary Undifferentiated Aquifer with the underlying BM bedrock classed as a Secondary B Aquifer. The site is not said to be located within any Environment Agency Source Protection Zones or close proximity to any sensitive water abstraction points (e.g. potable water supply well). There are no surface or groundwater abstraction points; or discharge consents, within 1000m of the site.
- 3.3.4 The nearest surface water feature is indicated 268m to the northeast in the form of an unnamed watercourse. No water quality data is available for this feature. There are no surface or groundwater abstraction points; or discharge consents, within 500m of the site.
- 3.3.5 The site is not on the Contaminated Land Register, and there are no such sites within 1km of the site. Nearby Pollution Controls are detailed in table 3.0 overleaf:

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Table 3.0: Pollution Controls

Regime	Onsite	0 to 250m	250m to 500m
Integrated Pollution Control (IPC)	None recorded	None recorded	None recorded
Integrated Pollution Prevention and Control (IPPC)	None recorded	None recorded	None recorded
Local Authority Pollution Prevention and Control (LAPPC)	None recorded	1	1
Local Authority Pollution Prevention and Control Enforcement (LAPPCE)	None recorded	None recorded	None recorded

- 3.3.6 A single LAPPC is recorded within 250m of the site associated with Manor Service Stations Ltd, Terminal 1 petrol stop and is a local authority air pollution control. However, it is understood that the petrol filling station no longer exists based on a review of satellite imagery and historic mapping.
- 3.3.7 The site is classified as Flood Zone 1 (lowest risk category). Envirocheck records that the site has potential for groundwater flooding to occur at the surface. These classifications do not constitute a Flood Risk Assessment.

4.0 Site Investigation Design

General

- 4.0.1 The RoC intrusive investigation was designed and completed to further investigate geo-environmental issues identified during the Phase 1 Desktop Study as well as provide geotechnical information to facilitate new building design.
- 4.0.2 The site investigation works comprised the following:
- Formation of 2x dynamic sample with rotary core follow-on boreholes to a maximum depth of 20.20mbgl.
 - Formation of 5x window sample boreholes to a maximum depth of 4.00mbgl.
 - Completion of 6x TRL DCP tests to a maximum depth of 0.94mbgl to establish CBR values of shallow soils.
- 4.0.3 Exploratory hole placement was dictated by the findings of the Phase 1 Desktop Study to zone in on areas where site soils have not previously been investigated, and to provide a good overall coverage across the site footprint since no particular point sources of contamination were identified during the desk study. In addition, boreholes were located within the footprint of the proposed new development to establish ground conditions and support foundation design.
- 4.0.4 Samples of soil collected during the investigation works are to be analysed for a variety of determinants associated with the pattern of current / historic industrial activity across the site as outlined within the preliminary conceptual site model.
- 4.0.5 Table 4.0 provided below provides location justification for each exploratory hole formed during the site investigation fieldworks. The purpose of this table is to illustrate the targeting of potential sources of contamination during the Phase 2 site investigation works.

Table 4.0: Borehole Locations & Justification

BH/WS ID.	Reason for selection
RBH301	Investigate ground conditions beneath the western portion of the proposed building. Facilitate the collection of environmental and geotechnical rock and soil samples and installation of a monitoring well in the BM.
RBH302	Investigate ground conditions beneath the eastern portion of the proposed building. Facilitate the collection of environmental and geotechnical rock and soil samples and installation of a monitoring well in the BM.
WS301	Investigate ground conditions in the eastern portion of the site and facilitate the collection of geotechnical and environmental samples from site soils and install a gas and groundwater monitoring well
WS302	Investigate ground conditions beneath the northwest portion of the proposed building. Facilitate the collection of geotechnical and environmental samples from site soils and install a gas and groundwater monitoring well.
WS303	Investigate ground conditions beneath the proposed plant / refuse building and facilitate the collection of environmental and chemical samples from site soils.



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BH/WS ID.	Reason for selection
WS304	Investigate ground conditions beneath the central portion of the proposed building. Facilitate the collection of environmental and chemical samples from site soils and install a ground gas and groundwater monitoring well.
WS305	Investigate ground conditions beneath the eastern portion of the proposed building. Facilitate the collection of geotechnical and environmental samples from site soils and install a gas and groundwater monitoring well.

- 4.0.6 Exploratory hole locations are shown on RoC Consulting drawing 4700-ROC-ZZ-XX-DR-ES-ES101 (Current Site) and 4700-ROC-ZZ-XX-DR-ES-ES102 (Proposed development) provided within Appendix A.

5.0 Site Investigation Fieldworks

- 5.0.1 Site investigation fieldworks were completed between the 21st and 29th of October 2024 by drilling contractors MT Geoservices. Boreholes were formed using Premier Compact (Window sample boreholes) and Beretta T41 (Dynamic sample with rotary core follow on boreholes).
- 5.0.2 Prior to excavation, our methodology for service avoidance, G5.15, was applied. This methodology includes:
- Consultation of existing statutory undertakers plans of services
 - Consultation of service drawings provided to us by the client or site operator
 - Completion of location specific GPR clearance where applicable
 - Opening of nearby service covers
 - CAT and Genny scanning
 - Excavation of 1.20m hand dug service avoidance pit in advance of borehole drilling
 - Recording of these checks through location specific Permits To Dig
- 5.0.3 To ensure no new sources of contamination were introduced to underlying soils and bedrock during the formation of each borehole, we have adopted safe drilling techniques for ground investigation in all instances, to ensure no new sources of contamination were introduced or mobilised as a consequence of the works. These methods include but are not limited to:
- Use of steel casing and vegetable oil as a lubrication medium
 - Formation of impermeable bentonite seals to the tops and bottoms of response zones in installed monitoring wells
 - Reinstatement of boreholes without monitoring wells with bentonite
 - Cleaning of sampling equipment to reduce cross contamination
 - Dual pipe monitoring wells have not been installed
- 5.0.4 We consider that the employment of these above methods keeps the likelihood of contamination disturbance as low as reasonably practicable, although it is not possible to wholly remove the possibility of such occurrences.
- 5.0.5 Soil and rock core samples were collected for subsequent chemical and geotechnical laboratory analysis. Soil samples used for geotechnical analysis were collected in 1kg plastic sample tubs, U100 wax sealed sample tubes and polythene “bulk” bags. Samples collected for chemical testing were collected in 60g glass vials, 258g glass jars and 1kg plastic sample tubs. Samples were obtained from both made ground and natural strata to assess the overall quality of underlying soils. In situ soil strength was investigated using Standard Penetration Tests (SPT) within superficial deposits as well as to confirm rock head had been reached.
- 5.0.6 The shallow soils encountered during construction of the boreholes were described and logged by a suitably qualified engineer in accordance with BS 5930: Code of Practice for Site Investigations (the log sheets for which have been provided within Appendix B).

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- 5.0.7 A total of 6 ground gas and ground water monitoring wells were installed within select boreholes. Installation details are provided within Table 5.0 overleaf, copies of ground water and gas monitoring records are provided within Appendix E.

Table 5.0: Monitoring Well Installations

BH ID	Monitoring well depth	Response zone	Response zone strata
RBH301	12.00m	3.50 to 12.00m (66.65 to 58.15mAOD)	Bollin Mudstone Member
RBH302	12.00m	3.00 to 12.00m (67.16 to 58.16mAOD)	Bollin Mudstone Member
WS301	3.00m	1.00 to 3.00m (69.04 to 67.04mAOD)	Devensian Till
WS302	3.00m	1.00 to 3.00m (68.97mAOD to 66.97mAOD)	Devensian Till
WS304	3.00m	1.00 to 3.00m (69.02 to 67.02mAOD)	Devensian Till
WS305	2.00m	1.00 to 2.00 (69.18 to 68.18mAOD)	Devensian Till

6.0 Encountered Ground Conditions

- 6.0.1 The following ground conditions are summarised from the exploratory holes formed during the RoC Consulting site investigation and select boreholes located within the site boundary or within close proximity to the site boundary from the Brownfield Solutions investigation completed in 2014 (BSA5, BSA7, BSA11, BSC6, BSC14 and BSC18). The following represents an overview of encountered ground conditions, and it is recommended reference be made to the borehole and trial pit log sheets provided within Appendix B for a detailed strata description; all depths shown are given in metres below ground level (mbgl) unless otherwise stated.

6.1 Ground Conditions Overview

Made Ground

- 6.1.1 Made ground was reported at all exploratory hole locations the details of which is provided in table 6.1 below:

Table 6.1: Made Ground Strata Description

Strata description	<p>Made ground (MG) was encountered at all exploratory hole locations and was reported as comprising car parking build-up of Asphalt underlain by a sandy gravel (reworked natural limestone / sandstone subbase). No evidence of demolition type fill material or other deleterious made ground materials were noted on site during fieldworks.</p> <p>No SPT testing was undertaken within these deposits as they were only encountered to shallow depths. However, DCP tests were undertaken on site and the results of these tests are discussed in section 6.4.</p> <p>No ground water strikes were encountered within MG.</p>		
Max Depth (m)	1.00	Min Depth (m)	0.30
Mean Depth (m)	0.57	SPTs	N/A

Devensian Till (Granular and Cohesive)

- 6.1.2 DT deposits were reported at the base of made ground deposits at all exploratory hole locations as described in Table 6.2 overleaf.

Table 6.2 Devensian Till (Granular and Cohesive)

Strata description

Devensian Till (DT) deposits were reported directly underlying made ground deposits. DT deposits encountered were a mixture of both granular (slightly silty fine to medium sand) and cohesive (slightly sandy slightly gravelly clay / slightly gravelly clay). Generally, speaking, in the western portion of the site granular deposits were encountered underlying the made ground underlain by interbedded cohesive and granular deposits.

In the central and eastern portion of the site, largely cohesive deposits were reported underlying made ground with the exception of BSC6 where a small granular band was reported within the cohesive deposits.

Granular Deposits:
The granular deposits were encountered beneath MG at WS301, WS302, WS303, RBH301, BSA5 and BSA11 and appear to be limited to the western portion of the site. The granular deposits also appear to be spilt into an upper and lower deposit separated by cohesive deposits at WS302, WS303, WS305, and BSA11.

Upper Granular Deposits:
The upper deposits ranged in depth from 0.90 to 2.20 mbgl varying from 0.35 to 1.80m in thickness with an average depth to base of 1.52mbgl. The upper deposit was generally described as a loose to medium dense slightly silty fine to medium sand which was occasionally recorded as gravelly or clayey. A total of 4 SPT tests were undertaken in the upper deposit with N values ranging from 7 to 20.

Groundwater strikes were recorded in WS301 and WS303 at 1.00mbgl and BSA11 at 1.80mbgl where the upper granular DT layer was reported. There appears to be a perched water body within these strata sitting above the lower permeability cohesive deposits. Although it is noted some water strikes were also recorded in cohesive soils at a similar depth.

Max Depth	2.20	Min Depth	0.92
Mean Depth	1.52	SPTs	7 to 20

Lower Granular Deposits:
The lower deposits were only encountered at WS302, WS303, RBH301, BSA11 and BSC6 and ranged in depth from 1.80 to 3.95mbgl. The thickness of the deeper granular deposit varied from 0.25m to 0.85m. Generally, the lower deposit was reported as a medium dense slightly silty fine to medium sand or dense brown sand.

A total of 3 SPT tests were undertaken in the lower deposits with N values ranging from 13 to 44.

Max Depth	3.95	Min Depth	1.80
Mean Depth	2.85	SPTs	13 to 44

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Cohesive Deposits

Central / Eastern Portion of site:

Cohesive deposits were encountered directly underlying MG at all exploratory hole locations in the central / eastern portion of the site (WS304, WS305, RBH302, BSC14, BSA7 and BSC6).

DT in this area of the site was generally described as a firm becoming stiff to very stiff with slightly sandy slightly gravelly clay varying in depth from 2.00 to 3.10mbgl with an average depth to base of 2.71mbgl. The thickness of these deposits ranged between 1.50 and 2.75m.

A water strike was recorded at WS304 at 1.00mbgl within cohesive soils. A total of 9 SPT tests were undertaken within cohesive deposits at these boreholes with N values ranging from 12 to 29 generally increasing with depth.

Max Depth	3.10	Min Depth	2.00
Mean Depth	2.71	SPTs	12 to 29

Western Portion of the site:

Cohesive deposits in the western portion of the site were encountered underlying granular DT. RBH301, WS302, WS303 and BSA11 were separated into an upper and lower layer of cohesive soils by a band of granular soil.

Upper Cohesive Deposits:

At WS301, WS302, WS303, RBH301, BSA5 and BSA11 cohesive deposits were encountered underlying the DT (granular). These deposits were generally described as a firm to stiff sandy slightly sandy slightly gravelly clay. However, notably at WS303 clay was described as being very soft at 1.52mbgl before becoming firm at 2.45mbgl. It is likely the clay at this location has been softened by the presence of the perched groundwater in the granular deposits above.

The depth of the upper cohesive deposit's ranges from 1.60 to 3.50mbgl with thickness varying from 0.70 to 2.50m (WS301 and BSC18 where no granular deposits were encountered separating cohesive deposits have been included with the upper cohesive deposits). A total of 2 SPT tests were undertaken in the upper deposits with N values ranging from 8 to 21.

Max Depth	3.50	Min Depth	1.60
Mean Depth	2.79	SPTs	8 to 21

Lower Cohesive Deposits:

At WS302, RBH301 and BSA11 deeper cohesive deposits were encountered underlying a band of granular deposits and was generally described as firm to stiff slightly sandy slightly gravelly clay. These deposits were encountered to a depth of 3.50 to 4.20mbgl (and varied in thickness from 0.25 1.65mbgl) before transitioning into weathered mudstone, the transition zone was demarked by the presence of tabular mudstone lithorelicts and the reddening of the soil.

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	A total of 2 SPT tests were completed within the lower cohesive deposits with SPT N values ranging between 32-35.			
	Max Depth	4.20	Min Depth	3.50
	Mean Depth	3.73	SPTs	32-35

Weathered Bedrock

- 6.1.3 Weathered bedrock of the Bollin Mudstone Formation (BM) was encountered at all exploratory hole locations ranging with the depth to the top of the stratum ranging from 2.00mbgl in the east to 4.20mbgl in the west (68.16 to 65.69mAOD) indicating that bedrock is dipping to the west. Weathered bedrock was generally reported as a gravelly clay or clayey gravel containing fine to medium tabular angular mudstone gravel.

Bedrock

- 6.1.4 Generally bedrock of the BM was described as extremely weak to weak reddish brown and grey thinly and thickly interlaminated, occasionally thinly bedded mudstone. RQD values within the mudstone were generally poor (<30) areas of higher RQD were recorded in RBH301 at 8.70 to 10.20mbgl (62) and at 13.20 to 16.20mbgl ranging from 67 to 85. At RBH302 higher RQD Values were recorded at 12.00 to 15.00mbgl ranging from 51 to 71. At BSA5 higher RQD values were recorded at 10.40 to 13.40mbgl (52) and 19.40 to 22.40mbgl (51). At BSA7 higher RQD values were recorded at 12.45-15.45mbgl. In BSA7 RQD values were poor throughout the borehole.
- 6.1.5 A programme of geotechnical testing was completed on soil and rock samples obtained from site investigation works, copies of which are provided within Appendix D.

6.2 Contamination Observations

- 6.2.1 No visual or olfactory evidence of contamination was observed during the site investigation.

6.3 Groundwater Observations

- 6.3.1 Groundwater strikes were reported in WS301, WS303 and WS304 at 1.00mbgl within DT deposits, additional water strikes were recorded in Brownfield Solutions boreholes BSA5, BSA7, BSA11, BSC6 and BSC18. Resting groundwater monitoring results (as revealed from borehole standpipes) indicate a groundwater table within the DT at levels ranging between 69.47 and 68.08mAOD. A second groundwater body has also been identified at a slightly deeper depth within the DT at RBH301 and BSC18 at levels ranging between 67.05 to 68.17mAOD. A third Groundwater body appears to be present within the BM at depths ranging between 65.62 to 65.96mAOD. Full details of monitoring results have been provided within Appendix E.

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Table 6.3: Groundwater Strike and Resting Water Level Information

BH ID	Water Strike Depth		Resting Water Level		Strata
	mbgl	mAOD	mbgl	mAOD	
WS301	1.00	69.04	0.88-1.29	69.16-68.75	Devensian Till (DT)
WS302	-	-	1.17-1.35	68.8-68.62	Devensian Till (DT)
WS303	1.00	69.17	-	-	Devensian Till (DT)
WS304	1.00	69.02	0.86-1.94	69.16-68.08	Devensian Till (DT)
WS305	-	-	0.71-1.69	69.47-68.49	Devensian Till (DT)
RBH301	-	-	2.63-3.10	67.52-67.05	Devensian Till (DT)
RBH302	-	-	4.20-4.38	65.96-65.74	Bollin Mudstone (BM)
BSA5	7.40	62.55	-	-	Bollin Mudstone (BM)
BSA7	4.50	65.57	4.40-4.45	65.67-65.62	Bollin Mudstone (BM)
BSA11	1.80	68.09	-	-	Devensian Till (DT)
BSC6	0.70	69.51	-	-	Devensian Till (DT)
BSC18	1.30	68.87	2.00-2.22	68.17-67.95	Devensian Till (DT)

- 6.3.2 It should be noted that, due to the choice of drilling methods, it was not possible to accurately record the depth of groundwater strikes in rotary drilling locations. Assessment of groundwater levels is more accurately made based on the resting water levels recorded during monitoring.

6.4 Below Ground Obstructions

- 6.4.1 No below ground obstructions were encountered during site investigation works.

6.5 TRL DCP CBR Testing

- 6.5.1 Transport Research Laboratory Dynamic Cone Penetration (TRL DCP) testing was carried out in six locations across the site. TRL DCP testing consists of manually dropping an 8kg hammer through a height of 575mm and driving a 20mm diameter, 60° cone into the ground. The amount of penetration per blow or set number of blows is recorded. This is then used to calculate an equivalent CBR (California Bearing Ratio) using the following equation.

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10} (\text{mm/blow})$$

This relationship has been proved empirically by the Transport Research Laboratory. It should be noted that TRL DCP testing is not a test defined by British Standards. It is however described in interim advice note 73/06 revision 1 (2009) issued by Highways England.

- 6.5.2 Results and analysis of dynamic cone penetration test data are presented in Appendix B. The results are summarised in Table 6.5 overleaf.

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Table 6.5: DCP Testing Results

Location ID	Top Depth (mm)	Bottom Depth (mm)	CBR (%)
WS301	290	464	135
	464	577	150
WS302	197	264	143
	264	439	79
	439	614	32
WS303	240	395	134
	395	465	150
	520	520	66
	527	527	150
WS304	235	388	132
	388	537	67
	537	549	150
WS305	215	276	104
	276	362	58
	362	542	30
	542	714	13
	924	924	25

- 6.5.3 Relatively high CBR values are observed throughout all locations, and it is unlikely that CBR values are so high in reality and results may have been affected by the presence of cobbles and coarse gravel within the made ground presenting artificially high results.

6.6 Hand Shear Vane Testing

6.6.1 Hand shear vane was undertaken within clay deposits within investigation points formed on site, in order to establish the shear strength of clay soils. The results of hand shear vane testing are presented below in Table 6.6.

Table 6.6 Hand Shear Vane Testing Results

	WS301	WS302		WS303		WS304		RBH301	RBH302	
Test Depth (m)	1.60	1.80	3.30	1.70	2.50	1.60	2.60	3.10	0.60	0.95
Shear Strength (kPa)	57	72	72	29	41	90	77	82	77	62
BS EN ISO 14688-2:2017 Undrained Shear Strength of Fine Soils (Table 6)	Medium	Medium	Medium	Low	Medium	High	High	High	High	Medium

7.0 Laboratory Testing

- 7.0.1 To establish the physical and chemical properties of underlying soils, a programme of laboratory analysis was completed utilising samples obtained during site investigation works. This analysis comprised the testing of soil samples to assist with the estimation of risks posed by contaminated land related concerns.

Chemical Testing

- 7.0.2 RoC Consulting submitted a total of 10 soil and 2 water samples to a UKAS accredited testing facility for analysis against a range of determinands synonymous with the site former industrial activity.

Determinands	No. of Tests
Soil Suites	
Toxic and phytotoxic metals and metalloids	10
Total & Speciated PAH,	10
Other inorganic substances (e.g. Sulphate, Cyanide etc)	10
Asbestos ID	2
Water Soluble Sulfate & pH	10
BRE SD1 Sulphate Suite	3
WAC	2
UU Pipework Risk Assessment (UKWIR)	1
Water Suites	
Toxic and phytotoxic metals and metalloids	2
Total & Speciated PAH	2
Other inorganic substances (e.g. Sulphate, Cyanide etc)	2
Water Soluble Sulfate & pH	2
TPH	2
SVOC / VOCs	2

- 7.0.3 Copies of chemical testing results have been provided within Appendix C.

Geotechnical Testing

- 7.0.4 A programme of geotechnical laboratory analysis was also completed on tub and undisturbed soil samples obtained during site investigation works.

Plasticity Index

- 7.0.5 A total of 13 soil samples were tested for the determination of the cohesive DT plasticity index. The depth range of samples tested varied from 1.00 to 3.30m with a mean depth of 1.92mbgl. The plasticity index range varied between 6 and 21% with a mean value of 12%. These results indicating the cohesive DT to be of a predominantly low plastic nature. The results were corrected for the % of soils passing the .425mm sieve in the samples. The modified plasticity index range varies between 6 and 21% with a mean value of 12. These results indicate that cohesive DT soils generally have a low volume change potential.
- 7.0.6 A total of 2 soil samples were tested for the determination of the weathered fraction of the Bollin Mudstones plasticity Index. The depth ranges of samples varied from 2.00 to 4.60mbgl. The plasticity index range varied from 8 to 10% indicating the BM to be of a predominantly low plastic nature. The results were corrected for the % of soils passing the .425mm sieve in the samples. The modified plasticity index range varies between 8 and 10% with a mean value of 9. These results indicate that the weather fraction of the BM generally has a low volume change potential.

Undrained Unconfined (UU) Triaxial Testing

- 7.0.7 A total of 3 samples of cohesive DT were tested for the determination of undrained shear strength from depths ranging between 1.65 to 3.00mbgl. Shear strength results vary between 33 and 227kPa with a mean value of 146kPa. These results indicate shallow clay strengths vary between low to very high strength.

Oedometer Testing

- 7.0.8 A total of 4 undisturbed 'U100' samples were subject to oedometer testing to establish the m_v value of the clay soils. These have established m_v values using a range of applied pressures (0 to 240kPa) with m_v values obtained ranging from 0.012 to 0.450.

Particle Size Distribution

- 7.0.9 A total of 4 bulk samples of granular DT were subject to particle size distribution testing to confirm their principal constituent parts. Results from these tests support the descriptions of granular DT deposits.

Unconfined Compressive Strength (UCS)

- 7.0.10 A single rock core sample obtained from site was subject to UCS testing. However, a total of 3 rock core samples from the Brownfield Solutions investigation were also subject to UCS testing for the determination of Unconfined Compressive Strength, and although located within the wider H plots site area, it is deemed they are located in close enough proximity to be included in the assessment of rock strength in this report. Tests were completed on cores obtained from 3.81 to 15.06mbgl. Results indicate the UCS of tested core samples to range from 6.5 to 12.1MPa.

Point Load Testing

- 7.0.11 A total of 43 core samples of BM underwent point load testing from depths ranging between 4.10 and 19.80mbgl. Point load testing is (50) values ranging from 0.02 to 2.49MPa. Using a conversion factor of 21 based on Aitalesh et al (2015) to convert the point load to a uniaxial strength indicates the UCS of the tested rock ranges from 0.42 to 26.46MPa.
- 7.0.12 Results from geotechnical laboratory testing have been provided within Appendix D.

8.0 Geo-Environmental Assessment

- 8.0.1 The results from the intrusive Phase 2 ground investigation have been used to complete a refined assessment of risks posed by ground contamination and ground stability issues beneath the site, building on the model and assessment outlined in the Phase 1 Desktop Study. The assessment considers these risks both in terms of the current site arrangement and usage, as well as any potential future development (and associated construction process).
- 8.0.2 The assessment has been collated with reference to various statutory and non-statutory guidance documents relating to land contamination and ground stability. Specifically, the assessment has been conducted in accordance with the Environment Agency Land Contamination Risk Management (LCRM) guidance relating to the “Tier 2 Generic Quantitative Risk assessment” process (revised April 2021).
- 8.0.3 In accordance with this method, a Refined Conceptual Model has been collated for the site based on the results of the desktop review. This model is based around the Source / Pathway / Receptor methodology as outlined in Fig 8.0.

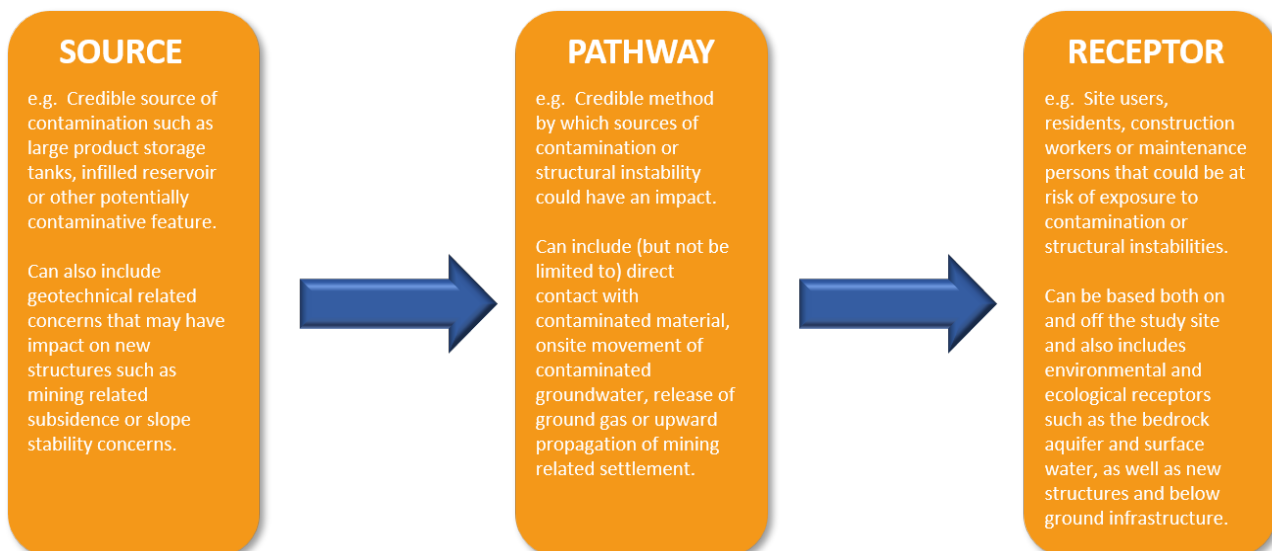


Figure 8.0 Source Pathway Receptor Diagram

- 8.0.4 Risk assessment is the process of collating known information on a hazard or set hazards in order to establish actual or potential risks to receptors. The receptor may be human health, controlled waters, a sensitive local ecosystem or even construction materials. Receptors can be connected with the hazard under consideration via one or several exposure pathways (e.g., the pathway of direct skin contact and oral exposure).

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- 8.0.5 Risks are generally managed by isolating or removing the hazard, isolating the receptor, or by intercepting the exposure pathway. Without the three essential components of a source (hazard), pathway and receptor, there is deemed to be no risk. In other words, the mere presence of a hazard at a site does not mean that there will necessarily be risks.
- 8.0.6 Potential sources of contamination have been identified across the site, where applicable, based on observations and information obtained during the desktop review. These sources are defined based on the results from site investigation fieldworks and subsequent laboratory analysis of samples / monitoring works. As previously discussed, the design of investigations was primarily intended to provide site wide information on soil, groundwater and ground gas quality given the lack of any significant point sources of contamination identified during the desk study phase.
- 8.0.7 The risk assessment has been completed with reference to the guidance outlined within CIRIA 552 "Contaminated land risk assessment. A good practice guide". This risk assessment methodology considers the potential consequence and severity of risks that may be present within soils and then compares these with the likelihood of occurrence and exposure of said risk. A range of risk classifications are provided within CIRIA 552 further details of which are provided in Table 8.0 below.

Table 8.0: Definition of risk class and consequence

Risk Class	Definition	Example
Minor	Potential for harm, although not significant, which may result in financial loss to resolve. Ground conditions where the use of PPE would readily mitigate risks posed to human health.	Low level contamination hotspots within made ground / demolition fill materials. Stunted or impeded plant growth due to poor soil quality.
Mild	Pollution of non-sensitive water resources or damage to crops, plant growth, below ground utilities or structures.	Perched groundwater contamination overlying low permeability aquifer or aggressive sulphate concentrations in soils.
Medium	Sources of contamination identified on site have the potential to cause both long and short-term health effects on site residents / users. Alternatively (or in conjunction with) sources of contamination may have the potential to impact surface or groundwater quality or impede vegetation growth.	Elevated concentrations of hydrocarbon contamination reported within topsoil tested within residential gardens as a result of inadequate or incomplete previous remediation works. Movement of contaminated groundwater from leaking below ground storage tank into adjacent surface water course.
Severe	Sources of contamination pose a credible and acute risk to human health with potential for "Significant Harm" occurring as defined by the Part IIA of the Environmental Protection Act (1990). Alternatively (or in conjunction with risks posed to human health) sources of contamination may pose an immediate risk to controlled water resources or ecosystems.	Grossly contaminated soils are encountered or disturbed during excavation works, causing an immediate release of toxic soil vapour and leachate / contaminated groundwater flow across adjacent land.

- 8.0.8 As previously discussed the contaminated land risk assessment model evaluates the severity of risks that may be present within soils / groundwaters in the context of threats posed to identified receptors before deriving the actual risk rating based on the probability of occurrence. Table 8.1 (provided overleaf) outlines the range likelihood of risk.

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Table 8.1: Probability Assessment

Classification	Definition
High likelihood	A credible pollutant linkage has been identified, and it is very likely contaminants will impact identified receptors in both the short or long term (or is already actively doing so). The potential for harm to be caused is thus highly likely.
Likely	Pollutant linkages between the sources of contamination and identified receptors are present and it is considered likely they will become active given the right set of circumstances (e.g. contaminants currently buried below ground that are likely to be exposed or disturbed during construction / excavation works). The circumstances are such that an event is not inevitable, however it is possible in the short term and likely over the longer term.
Low likelihood	A theoretical pollutant linkage has been identified that has the potential to expose receptors to contaminants under the correct circumstances. However, the likelihood of such an event occurring is not a certainty, even in the long term.
Unlikely	There is no / minimal likelihood a pollutant linkage would occur, even over the long term.

- 8.0.9 The risk assessment process is a combination of probability and consequence, recognising that it may be possible to have a significant source of contamination beneath a site (such as a large below ground chemical storage tank) that may only present a relatively moderate to low risk (owing to the fact it may be contained within a secure concrete bund). Table 8.2 indicates how the actual nature of risk is established with Table 8.3 illustrating how the risk is interpreted in the context of contaminated land risk assessment.

Table 8.2: Risk Definition

		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	

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Table 8.3: Description of risks posed

Risk Definition	Description
Very High	Active pollutant linkages between a significant source of contamination and identified receptors have been established and there is a high likelihood of severe harm occurring to said receptors unless immediate investigation and remediation action is taken.
High Risk	Harm is likely to arise to receptors from an identified hazard in the short and long term. Urgent investigation of the contaminant issue will be required, and remedial treatment is likely.
Moderate Risk	The possibility of harm has been identified toward receptors under the right circumstances, although the severity of harm would be relatively mild. Further investigation of identified issues would be prudent and possible need for remedial measures in the long term.
Low Risk	It is possible harm could arise to a designated receptor from identified hazard, but it is likely (if realised) any harm would be (at worst) mild.
Very Low Risk	No significant pollutant linkages have been identified and the possibility of harm occurring to receptors is low.

8.0.10 A Preliminary desk-based risk assessment has been completed for the site utilising the current and historical environmental information available (refer to RoC Consulting report ref: 4700-ROC-ZZ-XX-RP-G-P1DS1). This report formed the basis from which the current programme of ground investigations was designed and undertaken.

8.0.11 The Tier 2 risk assessment process can be divided based on the receptor group in question between:

1. Risks posed to human health by soil contamination (both construction persons and future site users).
2. Risks posed to human health by hazardous ground gas ingress (both construction persons and future site users).
3. Risks posed to controlled waters by soil or groundwater contamination (both surface water features and bedrock aquifers).
4. Risks posed to new building construction by aggressive ground conditions (namely elevated sulphate concentrations).

8.0.12 It is noted the site is being developed for use as an 8-storey hotel building with an ancillary plant building. Limited soft landscaping is proposed in the southern and eastern portions of the site. The primary exposure pathways to the proposed site are soils within areas of soft landscaping and ground gas migration and build up within confined spaces.

8.0.13 Appropriate assessments have been completed for each of the above utilising the latest statutory and non-statutory guidance documents; for details of risks posed to human health refer to Section 8.1 (soils) and Section 8.2 (ground gas), for details of risks posed to controlled waters refer to Section 8.3 and risks posed to new structures refer to Section 8.4.

8.1 Assessment of Soil Contamination

- 8.1.1 In order to estimate the risks posed to human health from soil contamination, a quantitative risk assessment has been completed utilising the latest Environment Agency CLEA methodology. The assessment utilises the chemical testing results obtained during the site investigation fieldworks to characterise site conditions and facilitate the completion of the risk assessment process.
- 8.1.2 The assessment for this site is based on the comparison of soil chemical testing results with RSK derived GACs under the proposed end use scenario to determine the site suitability for use as detailed in Appendix E.
- 8.1.3 Chemical testing results are compared against RSK derived GAC values for each determinant with any results reported in exceedance of screening criteria identified and their significance reviewed. When determining the significance of any exceedances within the dataset the magnitude and frequency of the exceedance need to be taken into account, for example, a single exceedance of a screening value may be considered a localised hotspot whereas consistently elevated levels of a substance at multiple locations across the site may indicate a more prevalent contamination issue.
- 8.1.4 In addition to this assessment, an Asbestos Identification test (via the visual inspection method) has been completed on all samples of made ground obtained during the investigation to determine risks posed. Any positive occurrences of Asbestos will be subject to quantification analysis to further assess the extent and significance of risks posed.
- 8.1.5 As required, for each exceedance reference will be made to the Conceptual Site Model to establish the most likely source of contaminants and initial commentary given as to the likely scope of remedial measures. In addition, reference will also be made to the assumptions used to derive generic assessment criteria (C4SL and S4UL values) to determine their comparability with the proposed end use.
- 8.1.6 For the purposes of this assessment we have assumed a “Commercial” end use scenario when reviewing chemical testing data against RSK derived GAC values; a “worst case” Soil Organic Matter content value of 1% has been assumed for the initial assessment.

Summary and Assessment of Risks Posed by Soil Contamination

- 8.1.7 Results from chemical testing analysis indicate that no sources of contamination were encountered within site soils. Similarly, there was no positive identification of the presence of asbestos.
- 8.1.8 The findings of the above have been used to update the Refined Conceptual Site Model (provided within Section 9.0) as well as inform the scope of any further investigation or remedial works deemed necessary to support the development of the site.

8.2 Ground Gas Risk Assessment

- 8.2.1 The Preliminary Conceptual Site model identified nearby infilled ponds and potential organic matter within site soils as being a potential source of ground gas generation. The site is not said to be located within in an area at risk from Radon gas ingress.
- 8.2.2 It is considered the most probable exposure pathways are likely to be limited to construction workers during the site redevelopment and future site users occupying buildings across the site.

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- 8.2.3 To estimate the risks posed by ground gas generation a total of 6 boreholes were installed with gas monitoring wells (RBH301, RBH302, WS301, WS302, WS304 and WS305). The purpose of these standpipes is to investigate ground gas generation potential of shallow and at depth soils and the associated implications this may have for new building design. Due to the shallow nature of the made ground deposits located on site it was not possible to install monitoring wells within the made ground. It should also be noted that the only made ground deposits encountered on site comprised road build up (Asphalt and limestone / sandstone subbase) which is not a likely source of ground gas generation.
- 8.2.4 At the time of writing, six ground gas monitoring visits had been completed on site (refer to Appendix E for further information). The results from these monitoring works revealed maximum Methane and Carbon Dioxide concentrations within the Devensian Till of **0.4%** and **2.6%** with gas flow rates ranging between 0 and 10.1l/hr. Maximum Methane and Carbon Dioxide concentrations in the Bollin Mudstone of **0.1%** and **1.9%** were recorded with gas flow rates ranging between 0 and 4.8l/hr. The range of atmospheric pressure readings varied between 997 and 1024 and monitoring included visits during periods of low or falling atmospheric pressure.
- 8.2.5 It is noted that the highest peak gas flow rates were recorded in WS301, WS305 within the Devensian Till (10.1, 2.2, -2.4l/hr) and RBH301 within the Bollin Mudstone (4.8l/hr) during monitoring visits where the well response zones were flooded. It is therefore judged that these flow rates are not representative of actual gas flow rates within the ground and have been created artificially as a results of ground water levels rising above the response zone and trapping gas in the solid section of the monitoring pipe.
- 8.2.6 All peak flow rates during periods when monitoring well response zones were flooded have been discounted from the calculation of the Gas Screening Value (GSV) and a worse case flow rate of **2.3l/hr** adopted for the Devensian Till based on steady flow rates from WS305 (albeit observed when the well was flooded) and **1.5l/hr** for the Bollin Mudstone based on worse case steady flow rates from RBH301.
- 8.2.7 With reference to guidance provided in BS8485:2015+A1:2019 (BS8485) "*Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings*" and assuming the development comprises Building Type B the above-mentioned worst case gas levels and borehole flow rates equate to a GSV 0.0598l/hr for wells sealed into the Devensian Till and 0.0285l/hr for wells sealed into the Bollin Mudstone both of which correspond to an anticipated Characteristic Situation of CS-1. This would not lead to a recommendation for ground gas protection measures in accordance with BS8485.
- 8.2.8 In addition to the above, gas monitoring results also reported elevated levels of Carbon Monoxide within soils above both short- and longer-term operational exposure limits. Whilst the presence of consistently elevated levels of CO may drive the need for gas protection measures, we are of the opinion that no measures are required within the development to mitigate against CO ingress. Our rational and justification for this approach is as follows:
- There are no credible sources of ground gas generation (e.g. landfill sites, areas of significant infilled ground, organic rich soils or peat deposits) beneath or within close proximity to the site.

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- The generation of Carbon Monoxide occurs as a result of below ground combustion (such as a Peat fire). No evidence of Peat deposits or recent below ground combustion incidents are noted on or adjacent the site.
- The construction of the new hotel building will see the removal of all residual made ground and any organic / deleterious material to the top of the glacial till. As such any (more general) potential sources of gas generation are likely to be removed.

8.3 Controlled Waters

- 8.3.1 It is understood the site is underlain by a Secondary Undifferentiated Aquifer in the Devensian Till deposits and the Bollin Mudstone is classified as a Secondary B Aquifer. The site is not said to be located within any Environment Agency Zone source protection zones or in close proximity to sensitive groundwater abstraction boreholes. The nearest surface water feature is indicated 268m to the northeast and is not considered to be at risk of contaminant migration from the study site.
- 8.3.2 Relatively shallow groundwater has been encountered within the Devensian Till deposits on site at a depth of ~1.00mbgl. No testing of shallow groundwater has been completed, and no evidence of any contaminants have been reported within made ground overlying the Devensian Till or the Devensian Till itself. A deeper groundwater body was recorded within the Bollin Mudstone ranging from 4.20 to 4.45mbgl. Samples of groundwater were obtained from within the Secondary B Aquifer and sent for geochemical laboratory testing, the results of this testing were subsequently screened against DWS screening criteria and no exceedances of GACs were reported.

8.4 Below Ground Utilities and Service Runs

- 8.4.1 No UU pipework risk assessment has been completed for the site as the water supply pipe alignment is not understood at the time of writing. However, anecdotally, based on the chemical testing completed on site to date (and the lack of any identified contamination within the ground) non chemically resistant water supply pipes are likely to be appropriate for use at the site.

9.0 Refined Conceptual Site Model

9.0.1 The Environmental Protection Act Part IIA: 1990, defines contamination as land containing levels of contamination which form a risk to human health, controlled waters or other ecosystems. Therefore, contamination in exceedance of the relevant screening values is considered a source. Table 9.0 assesses and summarises the sources, pathways and receptors that may exist at the site.

Table 9.0: Refined Conceptual Site Model

Table 9.0		Refined Conceptual Site Model					
Source		Pathway	Receptor	Severity	Probability	Risk definition	Comments
On Site	Current Ground Conditions, including Made Ground	Dermal contact and / or ingestion; inhalation of vapours / dusts	Current Site Users	Minor	Very Unlikely	Very Low	No contamination sources have been identified that will pose a risk to current site users.
			Construction workers	Minor	Very Unlikely	Very Low	No contamination sources have been identified that will pose a risk to construction workers during the construction phase of the proposed development. It is considered the risks posed to construction personnel, be sources of contamination, can be adequately mitigated against via the use of full PPE and the adoption of good hygiene and site practices*. Appropriate personal ground gas detection equipment should be deployed by all site operatives when working in below ground or confined spaces.
			Future Site Users	Minor	Very Unlikely	Very Low	No contamination sources have been identified that will pose a risk to future site users.
			Ecological	Minor	Very Unlikely	Very Low	No contamination sources have been identified that will pose a risk to any ecological receptors at the site.

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Table 9.0		Refined Conceptual Site Model					
	Source	Pathway	Receptor	Severity	Probability	Risk definition	Comments
On site	Current Ground Conditions	Leaching of contaminated soil & impact beneath site	Controlled Waters: Aquifer	Minor	Unlikely	Very Low	No contamination sources have been identified that will pose a risk to controlled waters, furthermore groundwater testing has not identified the presence of any contaminants within the Secondary B Aquifer located on site.
			Adjacent Sites	Minor	Unlikely	Very Low	No contamination sources have been identified that will pose a risk to adjacent sites.
	Ground Gas Generation	Migration / Accumulation	Current Site Users	Severe	Unlikely	Low - Moderate	Ground gas monitoring has revealed that the site has been classified as CS-1 in accordance with BS8485 and no mitigation measures are required with respect to ground gas. It is considered the risks posed to construction personnel, be it sources of contamination, can be adequately mitigated against via the use of full PPE and the adoption of good hygiene and site practises. Appropriate personal ground gas detection equipment should be deployed by all site operatives when working in below ground or confined spaces.
			Construction workers	Severe	Unlikely	Low - Moderate	
			Future Site Users	Severe	Unlikely	Low - Moderate	
Off site	Potentially Contaminative Sources; Controlled waters and ground gas generation [adjacent landfills, peat bogs etc]	Leaching of contaminated soil onto site	Controlled Waters: Aquifer	Minor	Unlikely	Very Low	No evidence of contaminants in site soils or groundwater.
			Construction workers	Severe	Unlikely	Low - Moderate	
		Ground gas Migration / Accumulation	Future Site Users	Severe	Unlikely	Low - Moderate	Ground gas monitoring has revealed that the site has been classified as CS-1 in accordance with BS8485 and no mitigation measures are required with respect to ground gas.
			Proposed development	Severe	Unlikely	Low - Moderate	



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Table 9.0		Refined Conceptual Site Model					
Source		Pathway	Receptor	Severity	Probability	Risk definition	Comments
							<p>It is considered the risks posed to construction personnel, be it sources of contamination, can be adequately mitigated against via the use of full PPE and the adoption of good hygiene and site practises.</p> <p>Appropriate personal ground gas detection equipment should be deployed by all site operatives when working in below ground or confined spaces.</p>

*Any sources of contamination uncovered during site development works should be brought to the immediate attention of RoC Consulting for consideration and comment.

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Soil Contamination Remedial Requirements

- 9.0.2 Re-appraisal and reassessment of the conceptual site model (following completion of investigation works) has failed to reveal any specific sources of contamination that could require specific remedial measures.
- 9.0.3 It is recommended all construction contractors take reasonable precautions to control environmental impacts that may occur as a result of redevelopment works with respect of soil and groundwater quality. These measures should include (and not be limited to):
- 1) Any sources of contamination uncovered during site development works should be brought to the immediate attention of RoC Consulting for consideration and comment. As required, the findings and recommendations of the current assessment may require amendment to reflect changes in site condition.
 - 2) The operation of plant, refuelling facilities and general basement excavation works should include appropriate provision to reduce the risk of leakage / spillage, particularly into the sites groundwater table or exposed natural soils.
 - 3) Appropriate dust mitigation measures should be deployed during basement excavation works, particularly when handling and excavating made ground deposits.
 - 4) All excavated materials stockpiled should be periodically dampened down to control dust release. Similarly, the disposal of any material from site should be completed using covered wagons.

Ground Water Remedial Requirements

- 9.0.4 No sources of soil contamination have been revealed during ground investigation works. Given the sites locality and proximity to sensitive water ground water receptors it is not considered any risks are posed to controlled water resources.

Ground Gas Protection Measures

- 9.0.5 Ground gas protection measures have not been identified as a requirement in new buildings in accordance with a BS8485 CS1 scenario.

10.0 Preliminary Waste Assessment

10.0.1 Site soils may be considered to comprise waste depending on the circumstances. The Waste Framework Directive (WFD) defines materials as waste if 'they are discarded, intended to be discarded or required to be discarded, by the holder'. Naturally occurring soils are not typically considered waste if reused on the site of origin for the purposes of development. Excavation arisings from the development may therefore be classified as waste if surplus to requirements or unsuitable for reuse. A large volume of laws, permitting and regulations govern the management of waste on construction sites, including Environmental Permits, Materials Management Plans and Construction Environmental Management Plans. The below assessment only provides some useful information which may inform future planning.

10.1 Hazardous Waste Assessment

Chemical Assessment

- 10.1.1 A methodology for the classification of waste, and requirement for sampling, is specified in Technical Guidance WM3 (EA, 2021). The level of sampling should be proportionate to the volume of waste and its heterogeneity. The preliminary assessment provided below is indicative based only upon the available sample results and may not be sufficient to adequately classify the waste.
- 10.1.2 Envirolab, an RSK company, has developed a waste soils characterisation assessment tool (HASWASTE), which follows the guidance within Technical Guidance WM3. The analytical results have been assessed using this tool to assess the hazardous properties to support potential off-site disposal of materials in the future. Note that it is ultimately for landfills to confirm what wastes they are able to accept within the constraints of their permit.
- 10.1.3 A total of two samples were taken from the subbase of the car park and 8 samples from the natural soils. No samples were found to have hazardous properties based on this assessment. This suggests that if applicable the waste would require disposal at a suitably permitted inert or non-hazardous waste landfill. The results are summarised in the table below and presented in full in Appendix J.

Asbestos Assessment

- 10.1.4 The Environment Agency publication '*Guidance on the classification and assessment of waste – WM3 (2018)*', requires that within a mixed waste the separately identifiable wastes be assessed separately. For instance, where waste soil contains identifiable pieces of asbestos (visible to the naked eye) the asbestos should, where feasible, be separated from the soil and classified separately. This should be disposed of within a hazardous, stable non-reactive hazardous waste landfill or a special cell in a non-hazardous waste landfill.
- 10.1.5 With reference to WM3 (2018), wastes containing greater than 0.1% free and dispersed asbestos fibres are classified as **hazardous waste** with the code 17 05 03* (soils and stones containing hazardous substances). Where a waste contains identifiable pieces of ACM, then these pieces must be assessed separately.

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- 10.1.6 While visible pieces of asbestos have not been identified during the site investigations, this does not comprise a specialist assessment and only a small portion of the site soils have been observed. The feasibility of removing visible pieces of ACM (and thus managing the hazardous potential of the soils) should be assessed by contractor. It may be possible, through additional sampling and analysis, to zone areas of asbestos containing soils, although, due to the density of sampling points required to provide confidence in this approach, this is likely to be a costly exercise with no guaranteed benefit.
- 10.1.7 Laboratory testing has not encountered positive identification of asbestos fibres within soils.

10.2 WAC Assessment

- 10.2.1 Additionally, a testing regime has been established in '*Waste Sampling and Testing for Disposal to Landfill*' (2013) to determine the suitability of soils for disposal. This regime does not supersede the hazardous properties assessment presented above.
- 10.2.2 We have scheduled testing of one sample of made ground and one sample of natural soils on this basis, the results of which are presented in Appendix J.
- 10.2.3 Comparison of test data with landfill waste acceptance criteria indicates that Made Ground soils are suitable for disposal at an inert landfill or a site that has a valid exemption from the Environmental Permitting (England and Wales) Regulations 2016 (as amended) registered with the Environment Agency.

10.3 Conclusions

- 10.3.1 The chemical testing of site soils and completion of a preliminary waste assessment, indicates that soils are not hazardous. WAC testing of site soils indicates that soils should be suitable for disposal at an inert waste landfill. It should be noted that no testing was completed on the asphalt surfacing present on site as this was outside the scope of this investigation. It is recommended that further testing is recommended to establish the suitability for reuse of asphalt materials and waste disposal criteria.
- 10.3.2 With reference to the Environment Agency's *publications Waste Sampling and Testing for Disposal to Landfill (2013)* and *Waste acceptance at landfills (2010)*, naturally occurring soils not likely to be affected by contamination can be classified as inert waste, with a EWC code of 17 05 04. Should any of the naturally deposited soils be suspected to contain contamination (by virtue of visual or olfactory evidence) upon excavation, then such soils should be stockpiled appropriately and additional testing carried out as considered necessary. Based on evidence obtained during our investigations, we are of the opinion that the soils of the Devensian Till at the site are not likely to be affected by chemical contamination and thus can be classified as inert waste.
- 10.3.3 The assessment of this report in regard to waste are indicative only and provide useful information to support future management of waste of site, which should be comprehensive and address all other legal and regulatory requirements. Further environmental testing of soils and subsequent treatment and processing may also be required.



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- 10.3.4 It may be necessary to consult with the Environment Agency before works commence to verify the proposed works and establish that material can be declassified as waste and re-used on site in accordance with the most current guidance and Article 6(1) of the Waste Directive. These applications are the responsibility of the contractor. We can consult on these matters on request.
- 10.3.5 We recommend this report is provided to the selected contractors and landfill facilities to confirm (or otherwise) that waste can be managed and disposed of as above. Please be aware that landfill sites are obligated to undertake in house quality assurance tests and thus may require further WAC testing for any soils encountered as part of this investigation. There is no obligation on any landfill operator to accept waste if they choose not to and waste operators may require additional testing of untested waste soils prior to acceptance at landfill in accordance with the landfill regulations.

11.0 Geotechnical & Foundation Design Assessment

Background Information

- 11.0.1 It is understood that the site is to be redeveloped for commercial use in accordance with AEW Architects drawing (ref: 13063-AEW-XX-XX-DR-A-0005-P8) provided within Appendix A. It is understood the development will comprise the construction of an 8-storey hotel building with an ancillary 1 storey plant building. It is understood that the design intent for the main hotel building is for a piled foundation solution, the structural engineer has indicated that pile loadings are in the region of 1500kN, the maximum slab loading of the proposed Hotel Building are 30kN/m², the maximum loadings of the proposed ancillary building are 50kN/m². A proposed foundation layout has been provided within Appendix A, although this does not detail the foundations of the ancillary plant building (Drawing ref: H5P1-ROC-PO-FD-DR-S-FD01).
- 11.0.2 Site investigations indicated that the site geology typically comprises a surface layer of made ground comprising asphalt and car park build up (sandy gravel of sandstone and limestone), with an average depth of 0.57m. Devensian Till (DT) were encountered underlying the made ground (MG) deposits, in the eastern and central portion of the site DT was reported as predominantly clay whereas in the western portion of the site DT was comprised of interbedded sand and clay.
- 11.0.3 Ground conditions and soil strength within the glacial drift deposits were found to be relatively consistent across the proposed hotel building footprint; however, an area of weaker ground was noted to the south of the main building in and around the area of a proposed electrical substation / plant room (see borehole logsheet for WS303 in Appendix B). It is likely that the weaker area is due to the presence of a perched groundwater table in this area which has locally weakened soil strength as a result. Alternatively, the area around WS303 could have historically contained a pond or area of low-lying ground that has softened soils.
- 11.0.4 Weathered mudstone bedrock of the Bollin Mudstone (BM) Formation was reported across the site, underlying the DT and was largely described as a gravelly clay or clayey gravel containing mudstone lithorelicts. The (BM) bedrock formation was generally described as extremely weak to weak reddish brown and grey thinly and thickly interlaminated, occasionally thinly bedded mudstone and appears to dip to the west of the site being circa 68.16mAOD in the east and circa 65.69mAOD in the west.
- 11.0.5 The shallow BM bedrock shows signs of weathering and is generally extremely weak to very weak in strength based on point load and UCS testing. From review of testing data and RQD values from borehole logs it is evident that generally poor RQD values were recorded (<50). A general increase in strength with depth is noted within the BM beyond 10mbgl UCS values were typically >5MPa indicating the rock strength to be weak.
- 11.0.6 A summary of ground conditions, rock depth and quality across the site is presented in Table 11.0 and 11.1 overleaf.

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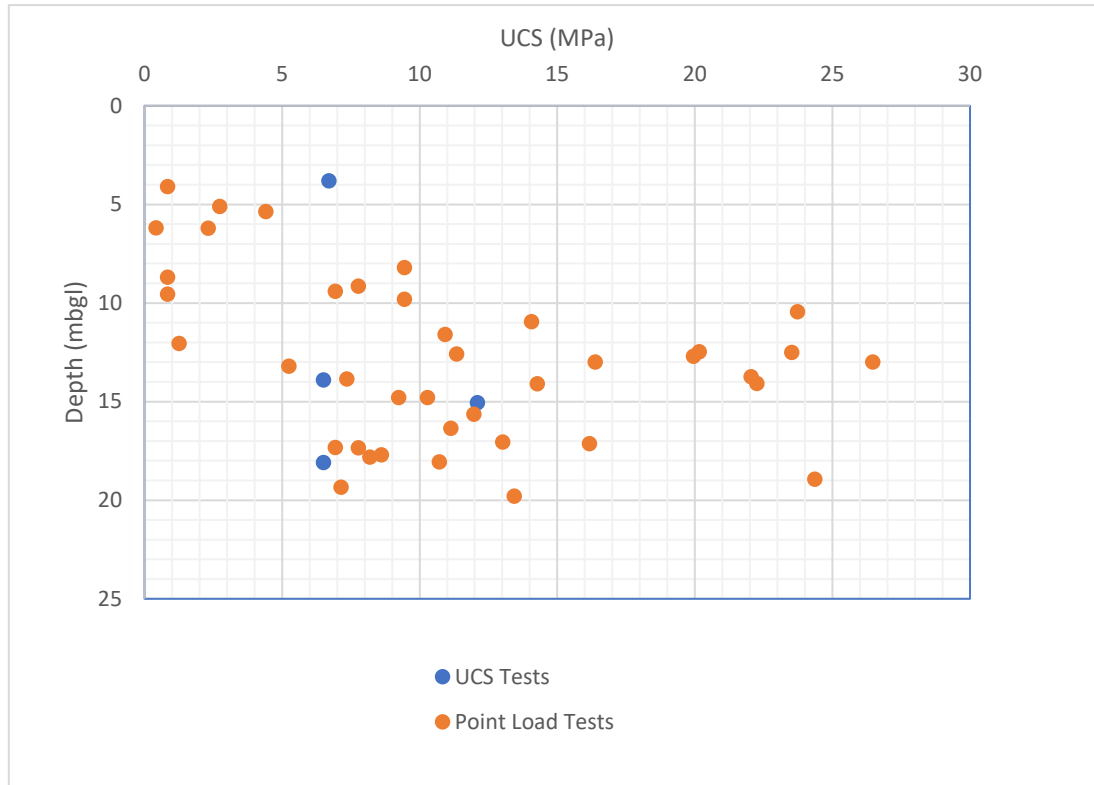
Table 11.0: Summary of Strata

Strata	Depth from (mAOD)	Depth to (mAOD)	Thickness (m)	General Description
Made Ground	GL	69.21-69.98	0.30-1.00	Surfacing of asphalt underlain by granular car park build up material reported as sandy limestone and sandstone gravel.
Devensian Till (East and Central)	69.21-69.98	66.92-68.18	1.50-2.60	Firm to stiff slightly sandy slightly gravelly clay.
Devensian Till (West)	69.35-69.67	65.69-67.17	2.50-3.80	Firm to stiff slightly sandy slightly gravelly clay (localised soft spot at WS303) interbedded with loose to medium dense fine to medium slightly silty sand.
Weathered Bollin Mudstone	65.69-68.18	65.35-67.26	0.20-1.95	Stiff reddish brown gravelly clay. The weathered fraction of the BM is predominantly matrix dominated with fine to medium angular mudstone lithorelicts. Rarely lithorelict (gravel) dominated.
Bollin Mudstone (Upper)	65.35—66.21	59.89-60.15	5.20-6.05	UCS <5MPa. Extremely weak to very weak reddish brown and grey mudstone.
Bollin Mudstone (Lower)	59.89-60.15	N/A	N/A	UCS >5 MPa. Very weak to weak reddish brown and grey mudstone.

Table 11.1: Summary of UCS Values and RQD

Geological Unit	UCS Tests (MPa)***	Point Load Tests Range Is50 (MPa)	Conversion Factor for Is50*	Equivalent UCS Values range (MPa)	Mean UCS (MPa)	Median UCS (MPa)	Representative UCS of sampled material (MPa)**	RQD**
Upper Bollin Mudstone Formation	3.81	0.02-0.45	21	0.42-9.45	4.09	3.36	3.36	16
Lower Bollin Mudstone Formation	15.06	0.06-1.26	21	1.26-26.46	13.22	11.65	11.65	23
	18.10							
	13.90							
*Conversion factors as per ASTM D 5731-05 “Standard Test Method for Determination of the Point Load Strength Index of Rock”. ** Lowest of mean and median, these values refer to tested material only and do not reflect weaker material that could not be recovered. ***Due to the small number of UCS tests available on the study site (1) UCS tests completed across the wider H plots obtained by Brownfield Solution (BSA1, BSA6 and BSA8) have been incorporated in the above assessment of UCS.								

Figure 11.0: UCS vs Depth



11.1 New Building Foundation Design – Main Hotel Building

- 11.1.1 An indicative foundation layout is presented on drawing H5P1-ROC-PO-FD-DR-S-FD01 presented in Appendix A. It is understood that it is proposed to construct the main hotel building on piled foundations.
- 11.1.2 It is not recommended that new building foundations be constructed on top of made ground deposits. The variable composition and in situ strength of these materials is such that unacceptable levels of total and differential settlement will occur as a result.
- 11.1.3 Given the loading associated with the main hotel building it is not recommended new foundations are constructed on top of Devensian Till deposits. While the Devensian Till (DT) deposits are relatively competent outside of the soft spot at WS303 it is considered they do not have the required bearing capacity to support the high (1500kN) loadings likely to be created by the new structure.

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- 11.1.4 In view of the above it is considered that the adoption of a piled foundation solution is the most appropriate solution for the proposed hotel building. Piles can be standard core cast in situ (Continuous Flight Auger) terminating in Bollin Mudstone (BM) at an appropriate depth. It is recommended that discussions be held with a suitably qualified piling specialist to establish the most suitable pile design for the development. A complete copy of this report should be provided to assist with the pile design process (including all appendices).
- 11.1.5 It is understood that a ground bearing floor slab is being considered for the proposed hotel building. The anticipated ground bearing pressure of the proposed floor slab is understood to be in the region of 30kN/m². Given the relatively shallow depth of made ground deposits beneath the site and competency of shallow DT, a ground bearing solution should be feasible. However, the potential for differential settlement where the slab spans the granular and cohesive deposits will need to be considered by the structural designer and an appropriate level of steel reinforcement provided to span across any localised soft spots or changes in bearing stratum.
- 11.1.6 A suitable stone blanket would need to be applied to clays and due care and attention taken during construction works to protect the formation layer from damage or localised weakening as a result of site vehicular movements and rainwater ingress. Proof rolling of all exposed formations and any soft spots notified to a Geotechnical Engineer to inspect and remove / treat if needed.

11.2 New Building Foundation Design – Ancillary Plant Building

- 11.2.1 It is understood an ancillary plant building is proposed to the south of the main hotel building (within and around the area of exploratory hole location WS303). The structural design aspirations for the new plant building comprise a raft foundation solution with loadings ranging between 30 and 50kN/m².
- 11.2.2 As discussed in Section 11.0, ground conditions in the area around WS303 were found to comprise weaker soils than reported elsewhere across the site, with the geological sequence comprising limited made ground (associated with car park construction) overlying a loose Sand (SPT N value = 7). A glacial clay was noted at 1.7m underlying the Sand with hand vane shear testing indicating a strength of 29kPa (i.e. very soft to soft). More competent ground conditions are reported at depths >2 to 2.5m with clay strength increasing toward the soft to firm range.
- 11.2.3 The adoption of a raft foundation for the new substation is theoretically possible, however (at the time of writing) we have no information on soil stiffness or modulus of subgrade reaction to base a raft design or allowable bearing capacity upon. In addition, the spatial extent of the weaker zone is not fully delineated and could relate to a small-scale localised area anomaly.

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11.2.4 As such, if a raft foundation is to be pursued a number of options are proposed:

- 1) Complete a localised supplementary ground investigation in the area around the plant room (comprising machine excavated trial pitting and plate bearing tests) to both delineate the spatial extent and depth of weaker soils and establish soil stiffness (modulus of subgrade reaction) to be used in raft design.
- 2) Excavate out and remove soils within the footprint of the proposed plant room to a depth of 2m and replace with a 250mm layers of geogrid reinforced well compacted granular fill material (to the underside of the proposed raft founding level).
- 3) Extend the scope of piling works currently required for the main building to include the plant room area to the south.

11.3 Below Ground Drainage

11.3.1 Buried services constructed in unimproved Made Ground soils may be subject to settlement and this should be considered during design. In particular water and sewerage pipes should not utilise shallow gradients that render them vulnerable to settlement.

11.4 Below Ground Obstructions

11.4.1 No below ground obstructions were encountered during site investigation.

11.5 General Comments

11.5.1 No entry should be permitted into excavations exceeding 1.2m depth without appropriate risk assessments, shoring and support. Whilst groundwater was not encountered in significant volumes during site investigation works the presence of a perched water table cannot be precluded, and site observations also recorded shallow levels within 1m of ground surface. Appropriate provisions should be made to dewater excavations as and when required.

11.5.2 Similarly it is not recommended foundation excavations to underlying clay be left open and exposed to the elements for extended periods of time as rainwater ingress will damage and reduce its strength (and subsequent bearing capacity). Similarly, no vehicular movements should be permitted within exposed foundation locations.

11.5.3 The geotechnical assessment has been collated based on the proposed development type, layout and likely loadings at the time of report publication. It should be noted that future alterations to these proposals or loadings (including alterations in the site layout or new building scale) will require the re-interpretation of the current assessment.

12.0 Aggressive Ground Conditions

- 12.0.1 The hazard of sulphide attack is addressed by reference to procedures described in Building Research Establishment (BRE) Special Digest 1: 2005 '*Concrete in Aggressive Ground*' to establish a design sulphate class (DS) and the '*aggressive Chemical Environment for Concrete*' (ACEC).
- 12.0.2 By the definitions provided, the site is considered to comprise a greenfield site, and the groundwater mobility is considered to be mobile.
- 12.0.3 The site is considered to be in an area of elevated sulphate and sulphide bearing strata (The Bollin Mudstone Member parent unit being the Mercia Mudstone Group known to contain elevated levels of sulfate and sulphides). Furthermore, Oxidisable Sulphides in site soils have been determined from laboratory testing of Total Sulphur and Total Sulphate, and do not exceed the stipulated threshold of 0.3%. Consequently, pyrite is not considered to be present.
- 12.0.4 Peak potential sulphate concentrations range between 67 and 10mg/l with soil pH values ranging between 7.9 and 9.5. Based on the site scenario and laboratory testing the Characteristic pH and Characteristic Sulphate levels have been calculated to determine the DS Class and ACEC Class as presented in the table below.

Table 12.0: ACEC and DS Classification

Geological Unit	DS Class	ACEC Class
Made Ground	DS1	AC1
Devensian Till	DS1	AC1
Bollin Mudstone	DS1	AC1

13.0 Conclusions & Recommendations

13.1 General

13.1.1 It is understood the development will comprise the construction of an 8-storey hotel building along with an associated ancillary plant building along the building southern elevation with associated areas of soft landscaping. With the exception of the proposed areas of soft landscaping there are limited potential pathways to receptors.

13.2 Geotechnical

13.2.1 Site investigations indicated that the site soils typically comprise:

- Made ground comprising a car parking build up ranging from 0.30 to 1.00m in thickness
- Devensian Till deposits comprising predominantly firm to stiff clays in the eastern portion of the site and interbedded firm to stiff clays and medium dense sands in the western portion of the site. A localised area of loose sand and very soft clays was reported at WS303
- Weathered mudstone bedrock of the Bollin Mudstone Formation underlying the Devensian Till deposits. The bedrock appears to dip to the west varying in depth from 68.160 to 65.69mAOD
- Generally, bedrock of the BM was found to have poor RQD values (generally <50) however a general increase in UCS values as derived from point load and UCS testing was observed with values typically being <5MPa below 10m and >5MPa beyond 10m.

13.2.2 Groundwater monitoring following the site investigation indicates a groundwater table within the DT at levels ranging between 69.47 and 68.08mAOD. A second groundwater body has also been identified at a slightly deeper depth within the DT at RBH301 and BSC18 at levels ranging between 67.05 to 68.17mAOD. A third Groundwater body appears to be present within the BM at depths ranging between 65.62 to 65.96mAOD. It should be noted that monitoring was undertaken in late autumn to early winter and groundwater levels may vary seasonally.

13.2.3 It is anticipated that the proposed hotel building will be constructed on piled foundations. Piles should be founded into suitably competent underlying rock of the Bollin Mudstone Formation and discussions should be held with piling contractors to establish design parameters.

13.2.4 If a raft foundation is to be pursued for the plant building a number of options are proposed:

1. Complete a localised supplementary ground investigation in the area around the plant room (comprising machine excavated trial pitting and plate bearing tests) to both delineate the spatial extent and depth of weaker soils and establish soil stiffness (modulus of subgrade reaction) to be used in raft design.

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MADE SIMPLE**

2. Excavate out and remove soils within the footprint of the proposed plant room to a depth of 2m and replace with a 250mm layers of geogrid reinforced well compacted granular fill material (to the underside of the proposed raft founding level).
 3. Extend the scope of piling works currently required for the main building to include the plant room area to the south.
- 13.2.5 DCP testing has been undertaken on both made ground and natural soils at the site to inform the design of ground bearing slabs. However, due to the presence of cobbles within the made ground it is believed that these results may have produced artificially high CBR results and should not be used in design. However, in many cases these structures will be constructed on variable ground conditions with predominantly clay soils in the east and predominantly sandy soils in the west. Consequently, structural designers will need to carefully consider the design, construction and treatment of building floor slabs and external pavements as part of the wider earthwork's design / specification process.
- 13.2.6 Laboratory testing for aggressive ground conditions indicates that a DS class DS-1 and ACEC Class of AC-1 should be adopted for the site.

13.3 Environmental

- 13.3.1 The site has been subject to minimal historic development existing largely as fields up until the 1990s when the site became a car park up until the 2020s when the site became a construction compound for the adjacent Plot H3 and in 2024 the majority of the site was converted to a bus and taxi drop off point. Therefore, minimal sources of potential contamination were identified on site and likewise there are limited potential nearby sources of contamination / potential contaminant migration pathways to the site.
- 13.3.2 Chemical assessment of site soils has failed to reveal any sources of soil contamination when compared against a "*commercial*" end use scenario and consequently no remedial measures are recommended. Due care and attention should be taken at all times when excavating site soils and any suspected sources of contamination identified brought to the immediate attention of RoC Consulting.
- 13.3.3 The Phase 1 Report did not identify any viable pathways to controlled waters and the observations of the intrusive site investigation have not led to revision of this assessment.
- 13.3.4 Laboratory testing indicates made ground and natural soils at the site should be suitable for disposal at an inert landfill site. Although it should be noted that no testing has been undertaken on the asphalt surfacing of the site as this was outside the scope of this investigation.
- 13.3.5 Following completion of a ground gas risk assessment, the site has been characterised as CS-1 in accordance with BS8485 and no ground gas protection measures are required in the proposed new buildings.



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- 13.3.6 Earthworks at the site may require Environmental Permits and Materials Management Plans. Environmental testing of soils and subsequent treatment and processing may also be required. It may be necessary to consult with the Environment Agency before works commence to verify the proposed works and establish that the material can be declassified as waste and re-used on site in accordance with the most current guidance and Article 6(1) of the Waste Directive. These applications are the responsibility of the contractor. We can consult on these matters on request.
- 13.3.7 As required, any suspected sources of contamination discovered during the site development (outside those discussed in this report) should be brought to the attention of RoC Consulting and their implications assessed. Depending on the extent and severity, the findings and assessment of the current study may require re-interpretation, and a remediation strategy proposed to support the sites development.

13.4 Additional

- 13.4.1 Copies of the current report, along with the Phase 1 Desktop Study, should be submitted to the Local Planning Authority for consideration and comment. As required, any feedback received from the Local Authority should be passed back to RoC Consulting for review.



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APPENDIX A – SITE DRAWINGS

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NOTES

ES101 LEGEND

-  ROC 2024 WS LOCATION
-  ROC 2024 WS LOCATION WITH INSTALL
-  ROC 2024 ROTARY BOREHOLE LOCATION WITH INSTALL

DRAWING NOTES

- TO BE READ IN CONJUNCTION WITH ROC CONSULTING PHASE 1 DESKTOP STUDY REF: 4700-ROC-ZZ-XX-RP-ES-PH1DTS
- EXPLORATORY HOLE LOCATIONS SHOWN AT APPROXIMATE EXTENTS.
- TOPOGRAPHICAL AND UTILITY SURVEY TAKEN FROM SURVEY OPERATIONS DRAWING 24G326 DUCT LINE THROUGH SITE TAKEN FROM VIRGIN MEDIA UTILITY PLANS AND APPROXIMATELY MAPPED
- ROC CONSULTING ACCEPTS NOT RESPONSIBILITY FOR ANY DAMAGES OR LOSS ARISING AS A RESULT OF THE USE OF THIS DRAWING

02	20.11.24	UPDATED WITH AS DUG COORDINATES	JF	RM
01	24.07.24	BH LOCATION PLAN	JF	RM
REV.	DATE	DETAILS	DRN	CHK

INFORMATION

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W rocconsulting.com

DRAWN	DATE	SCALES
JF	24/07/24	1:200
CHECKED	DATE	THE ABOVE SCALES APPLY WHEN PLOTTED AT A1 SIZE -DO NOT SCALE-
RM	24/07/24	
APPRVD.	DATE	EMAIL FOR DRAWINGS
MN	06/08/24	info@rocconsulting.com

CLIENT

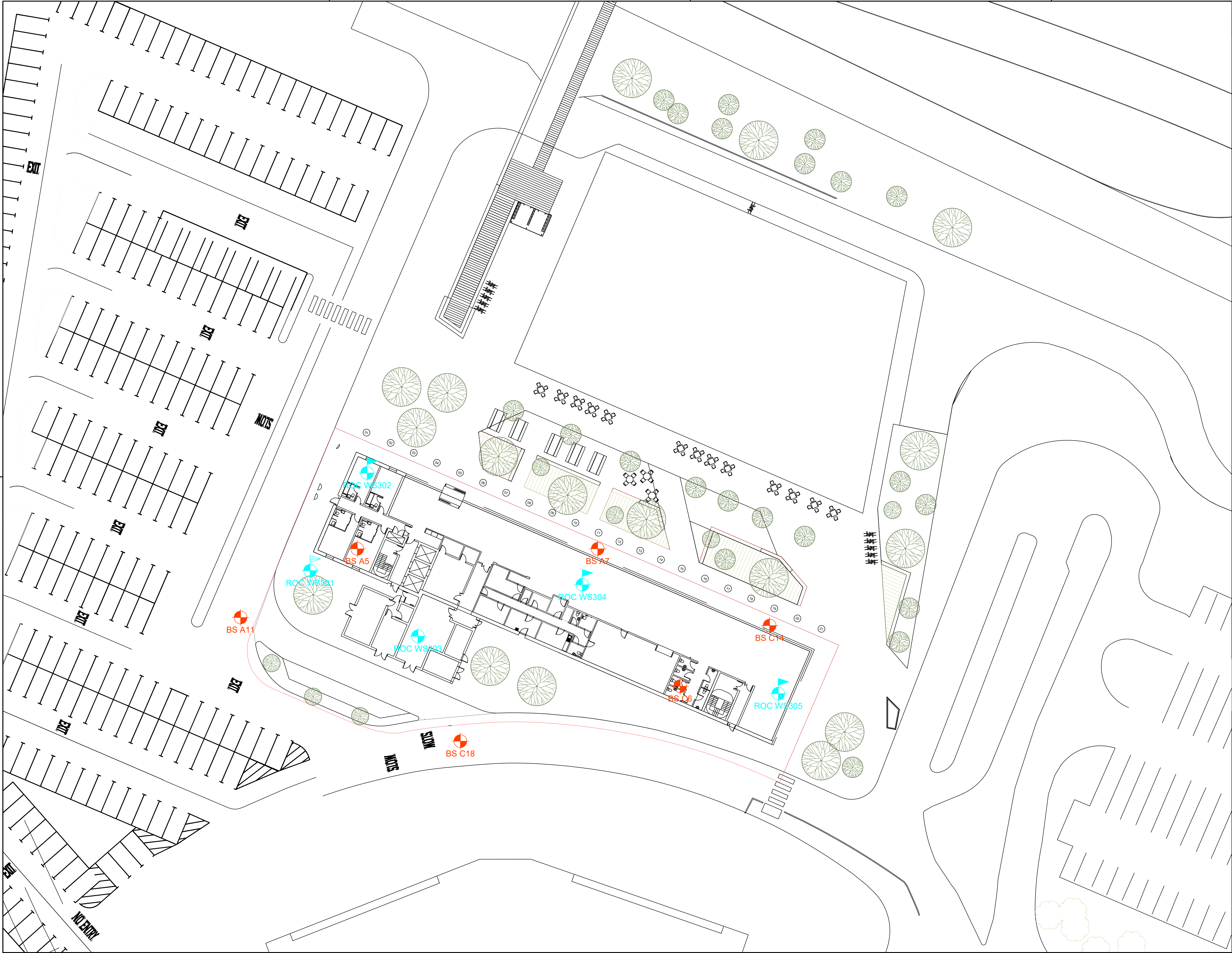
MAG GROUP

PROJECT TITLE
4700 PREMIER INN

DRAWING TITLE
PROPOSED BOREHOLE LOCATION PLAN

DRAWING No.	REV.
HP5-ROC-PL-XX-DR-ES-ES101	02





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NOTES

ES103 LEGEND

- ROC BH109 2016 BOREHOLE LOCATION
- BS A/B/C 2014 BS BOREHOLE LOCATION
- ROC BH201 2020 ROC BOREHOLE LOCATION

DRAWING NOTES

- TO BE READ IN CONJUNCTION WITH ROC CONSULTING PHASE 1 DESKTOP STUDY REF: 4700-ROC-ZZ-XX-RP-ES-PH1DTS
- EXPLORATORY HOLE LOCATIONS SHOWN AT APPROXIMATE EXTENTS.
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DRAWING STATUS

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PROJECT TITLE

4700 PREMIER INN

DRAWING TITLE

HISTORIC BOREHOLE LOCATION PLAN (PROPOSED SITE)

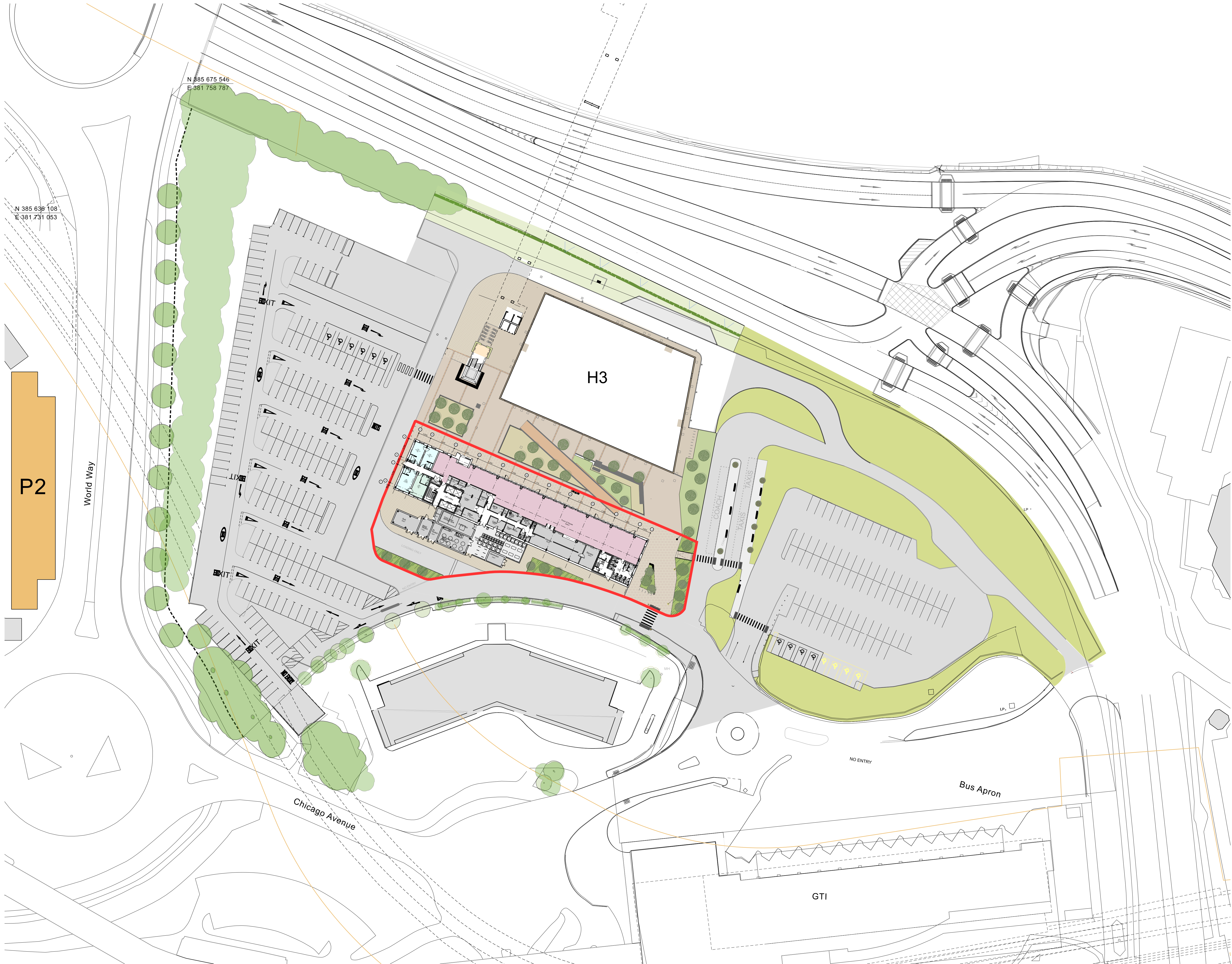
DRAWING No.	REV.
HP5I-ROC-PL-XX-DR-ES-ES103	01

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KEY PLAN:

Red Line Boundary



- REV: DATE: DETAILS:
- | | | |
|-----|----------|---|
| P09 | 22/01/25 | Refuse store amended and cycle spaces added |
| P08 | 05/11/24 | Building footprint increased to allow for tolerance |
| P07 | 22/10/24 | Ground floor amended to suit Stage 2 Issue |
| P06 | 10/10/24 | Site context updated |
| P05 | 09/10/24 | Site context updated |
| P04 | 07/10/24 | Final planning draft |
| P03 | 27/09/24 | Issued for planning review & submission |
| P02 | 20/09/24 | Landscape and coach drop off updated |
| P01 | 06/09/24 | First issue |

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PROJECT:
Manchester Airport City
Airport City Plot H5

TITLE:
Proposed Site Plan
Ground Floor

SCALE: 1:500@A1 ORIGIN DATE: 19/12/23 DRAWN: RK CHECKED: JB

STATUS:
Planning (Stage 2)

PROJECT: 06050 DRAWING NO: H5PI-SPA-00-00-DR-A-021200 REV: P09



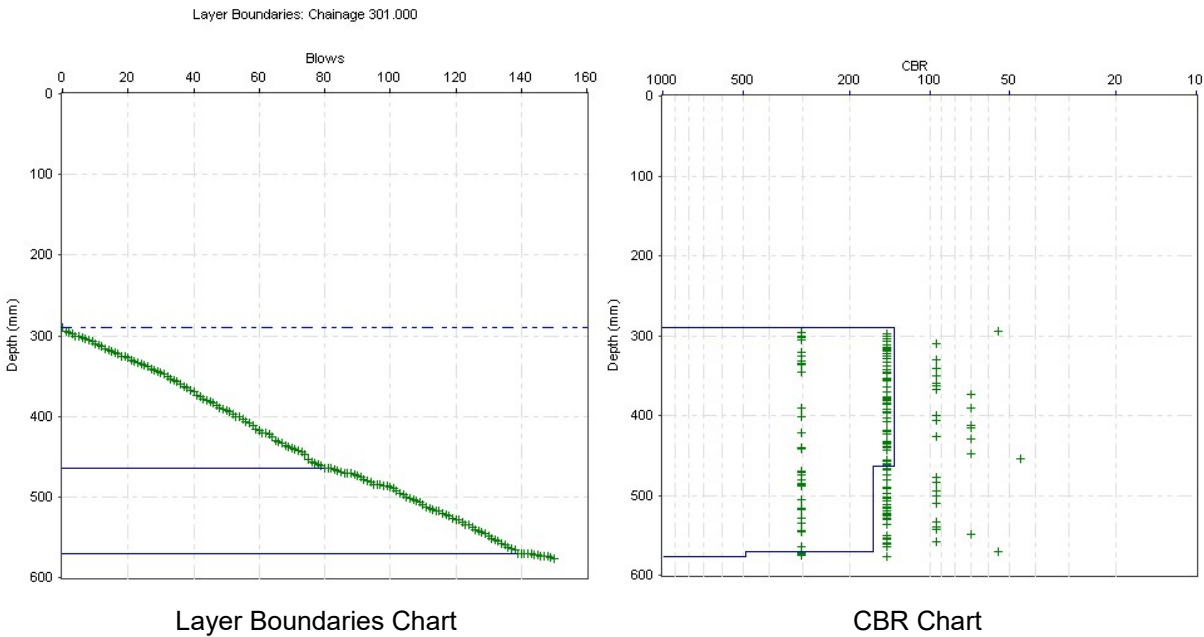
COMPLEX CHALLENGES ...
MADE SIMPLE

APPENDIX B – EXPLORATORY HOLE LOGSHEETS

DCP Layer Strength Analysis Report

Project Name: DCP

Chainage (km):	301.000	Surface Type:	Hot Mixed Asphalt
Direction:		Thickness (mm):	290
Location/Offset:	Verge	Strength Coeff.:	0.40
Cone Angle:	60 degrees	Base Type:	
Zero Error (mm):	0	Thickness (mm):	
Test Date:	18/12/2024	Strength Coeff.:	



Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)	Position	Strength Coefficient	SN	SNC	SNP
1	2.14	135	174	464	Sub-Base	0.12	0.79	0.79	0.84
2	1.80	163	106	570	Sub-Base	0.12	0.48	0.48	0.45
3	0.64	487	7	577	Sub-Base	0.12	0.03	0.03	0.03

Pavement Strength

Layer	Layer Contribution		
	SN	SNC	SNP
Surface	4.57	4.57	4.57
Base	--	--	--
Sub-Base	1.30	1.30	1.32
Subgrade	--	--	--
Pavement Strength	5.87	5.87	5.89

CBR Relationship:

TRL equation: $\log_{10}(\text{CBR}) = 2.48 - 1.057 \times \log_{10}(\text{Strength})$

Report produced by

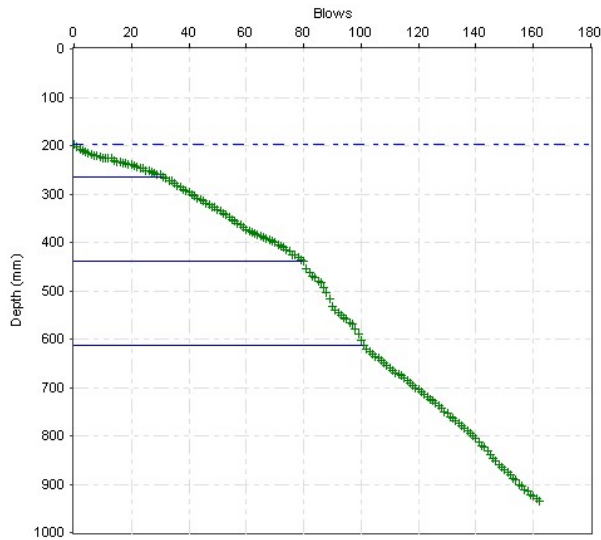
DCP Layer Strength Analysis Report

Project Name: DCP

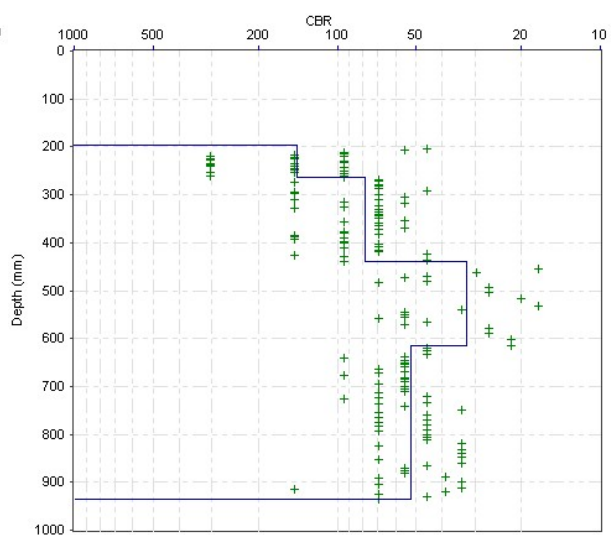
Chainage (km): 302.000
 Direction:
 Location/Offset: Verge
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 18/12/2024

Surface Type: Hot Mixed Asphalt
 Thickness (mm): 197
 Strength Coeff.: 0.40
 Base Type:
 Thickness (mm):
 Strength Coeff.:

Layer Boundaries: Chainage 302.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)	Position	Strength Coefficient	SN	SNC	SNP
1	2.03	143	67	264	Sub-Base	0.12	0.30	0.30	0.32
2	3.57	79	175	439	Sub-Base	0.11	0.79	0.79	0.81
3	8.33	32	175	614	Sub-Base	0.10	0.70	0.70	0.55
4	5.26	52	321	935	Subgrade	--	--	--	--

Pavement Strength

Layer	Layer Contribution		
	SN	SNC	SNP
Surface	3.10	3.10	3.10
Base	--	--	--
Sub-Base	1.79	1.79	1.68
Subgrade	--	2.08	1.38
Pavement Strength	4.89	6.97	6.16

CBR Relationship:

TRL equation: $\log_{10}(\text{CBR}) = 2.48 - 1.057 \times \log_{10}(\text{Strength})$

Report produced by

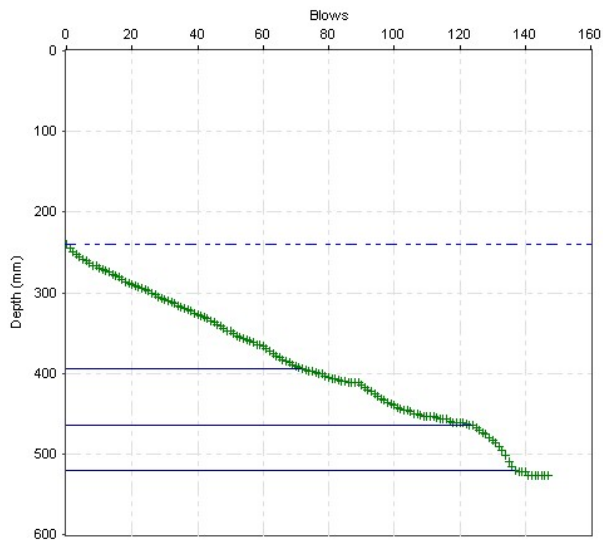
DCP Layer Strength Analysis Report

Project Name: DCP

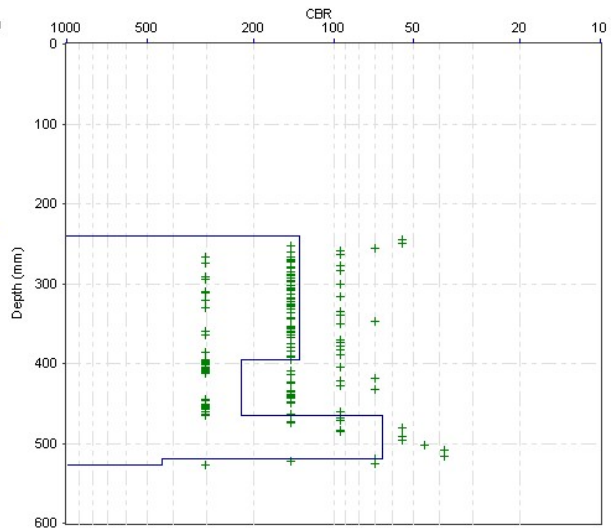
Chainage (km): 303.000
 Direction:
 Location/Offset: Verge
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 18/12/2024

Surface Type: Hot Mixed Asphalt
 Thickness (mm): 240
 Strength Coeff.: 0.40
 Base Type:
 Thickness (mm):
 Strength Coeff.:

Layer Boundaries: Chainage 303.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)	Position	Strength Coefficient	SN	SNC	SNP
1	2.15	134	155	395	Sub-Base	0.12	0.70	0.70	0.75
2	1.35	221	70	465	Sub-Base	0.12	0.32	0.32	0.31
3	4.23	66	55	520	Sub-Base	0.11	0.24	0.24	0.22
4	0.70	440	7	527	Sub-Base	0.12	0.03	0.03	0.03

Pavement Strength

Layer	Layer Contribution		
	SN	SNC	SNP
Surface	3.78	3.78	3.78
Base	--	--	--
Sub-Base	1.30	1.30	1.31
Subgrade	--	--	--
Pavement Strength	5.08	5.08	5.09

CBR Relationship:

TRL equation: $\log_{10}(\text{CBR}) = 2.48 - 1.057 \times \log_{10}(\text{Strength})$

Report produced by

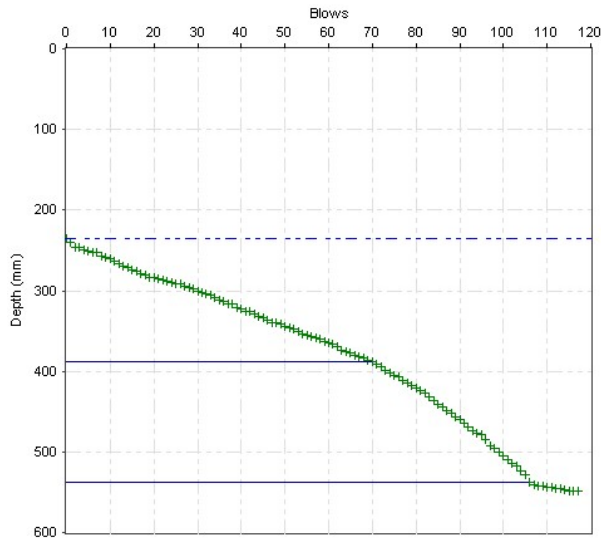
DCP Layer Strength Analysis Report

Project Name: DCP

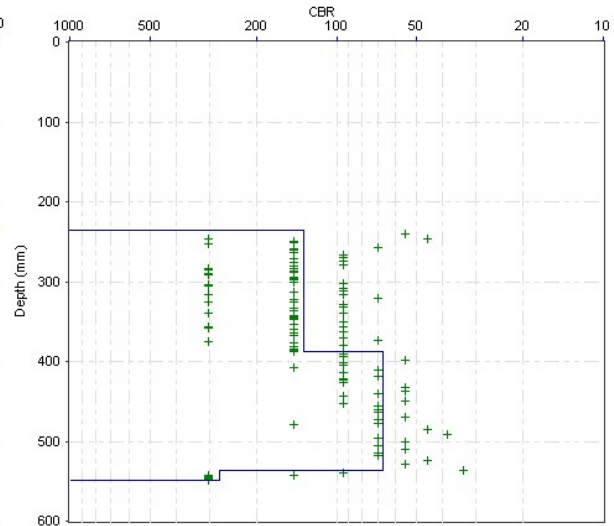
Chainage (km): 304.000
 Direction:
 Location/Offset: Verge
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 18/12/2024

Surface Type: Hot Mixed Asphalt
 Thickness (mm): 235
 Strength Coeff.: 0.40
 Base Type:
 Thickness (mm):
 Strength Coeff.:

Layer Boundaries: Chainage 304.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)	Position	Strength Coefficient	SN	SNC	SNP
1	2.19	132	153	388	Sub-Base	0.12	0.70	0.70	0.74
2	4.14	67	149	537	Sub-Base	0.11	0.66	0.66	0.62
3	1.09	275	12	549	Sub-Base	0.12	0.05	0.05	0.04

Pavement Strength

Layer	Layer Contribution		
	SN	SNC	SNP
Surface	3.70	3.70	3.70
Base	--	--	--
Sub-Base	1.41	1.41	1.41
Subgrade	--	--	--
Pavement Strength	5.11	5.11	5.11

CBR Relationship:

TRL equation: $\log_{10}(\text{CBR}) = 2.48 - 1.057 \times \log_{10}(\text{Strength})$

Report produced by

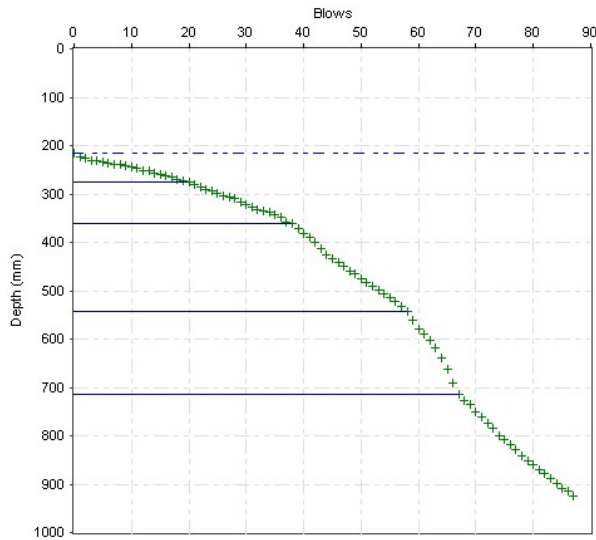
DCP Layer Strength Analysis Report

Project Name: DCP

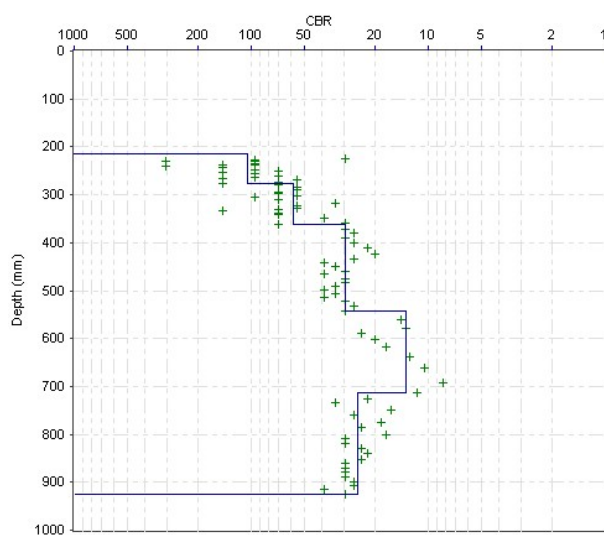
Chainage (km): 305.000
 Direction:
 Location/Offset: Verge
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 18/12/2024

Surface Type: Hot Mixed Asphalt
 Thickness (mm): 215
 Strength Coeff.: 0.40
 Base Type:
 Thickness (mm):
 Strength Coeff.:

Layer Boundaries: Chainage 305.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)	Position	Strength Coefficient	SN	SNC	SNP
1	2.74	104	61	276	Sub-Base	0.12	0.28	0.28	0.29
2	4.78	58	86	362	Sub-Base	0.11	0.38	0.38	0.41
3	9.00	30	180	542	Sub-Base	0.10	0.71	0.71	0.65
4	19.11	13	172	714	Sub-Base	0.08	0.51	0.51	0.35
5	10.50	25	210	924	Subgrade	--	--	--	--

Pavement Strength

Layer	Layer Contribution		
	SN	SNC	SNP
Surface	3.39	3.39	3.39
Base	--	--	--
Sub-Base	1.87	1.87	1.69
Subgrade	--	1.82	1.03
Pavement Strength	5.26	7.08	6.11

CBR Relationship:

TRL equation: $\log_{10}(\text{CBR}) = 2.48 - 1.057 \times \log_{10}(\text{Strength})$

Report produced by

Rotary Core Log

Project Name: Plot H5 Manchester Airport		Client: MAG Property		Date: 23/10/2024 - 25/10/2024	
Location: Manchester Airport		Contractor: MT Geoservices		Co-ords: E381846.59 N385555.22	
Project No. : 4700		Crew Name: M.E. & D.O.		Drilling Equipment: Beretta T41	
Borehole Number RBH301	Hole Type RC	Level 70.15m AoD	Logged By RM	Scale 1:50	Page Number Sheet 1 of 3

Well	Water	Depth (m)	Type /FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
		1.30	D				(15)	0.15	70.00	Asphalt (MADE GROUND)	1
								0.65	69.50	Light brown slightly sandy fine to coarse subangular to angular GRAVEL of limestone (MADE GROUND)	
										Brown slightly clayey fine to medium SAND (DEVENSIAN TILL)	
								1.20	68.95	Firm brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium rounded of quartzite (DEVENSIAN TILL)	
		3.10	D				(17)	2.20	67.95	Medium dense brown fine to medium SAND (DEVENSIAN TILL)	2
								3.05	67.10	Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium sub rounded to rounded of quartzite and sandstone (DEVENSIAN TILL)	
		3.60 3.20 - 4.20	D	100			(50)	3.50	66.65	Stiff reddish brown gravelly CLAY. Gravel is tabular fine to medium angular of mudstone (BOLLIN MUDSTONE)	4
								4.60	65.55	Reddish brown clayey tabular fine to coarse subangular to angular GRAVEL of mudstone (BOLLIN MUDSTONE)	
		4.60-4.70 4.20 - 5.70	D	100	59	0		4.80	65.35	Extremely weak thickly laminated to thinly bedded reddish brown MUDSTONE. Joints are extremely closely to very closely spaced horizontal occasionally sub-vertical to vertical planar and undulating smooth (BOLLIN MUDSTONE)	5
										...at 6.00 to 6.70mbgl light and dark grey	
		5.70 - 7.20	NI 50 100	100	60	7				...at 6.70 to 8.50 reddish brown bands and 10mm sand bands	7
		7.20 - 8.70	NI 70 120	95	65	39					8
		8.70 - 10.20	80 120 160	98	97	62		8.70	61.45	Very weak to weak thickly laminated to thinly bedded interlaminated reddish brown and grey silty MUDSTONE. Joints are very closely to closely spaced planar rough horizontal to sub horizontal (BOLLIN MUDSTONE)	9
								9.90	60.25		
											10

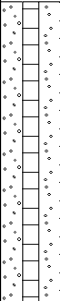
Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

Remarks

1. Position checked with GPR, CAT and genny prior to excavation. 2. Inspection pit hand dug to 1.20m depth. 3. No groundwater encountered. 4. 50mm diameter monitoring well complete with flush cover installed to 12.00m depth on completion. Response zone from 3.00 to 12.00m depth.

Rotary Core Log

Project Name: Plot H5 Manchester Airport			Client: MAG Property			Date: 23/10/2024 - 25/10/2024		
Location: Manchester Airport			Contractor: MT Geoservices			Co-ords: E381846.59 N385555.22		
Project No. : 4700			Crew Name: M.E. & D.O.			Drilling Equipment: Beretta T41		
Borehole Number RBH301		Hole Type RC		Level 70.15m AoD		Logged By RM		Page Number Sheet 2 of 3

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
		10.20 - 11.70	NI				93mm	10.40	59.75		Very weak to weak interlaminated reddish brown and grey silty MUDSTONE. Joints are very closely spaced planar smooth horizontal to sub horizontal (BOLLIN MUDSTONE)	11
			NI					10.80	59.35		Recovered as grey mudstone GRAVEL (BOLLIN MUDSTONE)	
			NI	61	11	0					Very weak to weak interlaminated reddish brown and grey silty MUDSTONE. Joints are very closely spaced planar rough horizontal to sub horizontal (BOLLIN MUDSTONE)	
			0 0 0									
		11.70 - 13.20	NI				93mm	11.70	58.45		Very weak to weak interlaminated light and dark grey silty MUDSTONE. Joints are extremely closely to closely spaced planar rough horizontal to sub horizontal (BOLLIN MUDSTONE)	12
			NI 80 180	100	83	28		12.88	57.27		Very weak to weak reddish brown silty MUDSTONE. Joints are very closely to closely spaced planar and undulating rough horizontal to sub horizontal (BOLLIN MUDSTONE)	13
		13.20 - 14.70	NI 100 330	100	94	67	93mm	14.20	55.95		...at 13.60 to 13.65 recovered as reddish brown clay	14
											Very weak to weak reddish brown MUDSTONE. Joints are closely to mediumly spaced horizontal undulating rough (BOLLIN MUDSTONE)	
		14.70 - 16.20	120 390 390	100	100	85	93mm	16.00	54.15		Very weak to weak interlaminated reddish brown and grey MUDSTONE. Joints are very closely to closely spaced planar and undulating rough horizontal (BOLLIN MUDSTONE)	15
											...at 17.03 to 19.00mbgl interlaminated light and dark grey	16
		16.20 - 17.70		100	73	24	93mm					
		17.70 - 19.20	NI 60 150	94	94	13	93mm					17
		19.20 - 20.20			30	10						18
												19
												20

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

Remarks

1. Position checked with GPR, CAT and genny prior to excavation. 2. Inspection pit hand dug to 1.20m depth. 3. No groundwater encountered. 4. 50mm diameter monitoring well complete with flush cover installed to 12.00m depth on completion. Response zone from 3.00 to 12.00m depth.

Rotary Core Log

Project Name: Plot H5 Manchester Airport		Client: MAG Property		Date: 23/10/2024 - 25/10/2024	
Location: Manchester Airport		Contractor: MT Geoservices		Co-ords: E381846.59 N385555.22	
Project No. : 4700		Crew Name: M.E. & D.O.		Drilling Equipment: Beretta T41	
Borehole Number RBH301	Hole Type RC	Level 70.15m AoD	Logged By RM	Scale 1:50	Page Number Sheet 3 of 3

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
								20.20	49.95		Very weak to weak interlaminated reddish brown and grey MUDSTONE. Joints are very closely to closely spaced planar and undulating rough horizontal (BOLLIN MUDSTONE) End of Borehole at 20.200m	21
												22
												23
												24
												25
												26
												27
												28
												29
												30

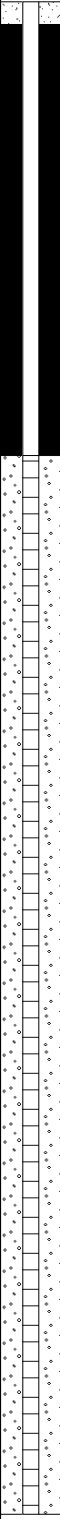
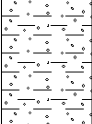
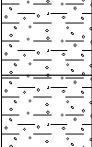
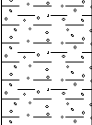
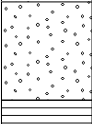
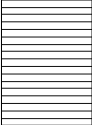
Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

Remarks

1. Position checked with GPR, CAT and genny prior to excavation. 2. Inspection pit hand dug to 1.20m depth. 3. No groundwater encountered. 4. 50mm diameter monitoring well complete with flush cover installed to 12.00m depth on completion. Response zone from 3.00 to 12.00m depth.

Rotary Core Log

Project Name: Plot H5 Manchester Airport		Client: MAG Property		Date: 28/10/2024 - 30/10/2024	
Location: Manchester Airport		Contractor: MT Geoservices		Co-ords: E381883.46 N385546.32	
Project No. : 4700		Crew Name:		Drilling Equipment: Unknown	
Borehole Number RBH302	Hole Type RC	Level 70.16m AoD	Logged By	Scale 1:50	Page Number Sheet 1 of 2

Well	Water	Depth (m)	Type /FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
							0.15	70.01		Asphalt (MADE GROUND)	
		0.50-0.70	ES				0.50	69.66		Light brown slightly sandy fine to coarse sub angular to angular GRAVEL of limestone (MADE GROUND)	
		1.00-1.20	D							Firm to stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium subrounded to subangular of coal and sandstone (DEVENSIAN TILL)	1
		1.20-1.65	U70							...at 0.88 to 0.95mbgl sand band	
		1.65-2.10	U70								
		2.00-2.45	D				2.00	68.16		Stiff reddish brown gravelly CLAY. Gravel is fine to coarse subangular to angular of mudstone (BOLLIN MUDSTONE)	2
		2.00 - 3.00		80							
		3.00 - 4.50		100	40	11	3.30	66.86		Reddish brown clayey fine to coarse subangular to angular GRAVEL of mudstone (BOLLIN MUDSTONE)	3
							3.95	66.21		Extremely weak thinly to thickly interlaminated light grey and dark grey MUDSTONE. Joints are very closely to closely spaced planar rough horizontal to sub horizontal (BOLLIN MUDSTONE)	4
		4.50 - 6.00		97	79	8				...at 5.15 to 5.86mbgl vertical fractures	5
		6.00 - 7.50	NI 70 170	100	67	30	6.60	63.56		Extremely weak reddish brown and grey thinly to thickly interlaminated MUDSTONE. Joints are very closely to closely spaced undulating and planar rough horizontal (BOLLIN MUDSTONE)	6
		7.50 - 9.00		100	68	8				...at 7.20 to 7.50mbgl recovered as clay and gravel	7
			20 30 50				8.50	61.66		Extremely weak to very weak grey mudstone. Joints are very closely spaced horizontal planar rough. (BOLLIN MUDSTONE)	8
		9.00 - 10.50		100	74	15	9.30	60.86		Very weak to weak thickly interlaminated to very thinly interbedded reddish brown and grey MUDSTONE. Joints are closely spaced horizontal to sub horizontal planar	9
											10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

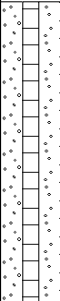
Remarks

1. Position checked with GPR, CAT and genny prior to excavation. 2. Inspection pit hand dug to 1.20m depth. 3. No groundwater encountered. 4. 50mm diameter monitoring well complete with flush cover installed to 3.00m depth on completion. Response zone from 1.00 to 3.00m depth.



Rotary Core Log

Project Name: Plot H5 Manchester Airport		Client: MAG Property		Date: 28/10/2024 - 30/10/2024	
Location: Manchester Airport		Contractor: MT Geoservices		Co-ords: E381883.46 N385546.32	
Project No. : 4700		Crew Name:		Drilling Equipment: Unknown	
Borehole Number RBH302	Hole Type RC	Level 70.16m AoD	Logged By	Scale 1:50	Page Number Sheet 2 of 2

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
		10.50 - 12.00	NI 80 130	100	56	23		12.35	57.81		Very weak to weak thickly inter laminated to very thinly interbedded reddish brown and grey MUDSTONE. Joints are closely spaced horizontal to sub horizontal planar rough (BOLLIN MUDSTONE) ...at 10.05 to 11.19mbgl becoming grey and dark grey ...at 11.19 to 12.35mbgl medium bedded	11
		12.00 - 13.50	NI 300 430	90	62	51					Weak reddish brown medium bedded MUDSTONE. Joints are medium spaced planar rough horizontal (BOLLIN MUDSTONE) ...at 13.50 to 14.58mbgl thinly bedded	12
		13.50 - 15.00		95	95	71						13
		15.00 - 16.50	40 90 140	95	85	23					Very weak reddish brown MUDSTONE. Joints are very closely to closely spaced planar rough horizontal (BOLLIN MUDSTONE) ...at 15.64 to 16.50mbgl light and dark grey up to 20mm bedding	14
		16.50 - 18.00	NI 30 70	100	81	15					Extremely weak to very weak inter laminated light and dark grey MUDSTONE. Joints are very closely spaced planar rough horizontal to sub horizontal (BOLLIN MUDSTONE) Very weak inter laminated reddish brown, light grey and dark grey MUDSTONE. Joints are very closely to closely spaced planar and undulating rough horizontal to sub horizontal (BOLLIN MUDSTONE)	15
		18.00 - 19.50	NI 60 120	97	57	20						16
												17
												18
												19
											End of Borehole at 19.500m	20

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

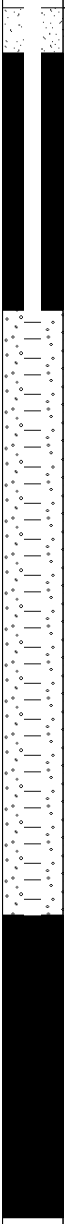
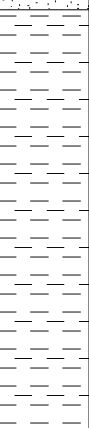
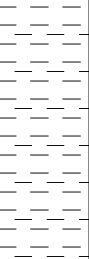
Remarks

1. Position checked with GPR, CAT and genny prior to excavation. 2. Inspection pit hand dug to 1.20m depth. 3. No groundwater encountered. 4. 50mm diameter monitoring well complete with flush cover installed to 3.00m depth on completion. Response zone from 1.00 to 3.00m depth.



Percussion Drilling Log

Project Name: Plot H5 Manchester Airport		Client: MAG Property		Date: 22/10/2024	
Location: Manchester Airport		Contractor: MT Geoservices		Co-ords: E381826.19 N385556.71	
Project No. : 4700		Crew Name: M.E. & D.O.		Drilling Equipment: Dando Terrier	
Borehole Number WS301	Hole Type WS	Level 70.04m AoD	Logged By RM	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.18	69.86		Asphalt (MADE GROUND)	
		0.30 - 0.60	ES		0.30	69.74		Light grey slightly sandy fine to coarse subangular to angular GRAVEL of limestone (MADE GROUND)	
		0.60 - 1.60	B		0.60	69.44		Brown slightly clayey slightly sandy medium to coarse angular GRAVEL of limestone (MADE GROUND)	
								Medium dense brown fine to medium slightly silty fine to medium SAND (DEVENSIAN TILL)	1
		1.20	SPT	N=13 (2,3/4,3,3,3)					
		1.60 1.60 1.60		HVP=51 HVP=59 HVP=62	1.60	68.44		Firm to stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium subangular to rounded of sandstone, quartzite and coal (DEVENSIAN TILL)	2
		2.00 2.00 2.00	D ES SPT	N=13 (1,2/2,2,4,5)				...at 1.80 to 3.00mbgl consistency is stiff	
		3.00	SPT	N=16 (2,2/3,4,4,5)	3.00 3.10	67.04 66.94		Black fine angular GRAVEL of coal (DEVENSIAN TILL)	3
								Stiff reddish brown gravelly CLAY. Gravel is tabular fine to medium angular of mudstone lithorelics (BOLLIN MUDSTONE)	
		4.00	SPT	50 (9,18/50 for 150mm)	4.00	66.04		End of Borehole at 4.000m	4
									5

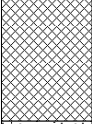
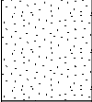
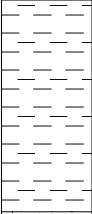
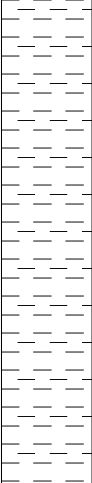
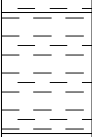
Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Position checked with GPR, CAT and genny prior to excavation. 2. Inspection pit hand dug to 1.20m depth. 3. Groundwater encountered at 1.00m depth 4. 50mm diameter monitoring well complete with flush cover installed to 3.00m depth on completion. Response zone from 1.00 to 3.00m depth.

Percussion Drilling Log

Project Name: Plot H5 Manchester Airport		Client: MAG Property		Date: 22/10/2024	
Location: Manchester Airport		Contractor: MT Geoservices		Co-ords: E381834.41 N385570.97	
Project No. : 4700		Crew Name: M.E. & D.O.		Drilling Equipment: Dando Terrier	
Borehole Number WS302	Hole Type WS	Level 69.97m AoD	Logged By RM	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.15	69.82		Asphalt (MADE GROUND)	
								Light brown slightly clayey slightly sandy medium to coarse subangular to angular GRAVEL of sandstone (MADE GROUND)	
		0.60 - 0.80	ES		0.56	69.41		Brown fine to medium SAND (DEVENSIAN TILL)	
					0.90	69.07		...at 0.75 to 0.90mbgl becoming slightly clayey	
		1.20	SPT	N=12 (3,4/3,3,3,3)				Firm grey slightly sandy slightly silty CLAY. Occasional roots (DEVENSIAN TILL)	
		1.50 - 1.60	D		1.60	68.37			
		1.80 - 2.00	ES	HVP=72	1.85	68.12		Brown silty fine to medium SAND (DEVENSIAN TILL)	
		1.80						Firm brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium subrounded to angular of coal, sandstone and quartzite (DEVENSIAN TILL)	
		2.00	SPT	N=21 (3,4/4,5,6,6)					
		2.50 - 2.60	D						
		3.00	SPT	N=35 (3,5/5,8,10,12)					
		3.30 - 3.50	D	HVP=72					
		3.30			3.50	66.47			
		3.50	SPT	50 (10,19/50 for 220mm)				Stiff reddish brown slightly gravelly CLAY. Gravel is tabular fine to medium angular of mudstone (BOLLIN MUDSTONE)	
					3.90	66.07		End of Borehole at 3.900m	

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Position checked with GPR, CAT and genny prior to excavation. 2. Inspection pit hand dug to 1.20m depth. 3. No groundwater encountered. 4. 50mm diameter monitoring well complete with flush cover installed to 3.00m depth on completion. Response zone from 1.00 to 3.00m depth.

Percussion Drilling Log

Project Name: Plot H5 Manchester Airport		Client: MAG Property		Date: 21/10/2024	
Location: Manchester Airport		Contractor: MT Geoservices		Co-ords: E381841.85 N385547.20	
Project No. : 4700		Crew Name: M.E. & D.O.		Drilling Equipment: Dando Terrier	
Borehole Number WS303	Hole Type WS	Level 70.17m AoD	Logged By RM	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.14	70.03		Asphalt (MADE GROUND)	1
					0.30	69.87		Light brown sandy fine to medium subangular to angular GRAVEL of limestone (MADE GROUND)	
					0.55	69.62		Brown slightly clayey sandy medium to coarse subangular GRAVEL of sandstone. Medium sandstone cobble content (MADE GROUND)	
		0.55 - 0.80	ES					Loose brown medium grained slightly silty fine to medium SAND (DEVENSIAN TILL)	
		1.20	SPT	N=7 (2,3/3,2,1,1)				...at 1.40mbgl becoming clayey	2
		1.70		HVP=26	1.52	68.65		Very soft brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded of sandstone and coal (DEVENSIAN TILL)	
		1.70		HVP=28				...at 1.40mbgl consistency is soft to firm	
		1.70		HVP=32				...at 2.00 to 2.30mbgl medium dense fine to medium grained sand band	
		2.00	D					...at 2.45mbgl consistency becoming firm	3
		2.00	ES					Medium dense brown fine to medium slightly silty fine to medium SAND (DEVENSIAN TILL)	
		2.00	SPT	N=21 (1,2/3,4,6,8)				Reddish brown slightly gravelly CLAY. Gravel is tabular fine to medium angular of mudstone (BOLLIN MUDSTONE)	
		2.50		HVP=32	2.70	67.47			
		2.50		HVP=40					4
		2.50		HVP=52					
		3.00	SPT	N=15 (5,4/4,4,6,1)	3.40	66.77			5
		4.00	SPT	N=50 (14,26/23,27,0,0)	4.45	65.72		End of Borehole at 4.450m	

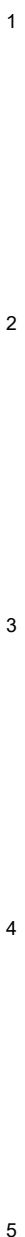
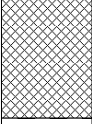
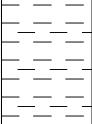
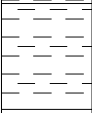
Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Position checked with GPR, CAT and genny prior to excavation. 2. Inspection pit hand dug to 1.20m depth. 3. Groundwater encountered at 1.00m depth. 4. 50mm diameter monitoring well complete with flush cover installed to 3.00m depth on completion. Response zone from 1.00 to 3.00m depth.

Percussion Drilling Log

Project Name: Plot H5 Manchester Airport		Client: MAG Property		Date: 22/10/2024	
Location: Manchester Airport		Contractor: MT Geoservices		Co-ords: E381865.78 N385554.67	
Project No. : 4700		Crew Name: M.E. & D.O.		Drilling Equipment: Dando Terrier	
Borehole Number WS304	Hole Type WS	Level 70.02m AoD	Logged By RM	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.15	69.87		Asphalt (MADE GROUND)	
								Light brown sandy fine to medium subangular to angular GRAVEL of limestone (MADE GROUND)	
					0.55	69.47		Firm brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium subrounded to angular of coal, sandstone and quartzite (DEVENSIAN TILL)	
		1.00	ES						
		1.20	SPT	N=12 (3,4/3,3,3,3)					
		1.60 - 1.80	D						
		1.60		HVP=76					
		1.60		HVP=98					
		1.60		HVP=98					
		2.00	SPT	N=21 (3,4/4,5,6,6)					
		2.60 - 2.80	D						
		2.60		HVP=100					
		2.60		HVP=62					
		2.60		HVP=68					
		3.00	SPT	N=35 (3,5/5,8,10,12)					
					3.10	66.92		Reddish brown slightly gravelly CLAY. Gravel is tabular fine to medium angular of mudstone (BOLLIN MUDSTONE)	
					3.45	66.57		End of Borehole at 3.450m	

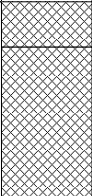
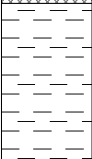
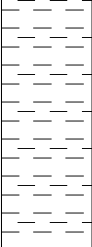
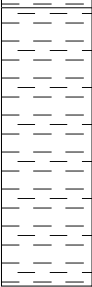
Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Position checked with GPR, CAT and genny prior to excavation. 2. Inspection pit hand dug to 1.20m depth. 3. No groundwater encountered. 4. 50mm diameter monitoring well complete with flush cover installed to 12.00m depth on completion. Response zone from 3.00 to 12.00m depth.

Percussion Drilling Log

Project Name: Plot H5 Manchester Airport		Client: MAG Property		Date: 22/10/2024	
Location: Manchester Airport		Contractor: MT Geoservices		Co-ords: E381894.32 N385538.85	
Project No. : 4700		Crew Name: M.E. & D.O.		Drilling Equipment: Dando Terrier	
Borehole Number WS305	Hole Type WS	Level 70.18m AoD	Logged By RM	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.15 - 0.65	ES		0.15	70.03		Asphalt (MADE GROUND)	
								Light brown slightly clayey sandy fine to coarse subangular to angular GRAVEL of limestone (MADE GROUND)	
		0.80 - 1.00	ES		0.65	69.53		Firm brown slightly gravelly slightly sandy CLAY. Gravel is fine to medium rounded of quartzite and sandstone (DEVENSIAN TILL) ...at 0.80 to 1.15mbgl fine to medium sand band	1
		1.20 - 1.45 1.20	D SPT	N=14 (1,1/2,4,4,4)				...at 1.60mbgl consistency becoming stiff to very stiff	
		1.90 - 2.00 2.00	D SPT	N=30 (2,3/5,5,8,12)	2.00	68.18		Very stiff reddish brown slightly gravelly CLAY. Gravel is tabular fine to medium angular of mudstone (BOLLIN MUDSTONE)	2
		2.50 2.50	D SPT	N=50 (9,9/50 for 230mm)	2.92	67.26		End of Borehole at 2.920m	3
									4
									5

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Position checked with GPR, CAT and genny prior to excavation. 2. Inspection pit hand dug to 1.20m depth. 3. No groundwater encountered. 4. 50mm diameter monitoring well complete with flush cover installed to 2.00m depth on completion. Response zone from 1.00 to 2.00m depth.



A5

Sheet 1 of 5

Project Name
PLOT 107 AND 108

Project No.
C2315

Co-ords: 381833E - 385560N

Hole Type
Cable/Rotary

Location: MANCHESTER AIRPORT

Level: 69.95 m AOD

Scale
1:25

Client: URS LTD

Dates: 08/04/2014

Checked by
AJH

Logged By
DMG

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.50 0.50	PID ES	0.0	0.11	69.84		MADE GROUND: Tarmac.		
								MADE GROUND: Light grey brown sandy gravel subbase.		
		1.00 1.00 1.00 1.20 1.20	PID ES B SPT D	0.0 N=20 (2,4,5,5,5,5)	0.60	69.35		Brown slightly gravelly SAND. Gravel is fine to coarse subrounded of sandstone.	1	
		1.50	D							
		2.00 2.00 2.00 2.00	PID SPT ES D	0.0 N=10 (2,1,2,2,3,3)	1.70	68.25		Firm to stiff brown very clayey SILT.	2	
		3.00 3.00 3.00	PID ES U	0.0	2.20	67.75		Firm brown slightly gravelly CLAY of low strength.	3	
		3.45 3.45	SPT D	50/280mm 280mm (4,9,11,14,14,11)						
3.90-5.90	90	57	19	3.90	66.05		Moderately weak thinly to thickly laminated red brown silty MUDSTONE. Discontinuities are sub-horizontal, smooth planar, tight to moderately open, very close to closely spaced. between 3.90m to 4.90m very thin to thin, closely spaced non intact bands recovered as gravel.	4		

Continued next sheet

Continued next sheet

Remarks: 1. Hand dug pit to 1.2m bgl
2. Groundwater encountered between 7.4m - 8.4m and 15.2m-16.2m bgl
3. Coring from 3.9m to 22.4m bgl.
4. Backfilled on completion.
5. Drilled using Commachio 205



Project Name
PLOT 107 AND 108

Project No.
C2315

Co-ords: 381833E - 385560N

Hole Type
Cable/Rotary

Location: MANCHESTER AIRPORT

Level: 69.95 m AOD

Scale
1:25

Client: URS LTD

Dates: 08/04/2014

Checked by
AJH

Logged By
DMG

Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD	FI					
1	▽	5.90-7.40	87	62	20	11	5.39	64.56		Remaining Detail : 4.87m - 4.90m : from 4.87m to 4.90m sub vertical stepped striated moderately open discontinuity.	6
						NI			Moderately weak thinly interlaminated red brown / grey silty MUDSTONE. Discontinuities are horizontal to sub horizontal smooth planar and rough planar tight to moderately open, very close to closely spaced. from 5.65m to 6.70m thickly laminated to thinly bedded, medium spaced non intact bands recovered as gravel.		
						2					
						NI					
						NR					
						NI					
						2					
						NI					
						1					
						NI					
						13			Moderately weak thinly laminated grey / light grey silty MUDSTONE. Discontinuities are horizontal to sub-horizontal smooth planar very close to closely spaced, very tight to tight.	7	
		NR									
		3									
		NI									
		7.40-10.40	100	90	43	8	6.61	63.34		between 7.60m and 8.21m thickly bedded to thinly laminated, medium spaced non intact bands recovered as gravel. from 7.64m to 7.74m vertical rough planar tight discontinuity.	8
						6					
						NI					
						7					
						13			Moderately weak thinly laminated to thinly bedded MUDSTONE. Discontinuities are horizontal to sub-horizontal smooth planar, very close to medium spaced. from 8.60m to 8.70m vertical to sub vertical rough planar and rough undulating tight to very tight discontinuity. from 9.10m to 9.21m vertical rough planar open discontinuity.	9	

Continued next sheet

- Remarks:
1. Hand dug pit to 1.2m bgl
 2. Groundwater encountered between 7.4m - 8.4m and 15.2m-16.2m bgl
 3. Coring from 3.9m to 22.4m bgl.
 4. Backfilled on completion.
 5. Drilled using Commachio 205

Project Name
PLOT 107 AND 108

Project No.
C2315

Co-ords: 381833E - 385560N

Hole Type
Cable/Rotary

Location: MANCHESTER AIRPORT

Level: 69.95 m AOD

Scale
1:25

Client: URS LTD

Dates: 08/04/2014

Checked by
AJH

Logged By
DMG

Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD	FI					
		10.40-13.40	100	92	52	2	11.04	58.91		Moderately weak thinly laminated to thinly bedded MUDSTONE. Discontinuities are horizontal to sub-horizontal smooth planar, very close to medium spaced.	
						9					
						NI					
						1					
						NI					
						1					
						10					
						NI					
						6					
						NI					
		13.40-16.40	91	67	20	5	14.61	55.34		Moderately weak thinly laminated red brown silty MUDSTONE. Discontinuities are sub-horizontal, smooth planar, and rough planar, very tight to tight, extremely close to closely spaced.	
						8					
						NR					
						6					
						NI					
						7					
						NI					
						5					
						NI					
						7					
						7					
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						7					
						7					

Continued next sheet

Remarks: 1. Hand dug pit to 1.2m bgl
2. Groundwater encountered between 7.4m - 8.4m and 15.2m-16.2m bgl
3. Coring from 3.9m to 22.4m bgl.
4. Backfilled on completion.
5. Drilled using Commachio 205

Project Name
PLOT 107 AND 108Project No.
C2315

Co-ords: 381833E - 385560N

Hole Type
Cable/Rotary

Location: MANCHESTER AIRPORT

Level: 69.95 m AOD

Scale
1:25

Client: URS LTD

Dates: 08/04/2014

Checked by
AJHLogged By
DMG

Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	Legend	Stratum Description						
		Depth (m)	TCR	SCR	RQD	FI										
		16.40-19.40				NI	16.26	53.69		Weak to moderately weak thinly laminated grey silty MUDSTONE. Discontinuities are sub horizontal to horizontal rough planar and smooth planar extremely close to closely spaced.	16					
						3										
						9										
						2										
						NI										
						1										
						NR									Moderately weak thickly laminated to thinly bedded grey silty MUDSTONE. Discontinuities are smooth undulating and rough planar, moderately open to very open.	17
						11										
						NI										
						2										
						NI										
						1										
			NI				Moderately weak thinly laminated red brown silty MUDSTONE. Discontinuities are rough planar and smooth undulating, tight to open, close to medium spaced.	18								
			4													
			NI													
			4													
			2													
			5													
			NI										from 19.32m to 19.40m recovered as gravel.	19		
			NR													
			NI													
			10													
			NI													
															Moderately weak thinly interlaminated grey / dark grey silty MUDSTONE. Discontinuities are horizontal, smooth planar, very	

Continued next sheet

Continued next sheet

Remarks:

1. Hand dug pit to 1.2m bgl
2. Groundwater encountered between 7.4m - 8.4m and 15.2m-16.2m bgl
3. Coring from 3.9m to 22.4m bgl.
4. Backfilled on completion.
5. Drilled using Commachio 205

Project Name
PLOT 107 AND 108Project No.
C2315

Co-ords: 381833E - 385560N

Hole Type
Cable/Rotary

Location: MANCHESTER AIRPORT

Level: 69.95 m AOD

Scale
1:25

Client: URS LTD

Dates: 08/04/2014

Checked by
AJHLogged By
DMG

Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD	FI					
		19.40-22.40	97	77	51	5	22.40	47.55		tight to tight very close to closely spaced. Detail 19.77m - 19.83m : from 19.77m to 19.83m recovered as gravel.	21
						9					
						NI					
						5					

Remarks:

1. Hand dug pit to 1.2m bgl
2. Groundwater encountered between 7.4m - 8.4m and 15.2m-16.2m bgl
3. Coring from 3.9m to 22.4m bgl.
4. Backfilled on completion.
5. Drilled using Commachio 205

Project Name
PLOT 107 AND 108

Project No.
C2315

Co-ords: 381868E - 385560N

Hole Type
Cable/Rotary

Location: MANCHESTER AIRPORT

Level: 70.07 m AOD

Scale
1:25

Client: URS LTD

Dates: 11/04/2014

Checked by
AJH

Logged By
DMG

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description		
		Depth (m)	Type	Results						
1		0.20	PID	0.0	0.10	69.97		MADE GROUND: Tarmac. from 12.74m to 12.92m rough planar sub vertical discontinuity.		
		0.20	ES							
		0.20	B							MADE GROUND: Light grey sandy fine to coarse angular to subrounded limestone gravel subbase. Limestone cobbles from 0.3 to 0.5m.
		0.60	PID	0.0	0.50	69.57		Stiff slightly gravelly CLAY. Gravel is fine to coarse angular to subrounded of mudstone, siltstone and sandstone.		
		0.60	B							
		0.60	ES							
		1.00	D							
		1.20	SPT	N=8						
		1.00-1.50	B	(1,1,2,2,2,2)					Thin sand lense from 1.3 to 1.32m.	
		1.20-1.65	D							
		1.60	PID	0.0						
		1.60	B							
		1.60	ES							
		2.00	D						Becoming stiff very high strength clay from 2.00m.	2
		2.00-2.45	U							
		2.45	SPT	N=19						
		2.60	PID	(2,2,3,4,5,7)						
		2.60	ES	0.0						
		2.45-2.90	D							
		2.45-3.90	D			3.10		66.97	Red brown highly weathered very weak MUDSTONE.	3
3.20	D									
3.30	PID	0.0								
3.30	ES									
3.45	SPT	50/205mm		3.45	66.62	Red brown MUDSTONE recovered as clay and gravel.	4			
		205mm (8,8,11,19,20)								

Project Name
PLOT 107 AND 108

Project No.
C2315

Co-ords: 381868E - 385560N

Hole Type
Cable/Rotary

Location: MANCHESTER AIRPORT

Level: 70.07 m AOD

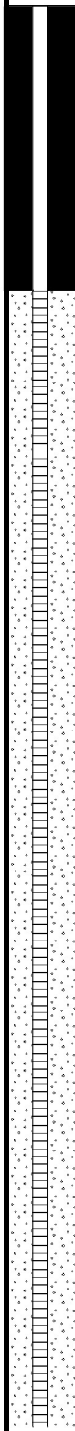
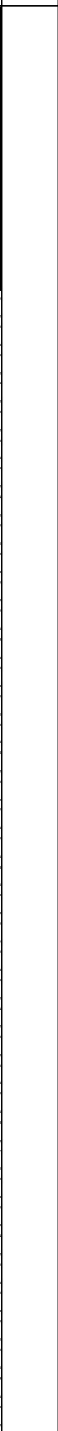
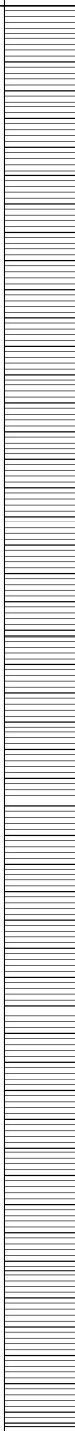
Scale
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Client: URS LTD

Dates: 11/04/2014

Checked by
AJH

Logged By
DMG

Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD	FI					
		6.45-9.45	80	52	17	NI	7.22	62.85		spaced. from 5.04m to 5.14m two vertical rough stepped tight discontinuities.	6
						4					
						NI					
						1					
						NI					
						2					
						9					
						NI					
						NI					
			NR	7							
			NI								
			4								
			NI								
			3								
			NI								
			7								
			NI								
			7								
		5									
		4									
		NI									
		2									
		NR	9.45	60.62	Weak to moderately weak interlaminated dark red brown / grey silty MUDSTONE. Discontinuities are horizontal to sub horizontal, very tight to tight, very close to closely spaced discontinuities.						
		NR									
		NI									
		9									
		NI									
from 9.84m to 9.89m vertical moderately open rough stepped										Continued next sheet	

Continued next sheet

- Remarks:
1. Hand dug pit to 1.2m bgl
 2. Slight groundwater seepage at 4.5m and 5.5m. & Groundwater encountered at 12.45m.
 3. Rotary coring from 3.45m to 18.45m bgl.
 4. Standpipe installed to 18.0m; 6m plain, 12m slotted.
 5. Hole drilled using Commachio 205.

Project Name
PLOT 107 AND 108

Project No.
C2315

Co-ords: 381868E - 385560N

Hole Type
Cable/Rotary

Location: MANCHESTER AIRPORT

Level: 70.07 m AOD

Scale
1:25

Client: URS LTD

Dates: 11/04/2014

Checked by
AJH

Logged By
DMG

Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD	FI					
		9.45-12.45	96	82	29	10	10.41	59.66		Remaining Detail : 9.84m - 9.89m : discontinuity.	11
						7				Weak to moderately weak thinly laminated to thickly laminated grey silty MUDSTONE. Discontinuities are close to very close spaced, horizontal, smooth planar, very tight to tight.	
						NI					
						5					
		12.45-15.45	97	93	67	13	11.40	58.67		Moderately weak red brown thinly laminated red brown silty MUDSTONE. Discontinuities are horizontal to sub horizontal, close to medium, rough planar. from 11.60m to 11.65m rough vertical very open discontinuity.	12
										from 11.92m to 11.94m rough undulating horizontal very open discontinuity. from 11.99m to 12.21m rough planar sub vertical moderately open discontinuity. from 12.12m to 12.17m rough undulating sub horizontal to sub vertical tight discontinuity.	
						NR					
						5				Moderately weak thinly laminated to thinly bedded red brown SILTSTONE. Discontinuities are horizontal to sub horizontal, rough planar, very close to medium spacing. from 12.74m to 12.92m sub vertical rough planar discontinuity.	
						NI					
						7					
						NI					
							14.59	55.48		from 14.12m to 14.17m rough undulating sub vertical discontinuity.	14
										Moderately weak red brown thinly laminated red brown silty MUDSTONE. Discontinuities are horizontal to sub horizontal, close to medium, rough planar.	

Continued next sheet

- Remarks:
1. Hand dug pit to 1.2m bgl
 2. Slight groundwater seepage at 4.5m and 5.5m. & Groundwater encountered at 12.45m.
 3. Rotary coring from 3.45m to 18.45m bgl.
 4. Standpipe installed to 18.0m; 6m plain, 12m slotted.
 5. Hole drilled using Commachio 205.

Project Name
PLOT 107 AND 108

Project No.
C2315

Co-ords: 381868E - 385560N

Hole Type
Cable/Rotary

Location: MANCHESTER AIRPORT

Level: 70.07 m AOD

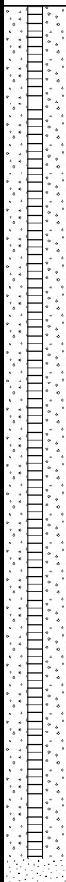
Scale
1:25

Client: URS LTD

Dates: 11/04/2014

Checked by
AJH

Logged By
DMG

Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	Legend	Stratum Description									
		Depth (m)	TCR	SCR	RQD	FI													
		15.45-18.45	100	97	43	9	15.70	54.37		Moderately weak red brown thinly laminated red brown silty MUDSTONE. Discontinuities are horizontal to sub horizontal, close to medium, rough planar.									
						11													
								Moderately weak thinly to thickly laminated grey SILTSTONE. Discontinuities sub horizontal are very close to closely spaced, rough planar, tight to moderately open. from 15.98m to 16.08m sub vertical to vertical rough undulating discontinuity.	16										
										NI									
											1								
												NI							
													16.81	53.26		Moderately weak thinly to thickly interlaminated grey/ light grey SILTSTONE. Discontinuities are sub horizontal, very close to closely spaced, rough planar, tight to moderately open.	17		
										9									
											17.71							52.36	
						9													
18.45	51.62		End of Borehole at 18.45 m	19															

Remarks:

1. Hand dug pit to 1.2m bgl
2. Slight groundwater seepage at 4.5m and 5.5m. & Groundwater encountered at 12.45m.
3. Rotary coring from 3.45m to 18.45m bgl.
4. Standpipe installed to 18.0m; 6m plain, 12m slotted.
5. Hole drilled using Commachio 205.

Project Name
PLOT 107 AND 108Project No.
C2315

Co-ords: 381816E - 385550N

Hole Type
Cable/Rotary

Location: MANCHESTER AIRPORT

Level: 69.89 m AOD

Scale
1:25

Client: URS LTD

Dates: 04/04/2014

Checked by
AJHLogged By
DMG

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
▽		0.10			0.10	69.79		MADE GROUND: Tarmac.	
		0.30	PID	0.0	0.40	69.49		MADE GROUND: Light brown grey sandy fine to coarse angular to subrounded gravel of limestone and occasional tarmac road cuttings.	
		0.30	ES						
		0.30	B						
		0.50	PID	0.0				Medium dense brown slightly clayey slightly silty SAND.	
		0.50	ES						
		0.50	B						
		1.20	SPT	N=13	2.20	67.69		Becoming silty from 1.2m.	
		1.20	D	(3,3,4,5,2,2)					
		1.50	PID	0.0				SILT layer from 1.55m to 1.65m.	
		1.50	ES						
		1.50	B						
		2.00	SPT	N=8	3.50	66.39		Stiff brown slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded of siltstone, sandstone and mudstone.	
		2.00	D	(1,1,1,2,2,3)					
		2.50	PID	0.0					
		2.50	B						
		2.50	ES						
		3.00-3.45	U		4.20	65.69		Becoming sandy to very sandy.	
		3.45	SPT	N=44				Dense brown medium SAND.	
		3.45	D	(3,4,6,7,12,19)					
		3.50	PID	0.0					
		3.50	ES						
		4.00	PID	0.0	3.95	65.94		Stiff brown mottled grey slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded of siltstone, sandstone and mudstone.	
		4.00	ES		4.20	65.69		No Recovery	
		4.20	SPT	50/200mm					
		4.20	D	200mm (9,12,12,18,20)					

Continued next sheet

Remarks:

1. Hand dug pit to 1.2m bgl
2. Slow ingress of groundwater at 1.8m.
3. Coring from 4.2m to 21.7m bgl.
4. Hole backfilled with bentonite on completion.
5. Hole drilled using Commachio 205

Project Name
PLOT 107 AND 108Project No.
C2315

Co-ords: 381816E - 385550N

Hole Type
Cable/Rotary

Location: MANCHESTER AIRPORT

Level: 69.89 m AOD

Scale
1:25

Client: URS LTD

Dates: 04/04/2014

Checked by
AJHLogged By
DMG

Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	Legend	Stratum Description									
		Depth (m)	TCR	SCR	RQD	FI													
		4.20-7.20	32	12	7	NR	6.51	63.38		No Recovery	6								
						NI													
						1													
						NI													
						2													
						NI													
						1													
						7.20-10.20			95			60	30	NR	9.02	60.87		Moderately weak thinly to thickly interlaminated red brown / grey silty MUDSTONE. Discontinuities are rough planar, sub horizontal, tight to open. Moderately strong between 6.51m and 6.84m.	7
														NI					
														9					
														2					
														NI					
		2																	
		NI																	
		2																	
		NI																	
		1																	
		NI																	
		2																	
		NI																	
		2																	
		NI																	
		1																	
		NI																	
		8									Moderately weak thickly laminated red brown SILTSTONE. Discontinuities are very close to medium spaced, sub horizontal, very tight to tight, smooth planar.	8							

Project Name
PLOT 107 AND 108Project No.
C2315

Co-ords: 381816E - 385550N

Hole Type
Cable/Rotary

Location: MANCHESTER AIRPORT

Level: 69.89 m AOD

Scale
1:25

Client: URS LTD

Dates: 04/04/2014

Checked by
AJHLogged By
DMG

Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD	FI					
		10.20-13.20				NR	10.36	59.53	XXXXXXXXXX XXXXXXXXXX XXXXXXXXXX XXXXXXXXXX XXXXXXXXXX XXXXXXXXXX XXXXXXXXXX XXXXXXXXXX XXXXXXXXXX XXXXXXXXXX	Moderately weak thickly laminated red brown SILTSTONE. Discontinuities are very close to medium spaced, sub horizontal, very tight to tight, smooth planar. becoming thinly laminated from 10.20m	
						2					
						NI					
						1					
						2					
						NI					
						2					
						NI					
						8					
						NI					
		10.20-13.20	98	87	15					Moderately weak thinly interlaminated grey / light grey silty MUDSTONE. Discontinuities are smooth planar, extremely close to close, sub horizontal, very tight to tight.	
		13.20-14.20	94	68	14	NR				from 11.74m to 11.85m sub vertical rough planar discontinuity.	
						5					
						NI					
						3					
						NI					
						3					
						NI					
		14.20-15.70	64	36	23	NR				from 12.80m to 12.92m sub vertical smooth planar tight discontinuity.	
						5					
						NI					
						4					
						NI					
		14.20-15.70	64	36	23	NR				Moderately weak thickly laminated grey silty MUDSTONE. Discontinuities are very close to closely spaced, rough planar and horizontal.	
						5					
						NI					
						4					
						NI					
		14.20-15.70	64	36	23	NR				from 14.20m to 14.72m No Recovery.	
						5					
						NI					
						4					
						NI					

Continued next sheet

Remarks:

1. Hand dug pit to 1.2m bgl
2. Slow ingress of groundwater at 1.8m.
3. Coring from 4.2m to 21.7m bgl.
4. Hole backfilled with bentonite on completion.
5. Hole drilled using Commachio 205

Project Name
PLOT 107 AND 108Project No.
C2315

Co-ords: 381816E - 385550N

Hole Type
Cable/Rotary

Location: MANCHESTER AIRPORT

Level: 69.89 m AOD

Scale
1:25

Client: URS LTD

Dates: 04/04/2014

Checked by
AJHLogged By
DMG

Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	Legend	Stratum Description						
		Depth (m)	TCR	SCR	RQD	FI										
		15.70-18.70	72	28	17		15.27	54.62		Moderately weak thickly laminated grey silty MUDSTONE. Discontinuities are very close to closely spaced, rough planar and horizontal.						
						2										
						NI			Very weak thinly laminated red brown silty MUDSTONE. Discontinuities are very close to close, rough planar, horizontal to sub horizontal.							
						4										
						NI	15.70	54.19		No Recovery No recovery from between 15.70m to 16.55m	16					
						NR										
						NI						16.55	53.34		Moderately weak thinly laminated red brown silty MUDSTONE, becoming moderately strong from 17.22m. Discontinuities are very close to closely spaced, planar (rough and smooth), sub horizontal.	17
						10										
						4										
						NI										
						4	17.81	52.08		Moderately weak thinly laminated grey silty MUDSTONE. Discontinuities are very close to medium spaced, sub horizontal, smooth planar.	18					
						NI										
			6													
			NI													
			5													
			NI													
				19.97	49.92							from 18.20m to 18.59m sub vertical rough undulating, locally discoloured orange discontinuity.	19			

Continued next sheet

Remarks:

1. Hand dug pit to 1.2m bgl
2. Slow ingress of groundwater at 1.8m.
3. Coring from 4.2m to 21.7m bgl.
4. Hole backfilled with bentonite on completion.
5. Hole drilled using Commachio 205

Project Name
PLOT 107 AND 108Project No.
C2315

Co-ords: 381816E - 385550N

Hole Type
Cable/Rotary

Location: MANCHESTER AIRPORT

Level: 69.89 m AOD

Scale
1:25

Client: URS LTD

Dates: 04/04/2014

Checked by
AJHLogged By
DMG

Well	Water Strikes	Rotary Coring					Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	TCR	SCR	RQD	FI					
		18.70-21.70	87	51	4					<p>Moderately weak thinly laminated red brown silty MUDSTONE. Discontinuities are sub horizontal, planar (rough & smooth), closely spaced.</p> <p>from 20.17m to 20.26m sub vertical rough planar bifurcating discontinuities.</p> <p>between 20.53m to 20.67m vertical to sub vertical rough stepped discontinuity.</p> <p>becoming weak to moderately weak from 20.89m due to fracturing.</p> <p>from 21.17m to 21.33m rough undulating sub vertical moderately open discontinuity.</p> <p>from 21.47m to 21.55m rough undulating cross cutting discontinuities.</p>	21
							21.70	48.19		End of Borehole at 21.70 m	22
											23
											24

Remarks:

1. Hand dug pit to 1.2m bgl
2. Slow ingress of groundwater at 1.8m.
3. Coring from 4.2m to 21.7m bgl.
4. Hole backfilled with bentonite on completion.
5. Hole drilled using Commachio 205

Project Name
PLOT 107 AND 108

Project No.
C2315

Co-ords: 381880E - 385540N

Hole Type
WS

Location: MANCHESTER AIRPORT

Level: 70.21 m AOD

Scale
1:25

Client: URS LTD

Dates: 10/04/2014

Checked by
AJH

Logged By
DMG

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	PID	0.0	0.10	70.11		MADE GROUND: Tarmac.	
		0.20	ES		0.30	69.91		MADE GROUND: Light grey sandy fine to coarse angular to subangular limestone gravel.	
		0.50	PID	0.0				MADE GROUND: Brown fine to coarse sand and fine to coarse angular sandstone gravel with cobbles.	
		0.50	ES						
					1.00	69.21		Firm brown mottled orange slightly sandy slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded of mudstone and siltstone.	1
		1.20	SPT	N=20					
		1.00-1.45	D	(5,8,7,6,4,3)					
		1.30	PID	0.0					
		1.30	ES						
					1.65	68.56		Brown medium to coarse SAND.	
		2.00	PID	0.0	2.00	68.21		Firm to stiff brown slightly gravelly CLAY. Gravel is fine to medium angular to subrounded of siltstone and mudstone.	2
		2.00	SPT	N=28					
		2.00	ES	(4,7,9,8,5,6)					
		2.00-2.45	D						
		2.50	PID					Becoming very stiff from 2.5m.	
		2.50	ES						
		2.80	D						
		3.00	SPT	N=55					3
				(5,9,12,13,15,15)					
		3.00-3.45	D						
					3.45	66.76		End of Borehole at 3.45 m	

Remarks: 1. Hand dug pit to 1.2m bgl.
2. Groundwater encountered at 0.7m.
3. Backfilled with bentonite.
4. Hole drilled using Dando Terrier.

Project Name
PLOT 107 AND 108

Project No.
C2315

Co-ords: 381892E - 385552N

Hole Type
WS

Location: MANCHESTER AIRPORT

Level: 70.28 m AOD

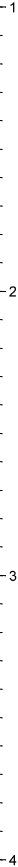
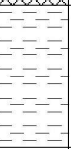
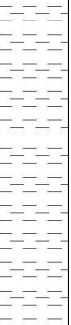
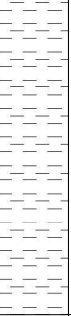
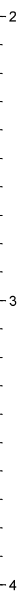
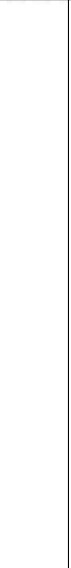
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Client: URS LTD

Dates: 10/04/2014

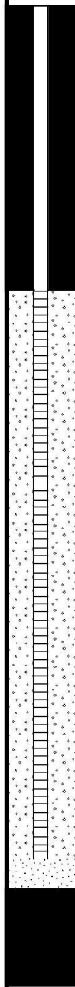
Checked by
AJH

Logged By
DMG

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	PID	0.0	0.10	70.18		MADE GROUND: Tarmac.	
		0.20	ES		0.30	69.98		MADE GROUND: Light grey sandy fine to coarse angular to subrounded gravel sub base.	
		0.50	PID	0.0	0.80	69.48		Firm dark grey brown slightly gravelly slightly sandy CLAY. Gravel is fine to medium angular to subrounded of mudstone and siltstone.	
		0.50	ES						
		1.00	PID	0.0				Firm to stiff light brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is subrounded of siltstone.	
		1.00	ES						
		1.20	SPT	N=16	1.50			Becoming brown from 1.2m.	
		1.00-1.45	D	(1,2,2,4,4,6)					
		1.00-1.50	B						
			D					Becoming stiff from 1.7m.	
		2.00	PID	0.0	2.00			Becoming very stiff from 2.5m.	
		2.00	SPT	N=29					
		2.00	ES	(3,3,7,7,7,8)					
		2.00-2.45	D						
		2.50	D		2.60				
		2.60	PID	0.0					
		2.60	SPT	N=50					
		2.60	ES	(10,10,11,13,13,13)					
		2.60-3.05	D						
					3.05	67.23		End of Borehole at 3.05 m	

Remarks: 1. Hand dug pit to 1.2m bgl.
2. No groundwater encountered.
3. Backfilled with bentonite.
4. Hole drilled using Dando Terrier.

Project Name PLOT 107 AND 108	Project No. C2315	Co-ords: 381848E - 385532N	Hole Type WS
Location: MANCHESTER AIRPORT		Level: 70.17 m AOD	Scale 1:25
Client: URS LTD		Dates: 09/04/2014	Checked by AJH
			Logged By DMG

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.20	PID	0.0	0.10	70.07		MADE GROUND: Tarmac.	1	
		0.20	ES		0.30	69.87		MADE GROUND: Light grey sandy gravel sub base.		
		0.40	PID	0.0	0.50	69.67		MADE GROUND: Light brown slightly gravelly sandy cobbles of limestone.		
		0.40	ES					Firm to stiff brown mottled grey slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded of mudstone and sandstone.		
		1.00	PID	0.0				Sand band from 1.25m to 1.35m.		
		1.00	ES							
		1.20	SPT	N=15						
		1.00-1.45	D	(1,2,3,5,4,3)						
		1.30	PID	0.0					2	
		1.30	ES							
		1.60	PID	0.0						
		1.60	ES							
		2.00	SPT	N=18				Becoming stiff from 2.2m.		
		2.00	D	(3,4,4,4,5,5)						
		2.00-2.45	D					3		
		2.00-2.50	B							
2.50	ES									
3.00	SPT	N=57								
3.00	D	(3,4,8,12,18,19)								
3.00-3.45	D									
					3.45	66.72		End of Borehole at 3.45 m	4	

Remarks: 1. Hand dug pit to 1.2m bgl.
2. Groundwater encountered at 1.3m bgl.
3. Standpipe Installed to 3.0m bgl; 1.0m plain, 2.0m slotted.
4. Hole drilled using Dando Terrier.



COMPLEX CHALLENGES ...
MADE SIMPLE

APPENDIX C – CHEMICAL TESTING RESULTS

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 24/10272
Issue Number: 1

Date: 30 October, 2024

Client: ROCP LIMITED
Commercial Wharf 6 Commercial Street
Castlefield
Manchester
M15 4PZ

Project Manager: Reece McGuinness
Project Name: Plot H5 Manc Airport
Project Ref: 4700
Order No: PBJ20371
Date Samples Received: 23/10/24
Date Instructions Received: 24/10/24
Date Analysis Completed: 30/10/24

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 24/10272

Client Project Name: Plot H5 Manc Airport

Client Project Ref: 4700

Lab Sample ID	24/10272/1	24/10272/2	24/10272/3	24/10272/4	24/10272/5	24/10272/6	24/10272/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS303	WS303	WS301	WS301	WS304	WS302	WS302			
Depth to Top	0.55	2	0.3	2	1	0.6	1.8			
Depth To Bottom	0.8		0.6			0.8	2.0			
Date Sampled	21-Oct-24	21-Oct-24	21-Oct-24	21-Oct-24	22-Oct-24	22-Oct-24	22-Oct-24			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Matrix Code	1A	6A	4A	3A	6A	1A	6A			
% Moisture at <40C _A	9.2	11.9	7.6	10.1	16.5	12.6	11.4	% w/w	0.1	A-T-044
% Stones >10mm _A	2.4	2.4	18.9	<0.1	<0.1	<0.1	3.5	% w/w	0.1	A-T-044
pH _D ^{M#}	8.32	8.93	9.53	8.59	8.27	8.25	8.29	pH	0.01	A-T-031s
pH BRE _D ^{M#}	-	8.93	-	8.59	8.27	-	-	pH	0.01	A-T-031s
Electrical conductivity @ 20degC _D	661	-	-	-	-	-	-	µs/cm	10	A-T-037s
Sulphate BRE (water sol 2:1) _D ^{M#}	12	<10	<10	<10	25	<10	<10	mg/l	10	A-T-026s
Sulphate BRE (acid sol) _D ^{M#}	-	<0.02	-	<0.02	<0.02	-	-	% w/w	0.02	A-T-028s
Sulphur BRE (total) _D	-	<0.01	-	0.04	<0.01	-	-	% w/w	0.01	A-T-024s
Sulphate BRE (total potential) _D	-	<0.03	-	0.12	<0.03	-	-	% w/w	0.03	A-T-024s
Cyanide (total) _A ^{M#}	<1	<1	<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	<0.2	<0.2	mg/kg	0.2	A-T-050s
Fraction of organic carbon _D [#]	0.0014	0.0079	0.0022	0.0100	0.0030	0.0009	0.0046	N/A	0.0003	A-T-032s
Antimony _D	<5	<5	<5	<5	<5	<5	<5	mg/kg	5	A-T-024s
Arsenic _D ^{M#}	<1	<1	<1	3	3	<1	<1	mg/kg	1	A-T-024s
Barium _D	11	54	35	55	125	19	40	mg/kg	1	A-T-024s
Beryllium _D	<0.5	0.8	<0.5	0.8	1.4	<0.5	0.8	mg/kg	0.5	A-T-024s
Boron (water soluble) _D ^{M#}	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	mg/kg	1	A-T-027s
Cadmium _D ^{M#}	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	mg/kg	0.5	A-T-024s
Copper _D ^{M#}	2	13	4	36	14	4	13	mg/kg	1	A-T-024s
Chromium _D ^{M#}	6	20	8	19	25	7	15	mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-040s
Chromium (trivalent)	6	20	8	19	25	7	15	mg/kg	1	Calc
Lead _D ^{M#}	<1	5	4	5	6	3	5	mg/kg	1	A-T-024s
Mercury _D	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	mg/kg	0.17	A-T-024s
Molybdenum _D ^{M#}	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-024s
Nickel _D ^{M#}	5	19	8	19	24	6	14	mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-024s
Vanadium _D ^{M#}	8	20	6	20	27	7	15	mg/kg	1	A-T-024s
Zinc _D ^{M#}	9	32	37	31	30	10	27	mg/kg	5	A-T-024s
Redox Potential (water soluble) _D	172	-	-	-	-	-	-	mV		Redox
TAME _A	<0.1	-	-	-	-	-	-	mg/kg	0.1	A-T-057s

Envirolab Job Number: 24/10272

Client Project Name: Plot H5 Manc Airport

Client Project Ref: 4700

Lab Sample ID	24/10272/1	24/10272/2	24/10272/3	24/10272/4	24/10272/5	24/10272/6	24/10272/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS303	WS303	WS301	WS301	WS304	WS302	WS302			
Depth to Top	0.55	2	0.3	2	1	0.6	1.8			
Depth To Bottom	0.8		0.6			0.8	2.0			
Date Sampled	21-Oct-24	21-Oct-24	21-Oct-24	21-Oct-24	22-Oct-24	22-Oct-24	22-Oct-24			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Matrix Code	1A	6A	4A	3A	6A	1A	6A			
Asbestos in Soil (inc. matrix)										
Asbestos in soil _D [#]	-	-	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	-	-	-	-			A-T-045

Envirolab Job Number: 24/10272

Client Project Name: Plot H5 Manc Airport

Client Project Ref: 4700

Lab Sample ID	24/10272/1	24/10272/2	24/10272/3	24/10272/4	24/10272/5	24/10272/6	24/10272/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS303	WS303	WS301	WS301	WS304	WS302	WS302			
Depth to Top	0.55	2	0.3	2	1	0.6	1.8			
Depth To Bottom	0.8		0.6			0.8	2.0			
Date Sampled	21-Oct-24	21-Oct-24	21-Oct-24	21-Oct-24	22-Oct-24	22-Oct-24	22-Oct-24			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Matrix Code	1A	6A	4A	3A	6A	1A	6A			
PAH-16MS										
Acenaphthene _A ^{M#}	<0.01	<0.01	<0.01	<0.01	<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	<0.01	<0.01	mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	mg/kg	0.01	A-T-019s

Envirolab Job Number: 24/10272

Client Project Name: Plot H5 Manc Airport

Client Project Ref: 4700

Lab Sample ID	24/10272/1	24/10272/2	24/10272/3	24/10272/4	24/10272/5	24/10272/6	24/10272/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS303	WS303	WS301	WS301	WS304	WS302	WS302			
Depth to Top	0.55	2	0.3	2	1	0.6	1.8			
Depth To Bottom	0.8		0.6			0.8	2.0			
Date Sampled	21-Oct-24	21-Oct-24	21-Oct-24	21-Oct-24	22-Oct-24	22-Oct-24	22-Oct-24			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Matrix Code	1A	6A	4A	3A	6A	1A	6A			
SVOC+TICS (UKWIR)										
4-Bromophenyl phenyl ether _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
SVOC TICs (Tentatively Identified Compounds) _A	None detected	-	-	-	-	-	-			A-T-052s
Hexachlorobenzene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Diethyl phthalate _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Dimethyl phthalate _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Dibenzofuran _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Carbazole _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Butylbenzyl phthalate _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Bis(2-ethylhexyl)phthalate _A	<500	-	-	-	-	-	-	µg/kg	500	A-T-052s
Bis(2-chloroethoxy)methane _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Bis(2-chloroethyl)ether _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
4-Nitrophenol _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
3+4-Methylphenol _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
4-Chloro-3-methylphenol _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
2-Nitrophenol _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
2-Methylphenol _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
1,2,4-Trichlorobenzene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
2-Chlorophenol _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
2,6-Dinitrotoluene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
2,4-Dinitrotoluene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
2,4-Dimethylphenol _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
2,4-Dichlorophenol _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
2,4,6-Trichlorophenol _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
2,4,5-Trichlorophenol _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
1,4-Dichlorobenzene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
1,3-Dichlorobenzene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
1,2-Dichlorobenzene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
2-Chloronaphthalene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
2-Methylnaphthalene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Acenaphthylene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Acenaphthene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Anthracene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s

Envirolab Job Number: 24/10272

Client Project Name: Plot H5 Manc Airport

Client Project Ref: 4700

Lab Sample ID	24/10272/1	24/10272/2	24/10272/3	24/10272/4	24/10272/5	24/10272/6	24/10272/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS303	WS303	WS301	WS301	WS304	WS302	WS302			
Depth to Top	0.55	2	0.3	2	1	0.6	1.8			
Depth To Bottom	0.8		0.6			0.8	2.0			
Date Sampled	21-Oct-24	21-Oct-24	21-Oct-24	21-Oct-24	22-Oct-24	22-Oct-24	22-Oct-24			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Matrix Code	1A	6A	4A	3A	6A	1A	6A			
Benzo(a)anthracene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Benzo(b)fluoranthene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Benzo(k)fluoranthene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Benzo(a)pyrene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Benzo(ghi)perylene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Chrysene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Fluoranthene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Fluorene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Indeno(1,2,3-cd)pyrene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Phenanthrene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Pyrene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Naphthalene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Dibenzo(ah)anthracene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Bis(2-chloroisopropyl)ether _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Phenol _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Pentachlorophenol _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
n-Nitroso-n-dipropylamine _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
n-Dioctylphthalate _A	<500	-	-	-	-	-	-	µg/kg	500	A-T-052s
n-Dibutylphthalate _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Nitrobenzene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Isophorone _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Hexachloroethane _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Hexachlorobutadiene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Cresol & Chlorinated Phenol Total _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Perylene _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Phenols Total (from SVOC) _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
SVOC Total (excl. PAH/Phenols/Cresols and Chlorophenols) _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
SVOC Total (excl. PAH/Phenols/Cresols/Chlorophenols/Ethers/Nitrobenzene) _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s
Ethers Total (from SVOC) _A	<100	-	-	-	-	-	-	µg/kg	100	A-T-052s

Envirolab Job Number: 24/10272

Client Project Name: Plot H5 Manc Airport

Client Project Ref: 4700

Lab Sample ID	24/10272/1	24/10272/2	24/10272/3	24/10272/4	24/10272/5	24/10272/6	24/10272/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS303	WS303	WS301	WS301	WS304	WS302	WS302			
Depth to Top	0.55	2	0.3	2	1	0.6	1.8			
Depth To Bottom	0.8		0.6			0.8	2.0			
Date Sampled	21-Oct-24	21-Oct-24	21-Oct-24	21-Oct-24	22-Oct-24	22-Oct-24	22-Oct-24			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Matrix Code	1A	6A	4A	3A	6A	1A	6A			
VOC+TICS (UKWIR)										
Dichlorodifluoromethane _A	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
Chloromethane _A	<10	-	-	-	-	-	-	µg/kg	10	A-T-006s
Vinyl Chloride (Chloroethene) _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
Bromomethane _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
Chloroethane _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
Trichlorofluoromethane _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
1,1-Dichloroethene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
Carbon Disulphide _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
Dichloromethane _A	<5	-	-	-	-	-	-	µg/kg	5	A-T-006s
trans 1,2-Dichloroethene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
1,1-Dichloroethane _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
cis 1,2-Dichloroethene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
2,2-Dichloropropane _A [#]	<1 ^U	-	-	-	-	-	-	µg/kg	1	A-T-006s
Bromochloromethane _A [#]	<5	-	-	-	-	-	-	µg/kg	5	A-T-006s
Chloroform _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
1,1,1-Trichloroethane _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
1,1-Dichloropropene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
Carbon Tetrachloride _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
1,2-Dichloroethane _A [#]	<2	-	-	-	-	-	-	µg/kg	2	A-T-006s
Benzene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
Trichloroethene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
1,2-Dichloropropane _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
Dibromomethane _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
Bromodichloromethane _A [#]	<10	-	-	-	-	-	-	µg/kg	10	A-T-006s
cis 1,3-Dichloropropene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
Toluene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
trans 1,3-Dichloropropene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
1,1,2-Trichloroethane _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
1,3-Dichloropropane _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
Tetrachloroethene _A [#]	<1 ^U	-	-	-	-	-	-	µg/kg	1	A-T-006s
Dibromochloromethane _A [#]	<3	-	-	-	-	-	-	µg/kg	3	A-T-006s
1,2-Dibromoethane _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s

Envirolab Job Number: 24/10272

Client Project Name: Plot H5 Manc Airport

Client Project Ref: 4700

Lab Sample ID	24/10272/1	24/10272/2	24/10272/3	24/10272/4	24/10272/5	24/10272/6	24/10272/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS303	WS303	WS301	WS301	WS304	WS302	WS302			
Depth to Top	0.55	2	0.3	2	1	0.6	1.8			
Depth To Bottom	0.8		0.6			0.8	2.0			
Date Sampled	21-Oct-24	21-Oct-24	21-Oct-24	21-Oct-24	22-Oct-24	22-Oct-24	22-Oct-24			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Matrix Code	1A	6A	4A	3A	6A	1A	6A			
Chlorobenzene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
Ethylbenzene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
m & p Xylene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
o-Xylene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
Styrene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
Bromoform _A [#]	<3	-	-	-	-	-	-	µg/kg	3	A-T-006s
Isopropylbenzene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
1,1,2,2-Tetrachloroethane _A	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
1,2,3-Trichloropropane _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
Bromobenzene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
n-Propylbenzene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
2-Chlorotoluene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
1,3,5-Trimethylbenzene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
4-Chlorotoluene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
tert-Butylbenzene _A [#]	<2	-	-	-	-	-	-	µg/kg	2	A-T-006s
1,2,4-Trimethylbenzene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
sec-Butylbenzene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
4-Isopropyltoluene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
1,3-Dichlorobenzene _A	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
1,4-Dichlorobenzene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
n-Butylbenzene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
1,2-Dichlorobenzene _A [#]	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
1,2-Dibromo-3-chloropropane (DCBP) _A	<2	-	-	-	-	-	-	µg/kg	2	A-T-006s
1,2,4-Trichlorobenzene _A	<3	-	-	-	-	-	-	µg/kg	3	A-T-006s
Hexachlorobutadiene _A [#]	<1 ^U	-	-	-	-	-	-	µg/kg	1	A-T-006s
1,2,3-Trichlorobenzene _A	<3	-	-	-	-	-	-	µg/kg	3	A-T-006s
VOC Total (excl. BTEX) _A	<10	-	-	-	-	-	-	µg/kg	10	A-T-006s
BTEX Total (from VOC) _A	<1	-	-	-	-	-	-	µg/kg	1	A-T-006s
VOC TICs _A	None detected	-	-	-	-	-	-			A-T-006s

Envirolab Job Number: 24/10272

Client Project Name: Plot H5 Manc Airport

Client Project Ref: 4700

Lab Sample ID	24/10272/1	24/10272/2	24/10272/3	24/10272/4	24/10272/5	24/10272/6	24/10272/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS303	WS303	WS301	WS301	WS304	WS302	WS302			
Depth to Top	0.55	2	0.3	2	1	0.6	1.8			
Depth To Bottom	0.8		0.6			0.8	2.0			
Date Sampled	21-Oct-24	21-Oct-24	21-Oct-24	21-Oct-24	22-Oct-24	22-Oct-24	22-Oct-24			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Matrix Code	1A	6A	4A	3A	6A	1A	6A			
TPH CWG (UKWIR) with Clean Up										
Ali >C5-C6 _A	<0.01	-	-	-	-	-	-	mg/kg	0.01	A-T-022s
Ali >C6-C8 _A	<0.01	-	-	-	-	-	-	mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	-	-	-	-	-	-	mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	-	-	-	-	-	-	mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	<1	-	-	-	-	-	-	mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	<1	-	-	-	-	-	-	mg/kg	1	A-T-055s
Ali >C21-C35 _A ^{M#}	<1	-	-	-	-	-	-	mg/kg	1	A-T-055s
Total Aliphatics _A	<1	-	-	-	-	-	-	mg/kg	1	Calc-As Recd
Aro >C5-C7 _A [#]	<0.01	-	-	-	-	-	-	mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01	-	-	-	-	-	-	mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	<1	-	-	-	-	-	-	mg/kg	1	A-T-055s
Aro >C10-C12 _A	<1	-	-	-	-	-	-	mg/kg	1	A-T-055s
Aro >C12-C16 _A	<1	-	-	-	-	-	-	mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	<1	-	-	-	-	-	-	mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	<1	-	-	-	-	-	-	mg/kg	1	A-T-055s
EPH Total Ali & Aro (>C10-C16) _A [#]	<1	-	-	-	-	-	-	mg/kg	1	A-T-055s
EPH Total Ali & Aro (>C8-C10) _A [#]	<1	-	-	-	-	-	-	mg/kg	1	A-T-055s
EPH Total Ali & Aro (>C16-C35) _A ^{M#}	<1	-	-	-	-	-	-	mg/kg	1	A-T-055s
Total Aromatics _A	<1	-	-	-	-	-	-	mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C35) _A	<1	-	-	-	-	-	-	mg/kg	1	Calc-As Recd
BTEX and MTBE Total _A	<0.01	-	-	-	-	-	-	mg/kg	0.01	A-T-022s
BTEX - Benzene _A [#]	<0.01	-	-	-	-	-	-	mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01	-	-	-	-	-	-	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	-	-	-	-	-	-	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	-	-	-	-	-	-	mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01	-	-	-	-	-	-	mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	-	-	-	-	-	-	mg/kg	0.01	A-T-022s
VPH total (>C5-C8) _A [#]	<0.01	-	-	-	-	-	-	mg/kg	0.01	A-T-022s

Envirolab Job Number: 24/10272

Client Project Name: Plot H5 Manc Airport

Client Project Ref: 4700

Lab Sample ID	24/10272/8	24/10272/9						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS305	WS305								
Depth to Top	0.15	0.8								
Depth To Bottom	0.65	1.0								
Date Sampled	22-Oct-24	22-Oct-24								
Sample Type	SOIL	SOIL								
Sample Matrix Code	4A	1A								
% Moisture at <40C _A	6.4	12.3						% w/w	0.1	A-T-044
% Stones >10mm _A	36.0	<0.1						% w/w	0.1	A-T-044
pH _D ^{M#}	8.82	8.33						pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1) _D ^{M#}	14	11						mg/l	10	A-T-026s
Cyanide (total) _A ^{M#}	<1	<1						mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2						mg/kg	0.2	A-T-050s
Fraction of organic carbon _D [#]	0.0047	0.0008						N/A	0.0003	A-T-032s
Antimony _D	<5	<5						mg/kg	5	A-T-024s
Arsenic _D ^{M#}	1	<1						mg/kg	1	A-T-024s
Barium _D	69	20						mg/kg	1	A-T-024s
Beryllium _D	0.5	<0.5						mg/kg	0.5	A-T-024s
Boron (water soluble) _D ^{M#}	<1.0	<1.0						mg/kg	1	A-T-027s
Cadmium _D ^{M#}	<0.5	<0.5						mg/kg	0.5	A-T-024s
Copper _D ^{M#}	12	5						mg/kg	1	A-T-024s
Chromium _D ^{M#}	15	8						mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1						mg/kg	1	A-T-040s
Chromium (trivalent)	15	8						mg/kg	1	Calc
Lead _D ^{M#}	12	3						mg/kg	1	A-T-024s
Mercury _D	<0.17	<0.17						mg/kg	0.17	A-T-024s
Molybdenum _D ^{M#}	<1	<1						mg/kg	1	A-T-024s
Nickel _D ^{M#}	17	8						mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1						mg/kg	1	A-T-024s
Vanadium _D ^{M#}	13	9						mg/kg	1	A-T-024s
Zinc _D ^{M#}	45	10						mg/kg	5	A-T-024s

Envirolab Job Number: 24/10272

Client Project Name: Plot H5 Manc Airport

Client Project Ref: 4700

Lab Sample ID	24/10272/8	24/10272/9						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS305	WS305								
Depth to Top	0.15	0.8								
Depth To Bottom	0.65	1.0								
Date Sampled	22-Oct-24	22-Oct-24								
Sample Type	SOIL	SOIL								
Sample Matrix Code	4A	1A								
Asbestos in Soil (inc. matrix)										
Asbestos in soil _D [#]	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	-								A-T-045

Envirolab Job Number: 24/10272

Client Project Name: Plot H5 Manc Airport

Client Project Ref: 4700

Lab Sample ID	24/10272/8	24/10272/9						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS305	WS305								
Depth to Top	0.15	0.8								
Depth To Bottom	0.65	1.0								
Date Sampled	22-Oct-24	22-Oct-24								
Sample Type	SOIL	SOIL								
Sample Matrix Code	4A	1A								
PAH-16MS										
Acenaphthene _A ^{M#}	<0.01	<0.01						mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	<0.01	<0.01						mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	<0.02	<0.02						mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	<0.04	<0.04						mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	<0.04	<0.04						mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	<0.05	<0.05						mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	<0.05	<0.05						mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	<0.07	<0.07						mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	<0.06	<0.06						mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	<0.04	<0.04						mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	<0.08	<0.08						mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	<0.01	<0.01						mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	<0.03	<0.03						mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	<0.03						mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	0.04	<0.03						mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	<0.07	<0.07						mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	<0.08	<0.08						mg/kg	0.01	A-T-019s

Report Notes

General

- This report shall not be reproduced, except in full, without written approval from Envirolab.
- The client Sample No, Client Sample ID, Depth to top, Depth to Bottom and Date Sampled are all provided by the client and can affect the validity of results.
- 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 within the same delivery, will be disposed of **four weeks** after the 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 our scope of accreditation.
- A deviating sample 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.
- If a sample is outside of the calibration range or affected by interferences then it may need diluting. This will result in the limit of detection (LOD) being raised.
- Subcontracted Analysis: Please see the appended report for any deviations, current LODs and accreditation status of the test.

Key

Superscript “#”	Accredited to ISO 17025
Superscript “M”	Accredited to MCertS
Superscript “U”	Individual result not accredited
None of the above symbols	Analysis unaccredited
Subscript “A”	Analysis performed on as-received Sample
Subscript “D”	Analysis performed on the dried sample, crushed to pass 2mm sieve.
Subscript “D” on Asbestos	Analysis performed on a dried aliquot of sample provided.
Subscript “A”	Analysis has dependant options against results. Details appear in the comments of your Sample receipt
IS	Insufficient Sample for analysis
US	Unsuitable Sample for analysis
NDP	No Determination Possible
NAD	No Asbestos Detected
Trace	Asbestos found not suitable for Gravimetric Quantification – not enough to accurately weigh.
N/A	Not applicable

Asbestos

Identification: 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

“Trace Asbestos Identified” will be reported if there is not enough present to verify the type.

Quantification: Generally a 2 stage process including visual identification, hand picking and weighing, and fibre counting. 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. 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). “TRACE” will be reported as a quantification result.

PLEASE INFORM THE LABORATORY IF YOU WOULD LIKE THE STAGE 3 SEDIMENTATION PROCESS CARRIED OUT. Note this will be subcontracted.

Assigned Matrix Codes

1	SAND	6	CLAY/LOAM	A	Contains Stones
2	LOAM	7	OTHER	B	Contains Construction Rubble
3	CLAY	8	Asbestos Bulk (Only Asbestos ID accredited)	C	Contains visible hydrocarbons
4	LOAM/SAND	9	Incinerator Ash (some Metals accredited)	D	Contains glass / metal
5	SAND/CLAY			E	Contains roots / twigs

Note: 7,8,9 matrices are not covered by our ISO 17025 or MCertS accreditation, unless stated above.

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 by method A-T-007:

For waters, free and visible oils are excluded from the sample used for analysis, so the reported result represents the dissolved phase only. Results “with Clean up” indicates samples cleaned up with Silica during extraction.

EPH CWG (method A-T-055) from TPH CWG:

EPH CWG results have humics mathematically subtracted through instrument calculation.

Where these humic substances have been identified in any IDs from “TPH CWG with clean up” please note that the concentration is **NOT** included in the quantified results but present in the ID for information.

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.

Please contact your client manager if you require any further information.

Envirolab Deviating Samples Report

Hattersley Science & Technology Park, Stockport Road, Hattersley, SK14 3QU
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: ROCP LIMITED, Commercial Wharf 6 Commercial Street, Castlefield,
Manchester, M15 4PZ

Project: Plot H5 Manc Airport
Clients Project No: 4700

Project No: 24/10272
Date Received: 24/10/2024 (am)
Cool Box Temperatures (°C): 14.8

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	24/10272/1	24/10272/2	24/10272/3	24/10272/4	24/10272/5	24/10272/6	24/10272/7	24/10272/8	24/10272/9
Client Sample No									
Client Sample ID/Depth	WS303 0.55-0.8m	WS303 2m	WS301 0.3-0.6m	WS301 2m	WS304 1m	WS302 0.6-0.8m	WS302 1.8-2.0m	WS305 0.15-0.65m	WS305 0.8-1.0m
Date Sampled	21/10/24	21/10/24	21/10/24	21/10/24	22/10/24	22/10/24	22/10/24	22/10/24	22/10/24
A-T-004s				28/10/2024				28/10/2024	
A-T-006s	28/10/2024								
A-T-007s				28/10/2024				28/10/2024	
A-T-019s	30/10/2024	30/10/2024	30/10/2024	30/10/2024	30/10/2024	30/10/2024	30/10/2024	30/10/2024	30/10/2024
A-T-022s	28/10/2024			28/10/2024				28/10/2024	
A-T-024s	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024
A-T-025w				30/10/2024				30/10/2024	
A-T-026s	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024
A-T-026w				30/10/2024				30/10/2024	
A-T-026w (F)				30/10/2024				30/10/2024	
A-T-027s	28/10/2024	28/10/2024	28/10/2024	28/10/2024	28/10/2024	28/10/2024	28/10/2024	28/10/2024	28/10/2024
A-T-028s		28/10/2024		28/10/2024	28/10/2024				
A-T-030s				28/10/2024				28/10/2024	
A-T-031s	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024
A-T-031w				30/10/2024				30/10/2024	
A-T-032s	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024
A-T-032w				30/10/2024				30/10/2024	
A-T-037s	29/10/2024								
A-T-037w				30/10/2024				30/10/2024	
A-T-040s	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024
A-T-042sTCN	28/10/2024	28/10/2024	28/10/2024	28/10/2024	28/10/2024	28/10/2024	28/10/2024	28/10/2024	28/10/2024
A-T-044	28/10/2024	28/10/2024	28/10/2024	28/10/2024	28/10/2024	28/10/2024	28/10/2024	28/10/2024	28/10/2024
A-T-045			25/10/2024					25/10/2024	
A-T-050s	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024
A-T-050w				30/10/2024				30/10/2024	
A-T-052s	30/10/2024								
A-T-055s	28/10/2024								
A-T-057s	29/10/2024								
A-T-ANCs				29/10/2024				29/10/2024	
Calc	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024
Calc-As Recd	28/10/2024								
Calc-no stones				30/10/2024				30/10/2024	

Lab Sample ID	24/10272/1	24/10272/2	24/10272/3	24/10272/4	24/10272/5	24/10272/6	24/10272/7	24/10272/8	24/10272/9
Client Sample No									
Client Sample ID/Depth	WS303 0.55-0.8m	WS303 2m	WS301 0.3-0.6m	WS301 2m	WS304 1m	WS302 0.6-0.8m	WS302 1.8-2.0m	WS305 0.15-0.65m	WS305 0.8-1.0m
Date Sampled	21/10/24	21/10/24	21/10/24	21/10/24	22/10/24	22/10/24	22/10/24	22/10/24	22/10/24
Probe (w)				30/10/2024				30/10/2024	
Redox	29/10/2024								

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

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 24/10504
Issue Number: 1

Date: 05 November, 2024

Client: ROCP LIMITED
Commercial Wharf 6 Commercial Street
Castlefield
Manchester
M15 4PZ

Project Manager: Reece McGuinness
Project Name: Plot H5 Manc Airport
Project Ref: 4700
Order No: PBJ20369
Date Samples Received: 30/10/24
Date Instructions Received: 30/10/24
Date Analysis Completed: 05/11/24

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 24/10504

Client Project Name: Plot H5 Manc Airport

Client Project Ref: 4700

Lab Sample ID	24/10504/1									
Client Sample No										
Client Sample ID	RBH302									
Depth to Top	0.50									
Depth To Bottom	0.70									
Date Sampled	28-Oct-24									
Sample Type	SOIL									
Sample Matrix Code	3A									
								Units	Limit of Detection	Method ref
% Moisture at <40C _A	15.9							% w/w	0.1	A-T-044
% Stones >10mm _A	<0.1							% w/w	0.1	A-T-044
pH _D ^{M#}	7.89							pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1) _D ^{M#}	23							mg/l	10	A-T-026s
Cyanide (total) _A ^{M#}	<1							mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2							mg/kg	0.2	A-T-050s
Fraction of organic carbon _D [#]	0.0031							N/A	0.0003	A-T-032s
Antimony _D	<5							mg/kg	5	A-T-024s
Arsenic _D ^{M#}	3							mg/kg	1	A-T-024s
Barium _D	116							mg/kg	1	A-T-024s
Beryllium _D	1.3							mg/kg	0.5	A-T-024s
Boron (water soluble) _D ^{M#}	<1.0							mg/kg	1	A-T-027s
Cadmium _D ^{M#}	<0.5							mg/kg	0.5	A-T-024s
Copper _D ^{M#}	16							mg/kg	1	A-T-024s
Chromium _D ^{M#}	27							mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1							mg/kg	1	A-T-040s
Chromium (trivalent)	27							mg/kg	1	Calc
Lead _D ^{M#}	7							mg/kg	1	A-T-024s
Mercury _D	<0.17							mg/kg	0.17	A-T-024s
Molybdenum _D ^{M#}	<1							mg/kg	1	A-T-024s
Nickel _D ^{M#}	26							mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1							mg/kg	1	A-T-024s
Vanadium _D ^{M#}	28							mg/kg	1	A-T-024s
Zinc _D ^{M#}	33							mg/kg	5	A-T-024s

Envirolab Job Number: 24/10504

Client Project Name: Plot H5 Manc Airport

Client Project Ref: 4700

Lab Sample ID	24/10504/1							Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	RBH302									
Depth to Top	0.50									
Depth To Bottom	0.70									
Date Sampled	28-Oct-24									
Sample Type	SOIL									
Sample Matrix Code	3A									
PAH-16MS										
Acenaphthene _A ^{M#}	<0.01							mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	<0.01							mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	<0.02							mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	<0.04							mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	<0.04							mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	<0.05							mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	<0.05							mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	<0.07							mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	<0.06							mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	<0.04							mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	<0.08							mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	<0.01							mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	<0.03							mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03							mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	<0.03							mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	<0.07							mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	<0.08							mg/kg	0.01	A-T-019s

Report Notes

General

- This report shall not be reproduced, except in full, without written approval from Envirolab.
- The client Sample No, Client Sample ID, Depth to top, Depth to Bottom and Date Sampled are all provided by the client and can affect the validity of results.
- 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 within the same delivery, will be disposed of **four weeks** after the 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 our scope of accreditation.
- A deviating sample 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.
- If a sample is outside of the calibration range or affected by interferences then it may need diluting. This will result in the limit of detection (LOD) being raised.
- Subcontracted Analysis: Please see the appended report for any deviations, current LODs and accreditation status of the test.

Key

Superscript “#”	Accredited to ISO 17025
Superscript “M”	Accredited to MCertS
Superscript “U”	Individual result not accredited
None of the above symbols	Analysis unaccredited
Subscript “A”	Analysis performed on as-received Sample
Subscript “D”	Analysis performed on the dried sample, crushed to pass 2mm sieve.
Subscript “D” on Asbestos	Analysis performed on a dried aliquot of sample provided.
Subscript “A”	Analysis has dependant options against results. Details appear in the comments of your Sample receipt
IS	Insufficient Sample for analysis
US	Unsuitable Sample for analysis
NDP	No Determination Possible
NAD	No Asbestos Detected
Trace	Asbestos found not suitable for Gravimetric Quantification – not enough to accurately weigh.
N/A	Not applicable

Asbestos

Identification: 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

“Trace Asbestos Identified” will be reported if there is not enough present to verify the type.

Quantification: Generally a 2 stage process including visual identification, hand picking and weighing, and fibre counting. 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. 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). “TRACE” will be reported as a quantification result.

PLEASE INFORM THE LABORATORY IF YOU WOULD LIKE THE STAGE 3 SEDIMENTATION PROCESS CARRIED OUT. Note this will be subcontracted.

Assigned Matrix Codes

1	SAND	6	CLAY/LOAM	A	Contains Stones
2	LOAM	7	OTHER	B	Contains Construction Rubble
3	CLAY	8	Asbestos Bulk (Only Asbestos ID accredited)	C	Contains visible hydrocarbons
4	LOAM/SAND	9	Incinerator Ash (some Metals accredited)	D	Contains glass / metal
5	SAND/CLAY			E	Contains roots / twigs

Note: 7,8,9 matrices are not covered by our ISO 17025 or MCertS accreditation, unless stated above.

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 by method A-T-007:

For waters, free and visible oils are excluded from the sample used for analysis, so the reported result represents the dissolved phase only. Results “with Clean up” indicates samples cleaned up with Silica during extraction.

EPH CWG (method A-T-055) from TPH CWG:

EPH CWG results have humics mathematically subtracted through instrument calculation.

Where these humic substances have been identified in any IDs from “TPH CWG with clean up” please note that the concentration is **NOT** included in the quantified results but present in the ID for information.

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.

Please contact your client manager if you require any further information.

Envirolab Deviating Samples Report

Hattersley Science & Technology Park, Stockport Road, Hattersley, SK14 3QU
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: ROCP LIMITED, Commercial Wharf 6 Commercial Street, Castlefield,
Manchester, M15 4PZ

Project: Plot H5 Manc Airport
Clients Project No: 4700

Project No: 24/10504
Date Received: 30/10/2024 (am)
Cool Box Temperatures (°C): 11.5

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	24/10504/1
Client Sample No	
Client Sample ID/Depth	RBH302 0.50-0.70m
Date Sampled	28/10/24
A-T-019s	01/11/2024
A-T-024s	01/11/2024
A-T-026s	01/11/2024
A-T-027s	01/11/2024
A-T-031s	01/11/2024
A-T-032s	05/11/2024
A-T-040s	01/11/2024
A-T-042sTCN	01/11/2024
A-T-044	04/11/2024
A-T-050s	01/11/2024
Calc	01/11/2024

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

FINAL ANALYTICAL TEST REPORT

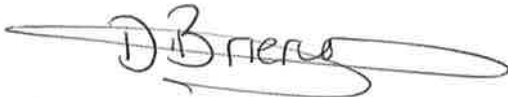
Envirolab Job Number: 24/10924
Issue Number: 1

Date: 18 November, 2024

Client: ROCP LIMITED
Commercial Wharf 6 Commercial Street
Castlefield
Manchester
M15 4PZ

Project Manager: Reece McGuinness
Project Name: Plot H5 Manchester Airport
Project Ref: 4700
Order No: PBJ20371
Date Samples Received: 08/11/24
Date Instructions Received: 11/11/24
Date Analysis Completed: 18/11/24

Approved by:



Danielle Brierley
Client Services Supervisor

Envirolab Job Number: 24/10924

Client Project Name: Plot H5 Manchester Airport

Client Project Ref: 4700

Lab Sample ID	24/10924/1	24/10924/2						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	RBH302	RBH301								
Depth to Top	11.00	10.50								
Depth To Bottom										
Date Sampled	07-Nov-24	07-Nov-24								
Sample Type	WATER - GW	WATER - GW								
Sample Matrix Code	N/A	N/A								
pH (w) _A [#]	6.82	7.03						pH	0.01	A-T-031w
Sulphate (w) _A [#]	31	27						mg/l	1	A-T-026w
Cyanide (total) (w) _A [#]	<0.005	<0.005						mg/l	0.005	A-T-042wTCN
Phenols - Total by HPLC (w) _A	<0.01	<0.01						mg/l	0.01	A-T-050w
DOC - Dissolved Organic Carbon (w) _A [#]	6.0	4.0						mg/l	2	A-T-032w
Antimony (dissolved) _A	<1	<1						µg/l	1	A-T-025w
Arsenic (dissolved) _A [#]	4	6						µg/l	1	A-T-025w
Boron (dissolved) _A [#]	47	38						µg/l	10	A-T-025w
Barium (dissolved) _A [#]	942	938						µg/l	1	A-T-025w
Beryllium (dissolved) _A [#]	<1	<1						µg/l	1	A-T-025w
Cadmium (dissolved) _A [#]	<0.2	<0.2						µg/l	0.2	A-T-025w
Copper (dissolved) _A [#]	4	<4						µg/l	4	A-T-025w
Chromium (dissolved) _A [#]	6	1						µg/l	1	A-T-025w
Chromium (hexavalent) (w) _A [#]	<0.01	<0.01						mg/l	0.01	A-T-040w
Chromium (trivalent) (w)	<0.01	<0.01						mg/l	0.01	Calc
Lead (dissolved) _A [#]	<1	<1						µg/l	1	A-T-025w
Mercury (dissolved) _A [#]	<0.1	<0.1						µg/l	0.1	A-T-025w
Molybdenum (dissolved) _A [#]	1.6	2.5						µg/l	0.5	A-T-025w
Nickel (dissolved) _A [#]	2	2						µg/l	2	A-T-025w
Selenium (dissolved) _A [#]	<1	<1						µg/l	1	A-T-025w
Vanadium (dissolved) _A [#]	<1	<1						µg/l	1	A-T-025w
Zinc (dissolved) _A [#]	7	4						µg/l	2	A-T-025w

Envirolab Job Number: 24/10924

Client Project Name: Plot H5 Manchester Airport

Client Project Ref: 4700

Lab Sample ID	24/10924/1	24/10924/2						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	RBH302	RBH301								
Depth to Top	11.00	10.50								
Depth To Bottom										
Date Sampled	07-Nov-24	07-Nov-24								
Sample Type	WATER - GW	WATER - GW								
Sample Matrix Code	N/A	N/A								
PAH 16MS (w)										
Acenaphthene (w) _A [#]	<0.01	<0.01						µg/l	0.01	A-T-019w
Acenaphthylene (w) _A [#]	<0.01	<0.01						µg/l	0.01	A-T-019w
Anthracene (w) _A [#]	<0.01	<0.01						µg/l	0.01	A-T-019w
Benzo(a)anthracene (w) _A [#]	<0.01	<0.01						µg/l	0.01	A-T-019w
Benzo(a)pyrene (w) _A [#]	<0.01	<0.01						µg/l	0.01	A-T-019w
Benzo(b)fluoranthene (w) _A [#]	<0.01	<0.01						µg/l	0.01	A-T-019w
Benzo(ghi)perylene (w) _A [#]	<0.01	<0.01						µg/l	0.01	A-T-019w
Benzo(k)fluoranthene (w) _A [#]	<0.01	<0.01						µg/l	0.01	A-T-019w
Chrysene (w) _A [#]	<0.01	<0.01						µg/l	0.01	A-T-019w
Dibenzo(ah)anthracene (w) _A [#]	<0.01	<0.01						µg/l	0.01	A-T-019w
Fluoranthene (w) _A [#]	<0.01	<0.01						µg/l	0.01	A-T-019w
Fluorene (w) _A [#]	<0.01 ^U	<0.01 ^U						µg/l	0.01	A-T-019w
Indeno(123-cd)pyrene (w) _A [#]	<0.01	<0.01						µg/l	0.01	A-T-019w
Naphthalene (w) _A [#]	<0.01	0.02						µg/l	0.01	A-T-019w
Phenanthrene (w) _A [#]	<0.01	<0.01						µg/l	0.01	A-T-019w
Pyrene (w) _A [#]	<0.01	<0.01						µg/l	0.01	A-T-019w
Total PAH 16MS (w) _A [#]	<0.01	0.02						µg/l	0.01	A-T-019w

Envirolab Job Number: 24/10924

Client Project Name: Plot H5 Manchester Airport

Client Project Ref: 4700

Lab Sample ID	24/10924/1	24/10924/2								
Client Sample No										
Client Sample ID	RBH302	RBH301								
Depth to Top	11.00	10.50								
Depth To Bottom										
Date Sampled	07-Nov-24	07-Nov-24								
Sample Type	WATER - GW	WATER - GW								
Sample Matrix Code	N/A	N/A								
TPH UKCWG (w) with Clean Up										
Ali >C5-C6 (w) _A [#]	<1	<1						µg/l	1	A-T-022w
Ali >C6-C8 (w) _A [#]	<1	<1						µg/l	1	A-T-022w
Ali >C8-C10 (w) _A [#]	<5	<5						µg/l	5	A-T-055w
Ali >C10-C12 (w) _A [#]	<5	<5						µg/l	5	A-T-055w
Ali >C12-C16 (w) _A [#]	<5	<5						µg/l	5	A-T-055w
Ali >C16-C21 (w) _A [#]	<5	<5						µg/l	5	A-T-055w
Ali >C21-C35 (w) _A [#]	<5	19						µg/l	5	A-T-055w
Ali >C35-C44 (w) _A	<5	<5						µg/l	5	A-T-055w
Total Aliphatics (w) _A	<5	19						µg/l	5	Calc-As Recd
Aro >C5-C7 (w) _A [#]	<1	<1						µg/l	1	A-T-022w
Aro >C7-C8 (w) _A [#]	<1	<1						µg/l	1	A-T-022w
Aro >C8-C10 (w) _A	<5	<5						µg/l	5	A-T-055w
Aro >C10-C12 (w) _A [#]	<5	<5						µg/l	5	A-T-055w
Aro >C12-C16 (w) _A [#]	<5	5						µg/l	5	A-T-055w
Aro >C16-C21 (w) _A [#]	<5	7						µg/l	5	A-T-055w
Aro >C21-C35 (w) _A [#]	<10	<10						µg/l	10	A-T-055w
Aro >C35-C44 (w) _A	<5	<5						µg/l	5	A-T-055w
Total Aromatics (w) _A	<10	12						µg/l	10	Calc-As Recd
TPH (Ali & Aro >C5-C44) (w) _A	<10	31						µg/l	10	Calc-As Recd
BTEX - Benzene (w) _A [#]	<1	<1						µg/l	1	A-T-022w
BTEX - Toluene (w) _A [#]	<1	<1						µg/l	1	A-T-022w
BTEX - Ethyl Benzene (w) _A [#]	<1	<1						µg/l	1	A-T-022w
BTEX - m & p Xylene (w) _A [#]	<1	<1						µg/l	1	A-T-022w
BTEX - o Xylene (w) _A [#]	<1	<1						µg/l	1	A-T-022w
MTBE (w) _A [#]	<1	<1						µg/l	1	A-T-057w

Report Notes

General

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- 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 within the same delivery, will be disposed of **four weeks** after the 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 our scope of accreditation.
- A deviating sample 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.
- If a sample is outside of the calibration range or affected by interferences then it may need diluting. This will result in the limit of detection (LOD) being raised.
- Subcontracted Analysis: Please see the appended report for any deviations, current LODs and accreditation status of the test.

Key

Superscript “#”	Accredited to ISO 17025
Superscript “M”	Accredited to MCertS
Superscript “U”	Individual result not accredited
None of the above symbols	Analysis unaccredited
Subscript “A”	Analysis performed on as-received Sample
Subscript “D”	Analysis performed on the dried sample, crushed to pass 2mm sieve.
Subscript “D” on Asbestos	Analysis performed on a dried aliquot of sample provided.
Subscript “A”	Analysis has dependant options against results. Details appear in the comments of your Sample receipt
IS	Insufficient Sample for analysis
US	Unsuitable Sample for analysis
NDP	No Determination Possible
NAD	No Asbestos Detected
Trace	Asbestos found not suitable for Gravimetric Quantification – not enough to accurately weigh.
N/A	Not applicable

Asbestos

Identification: 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

“Trace Asbestos Identified” will be reported if there is not enough present to verify the type.

Quantification: Generally a 2 stage process including visual identification, hand picking and weighing, and fibre counting. 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. 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). “TRACE” will be reported as a quantification result.

PLEASE INFORM THE LABORATORY IF YOU WOULD LIKE THE STAGE 3 SEDIMENTATION PROCESS CARRIED OUT. Note this will be subcontracted.

Assigned Matrix Codes

1	SAND	6	CLAY/LOAM	A	Contains Stones
2	LOAM	7	OTHER	B	Contains Construction Rubble
3	CLAY	8	Asbestos Bulk (Only Asbestos ID accredited)	C	Contains visible hydrocarbons
4	LOAM/SAND	9	Incinerator Ash (some Metals accredited)	D	Contains glass / metal
5	SAND/CLAY			E	Contains roots / twigs

Note: 7,8,9 matrices are not covered by our ISO 17025 or MCertS accreditation, unless stated above.

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 by method A-T-007:

For waters, free and visible oils are excluded from the sample used for analysis, so the reported result represents the dissolved phase only. Results “with Clean up” indicates samples cleaned up with Silica during extraction.

EPH CWG (method A-T-055) from TPH CWG:

EPH CWG results have humics mathematically subtracted through instrument calculation.

Where these humic substances have been identified in any IDs from “TPH CWG with clean up” please note that the concentration is **NOT** included in the quantified results but present in the ID for information.

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.

Please contact your client manager if you require any further information.

Envirolab Deviating Samples Report

Hattersley Science & Technology Park, Stockport Road, Hattersley, SK14 3QU
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: ROCP LIMITED, Commercial Wharf 6 Commercial Street, Castlefield,
Manchester, M15 4PZ

Project: Plot H5 Manchester Airport
Clients Project No: 4700

Project No: 24/10924
Date Received: 11/11/2024 (am)
Cool Box Temperatures (°C): 7.2

Lab Sample ID	24/10924/1	24/10924/2
Client Sample No		
Client Sample ID/Depth	RBH302 11.00m	RBH301 10.50m
Date Sampled	07/11/24	07/11/24
Deviation Code		
F	✓	✓

Key

F Maximum holding time exceeded between sampling date and analysis for analytes listed below

HOLDING TIME EXCEEDANCES

Lab Sample ID	24/10924/1	24/10924/2
Client Sample No		
Client Sample ID/Depth	RBH302 11.00m	RBH301 10.50m
Date Sampled	07/11/24	07/11/24
pH (w)	✓	✓

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	24/10924/1	24/10924/2
Client Sample No		
Client Sample ID/Depth	RBH302 11.00m	RBH301 10.50m
Date Sampled	07/11/24	07/11/24
A-T-019w	13/11/2024	13/11/2024
A-T-022w	13/11/2024	13/11/2024
A-T-025w	18/11/2024	18/11/2024
A-T-026w	12/11/2024	12/11/2024
A-T-031w	12/11/2024	12/11/2024
A-T-032w	12/11/2024	12/11/2024
A-T-040w	12/11/2024	12/11/2024
A-T-042wTCN	12/11/2024	12/11/2024
A-T-050w	13/11/2024	14/11/2024
A-T-055w	13/11/2024	13/11/2024
A-T-057w	13/11/2024	13/11/2024
Calc	18/11/2024	18/11/2024
Calc-As Recd	13/11/2024	13/11/2024

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

Certificate of Analysis

Client: SOCOTEC Geotechnical

Project: 24113030

Quote: BEC241137902 V1.1

Project Ref: N4003-24

Site: Plot H5 Manchester

Contact: Ryan Clark

Address: Welsyke Road
Adwick le Street
Doncaster
South Yorkshire
DN6 7DU

E-Mail: ryan.clark@socotec.com

Phone: N.A.

No. Samples Received: 6

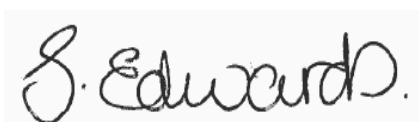
Date Received: 22/11/2024

Analysis Completed: 01/12/2024

Date Issued: 02/12/2024

Report Type: Version 01

This report supersedes any versions previously issued by the laboratory



Reported by Customer Service Co-Ordinator
Samantha Edwards
01283 554 541
Samantha.Edwards@socotec.co.uk



Project Number: 24113030

Client: SOCOTEC Geotechnical
Date Issued: 02/12/2024
Project Name: N4003-24 - Plot H5 Manchester

Samples Analysed

<u>Text ID</u>	<u>Sample Reference</u>	<u>Sampling Date</u>	<u>Sample Type</u>	<u>Sample Description</u>
24113030-001	RBH301-0-C-5.56-5.65		SOLID	Miscellaneous Sample
24113030-002	RBH301-0-C-9.16-9.33		SOLID	Miscellaneous Sample
24113030-003	RBH301-0-C-13.36-13.47		SOLID	Miscellaneous Sample
24113030-004	RBH302-0-C-4.92-4.99		SOLID	Miscellaneous Sample
24113030-005	RBH302-0-C-11.20-11.36		SOLID	Miscellaneous Sample
24113030-006	RBH302-0-C-18.56-18.66		SOLID	Miscellaneous Sample



Project Number: 24113030

Client: SOCOTEC Geotechnical
Date Issued: 02/12/2024
Project Name: N4003-24 - Plot H5 Manchester

Analysis Results

		SOCOTEC Sample ID:		24113030-001	24113030-002	24113030-003	24113030-004	24113030-005
		Sampling Date:						
		Customer ID:		RBH301-0-C-5.56-5.	RBH301-0-C-9.16-9.	RBH301-0-C-13.36-	RBH302-0-C-4.92-4.	RBH302-0-C-11.20-1
Method Code	Analysis	MDL	Accred.	65	33	13.47	99	1.36
CLANDPREP	Total Moisture at 35°C	0.1 %	N	7.8	6.4	5.7	13.9	10.6
	Major Constituents	-	N	MISCELLANEOUS	MISCELLANEOUS	MISCELLANEOUS	MISCELLANEOUS	MISCELLANEOUS
	Minor Constituents	-	N	Shale	Shale	Shale	Shale	Shale
	Miscellaneous Constituents	-	N	n/a	n/a	n/a	Clay	Silt
	Colour of Material	-	N	Brown/Grey	Brown/Grey	Brown/Grey	Grey	Brown/Grey
PHSOIL	pH (2.5:1 extraction)	1 pH units	N	8.9	9.0	9.0	8.6	8.8
ICPWSS	Water Soluble Sulphate as SO4 2:1 Ext	10 mg/l	N	12	<10	<10	67	<10
ICPACIDS	Acid Soluble Sulphate as SO4	20 mg/kg	N	341	416	239	676	273
WSLM59(TRL447)	Total Potential Sulphate (%)	0.015 % m/m	N	0.021	0.029	0.018	0.512	<0.015
	Total Potential Sulphate (mg/kg)	150 mg/kg	N	210	288	177	5120	<150
WSLM59	Sulphur as S	0.005 % m/m	N	0.007	0.010	0.006	0.171	<0.005



Project Number: 24113030

Client: SOCOTEC Geotechnical
Date Issued: 02/12/2024
Project Name: N4003-24 - Plot H5 Manchester

Analysis Results

SOCOTEC Sample ID: 24113030-006
 Sampling Date:
 Customer ID: RBH302-0-C-18.56-18.66

Method Code	Analysis	MDL	Accred.	
CLANDPREP	Total Moisture at 35°C	0.1 %	N	7.8
	Major Constituents	-	N	MISCELLANEOUS
	Minor Constituents	-	N	Silt
	Miscellaneous Constituents	-	N	Shale
	Colour of Material	-	N	Brown/Grey
PHSOIL	pH (2.5:1 extraction)	1 pH units	N	9.0
ICPWSS	Water Soluble Sulphate as SO ₄ 2:1 Ext	10 mg/l	N	<10
ICPACIDS	Acid Soluble Sulphate as SO ₄	20 mg/kg	N	309
WSLM59(TRL447)	Total Potential Sulphate (%)	0.015 % m/m	N	0.015
	Total Potential Sulphate (mg/kg)	150 mg/kg	N	153
WSLM59	Sulphur as S	0.005 % m/m	N	0.005



Project Number: 24113030

Client: SOCOTEC Geotechnical
Date Issued: 02/12/2024
Project Name: N4003-24 - Plot H5 Manchester

Deviating Sample Report

<u>Sample Reference</u>	<u>Text ID</u>	<u>Method Code</u>	Incorrect Container	Incorrect Label	Headspace	Incorrect/No Preservative	No Sampling Date	Holding Time
RBH301-0-C-5.56-5.65	24113030-001	CLANDPREP					✓	✓
RBH301-0-C-5.56-5.65	24113030-001	ICPACIDS					✓	✓
RBH301-0-C-5.56-5.65	24113030-001	ICPWSS					✓	✓
RBH301-0-C-5.56-5.65	24113030-001	PHSOIL					✓	✓
RBH301-0-C-5.56-5.65	24113030-001	WSLM59					✓	✓
RBH301-0-C-5.56-5.65	24113030-001	WSLM59(TRL447)					✓	✓
RBH301-0-C-9.16-9.33	24113030-002	CLANDPREP					✓	✓
RBH301-0-C-9.16-9.33	24113030-002	ICPACIDS					✓	✓
RBH301-0-C-9.16-9.33	24113030-002	ICPWSS					✓	✓
RBH301-0-C-9.16-9.33	24113030-002	PHSOIL					✓	✓
RBH301-0-C-9.16-9.33	24113030-002	WSLM59					✓	✓
RBH301-0-C-9.16-9.33	24113030-002	WSLM59(TRL447)					✓	✓
RBH301-0-C-13.36-13.47	24113030-003	CLANDPREP					✓	✓
RBH301-0-C-13.36-13.47	24113030-003	ICPACIDS					✓	✓
RBH301-0-C-13.36-13.47	24113030-003	ICPWSS					✓	✓
RBH301-0-C-13.36-13.47	24113030-003	PHSOIL					✓	✓
RBH301-0-C-13.36-13.47	24113030-003	WSLM59					✓	✓
RBH301-0-C-13.36-13.47	24113030-003	WSLM59(TRL447)					✓	✓
RBH302-0-C-4.92-4.99	24113030-004	CLANDPREP					✓	✓
RBH302-0-C-4.92-4.99	24113030-004	ICPACIDS					✓	✓
RBH302-0-C-4.92-4.99	24113030-004	ICPWSS					✓	✓
RBH302-0-C-4.92-4.99	24113030-004	PHSOIL					✓	✓
RBH302-0-C-4.92-4.99	24113030-004	WSLM59					✓	✓
RBH302-0-C-4.92-4.99	24113030-004	WSLM59(TRL447)					✓	✓
RBH302-0-C-11.20-11.36	24113030-005	CLANDPREP					✓	✓
RBH302-0-C-11.20-11.36	24113030-005	ICPACIDS					✓	✓
RBH302-0-C-11.20-11.36	24113030-005	ICPWSS					✓	✓
RBH302-0-C-11.20-11.36	24113030-005	PHSOIL					✓	✓
RBH302-0-C-11.20-11.36	24113030-005	WSLM59					✓	✓
RBH302-0-C-11.20-11.36	24113030-005	WSLM59(TRL447)					✓	✓
RBH302-0-C-18.56-18.66	24113030-006	CLANDPREP					✓	✓
RBH302-0-C-18.56-18.66	24113030-006	ICPACIDS					✓	✓
RBH302-0-C-18.56-18.66	24113030-006	ICPWSS					✓	✓
RBH302-0-C-18.56-18.66	24113030-006	PHSOIL					✓	✓



Project Number: 24113030

Client: SOCOTEC Geotechnical
Date Issued: 02/12/2024
Project Name: N4003-24 - Plot H5 Manchester

<u>Sample Reference</u>	<u>Text ID</u>	<u>Method Code</u>	Incorrect Container	Incorrect Label	Headspace	Incorrect/No Preservative	No Sampling Date	Holding Time
RBH302-0-C-18.56-18.66	24113030-006	WSLM59					✓	✓
RBH302-0-C-18.56-18.66	24113030-006	WSLM59(TRL447)					✓	✓

Analysis Method

Method Code

CLANDPREP
CLANDPREP
ICPACIDS
ICPWSS
PHSOIL
WSLM59
WSLM59(TRL447)

Method Description

Moisture Content @ 35°C
Solid Material Description
Sulphate as SO4 (Acid Soluble)
Sulphate as SO4 (Water Soluble 2:1 Extract)
pH (2.5:1)
Total Sulphur
Total Potential Sulphate

Analysis Method

As Received
As Received
Air Dried & Ground
Air Dried & Ground
As Received
Air Dried & Ground
Air Dried & Ground

Result Report Notes

Letters alongside results signify that the result has associated report notes.
The report notes are as follows:

Letter

Note

- A Due to the matrix of the sample the laboratory has had to deviate from our standard protocols to be able to process the sample and provide a result. Where applicable the accreditation has been removed and this should be taken into consideration when utilising the data.
- B The QC associated with this result has not wholly met the QMS requirements, the accreditation has therefore been removed. However, the Laboratory has confidence in the performance of the method as a whole and that the integrity of the data has not been significantly compromised.
- C Due to matrix interference, the internal standard and/or surrogate has not met the QMS requirements. This should be taken into consideration when utilising the data.
- D A non-standard volume or mass has been used for this test which has resulted in a raised detection limit.
- E Due to the parameter value being beyond our calibration range (and following the maximum size of dilution allowed, where applicable), the result cannot be quantified and as such the result will appear as a greater than symbol (>) with the accreditation removed. This data should be used for indicative purposes only.
- F Based on the sample history, appearance and smell a dilution was applied prior to testing. Unfortunately, the result is either above (>) or below (<) our calibration range. Results above our calibration range have accreditation removed. The data should be used for indicative purposes only.
- G The day 5 oxygen reading was below the capability of the instrument to detect, and therefore the calculated BOD has been reported unaccredited for guidance purposes only.



Project Number: 24113030

Client: SOCOTEC Geotechnical
Date Issued: 02/12/2024
Project Name: N4003-24 - Plot H5 Manchester

HWOL Acronym Key

<u>Acronym</u>	<u>Description</u>
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e everything extracted by the solvent(s)
CU	Clean up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
+	Operator to indicate cumulative e.g. EH_CU+HS_1D_Total

Additional Information

This report refers to samples as received. SOCOTEC UK Ltd takes no responsibility for accuracy or competence of sampling by others.

Results within this report relate only to the samples tested.

The accreditation codes are as follows:

U = UKAS accredited analysis
M = MCERT accredited analysis
N = Unaccredited analysis

Any accreditation marked with ^ signify results are reported on a dry weight basis of 105° c.

All Air Dried and Ground Samples (ADG) are oven dried at less than 35° c.

This report shall not be reproduced except in full, without written approval of the laboratory.

Opinions and interpretations given are outside the scope of our UKAS accreditation.

Any results marked with * are not covered by our scope of UKAS accreditation. If applicable, further report notes have been added.

Any solid samples where the Major Constituents are not one of the following (Sand, Silt, Clay, Made Ground) are not one of our accredited matrix types.

Any samples marked with a tick in the deviant table is deviant for the specific reason.

Any samples reported as IS, NA, ND mean the following:

IS = Insufficient Sample to complete analysis
NA = Sample is not amenable for the required analysis
ND = Results cannot be determined

Items listed with a 'SUB' method code prefix have been carried out by another SOCOTEC department or by an external subcontracted laboratory. Further information is available upon request.

Our deviating sample report does not include deviancy information for Subcontracted analysis. Please see the report from the subcontracted lab for information regarding any deviancies for this analysis.

Summaries of analysis methods are available upon request.

End of Certificate of Analysis



COMPLEX CHALLENGES ...
MADE SIMPLE

APPENDIX D – GEOTECHNICAL TESTING RESULTS

INDEX PROPERTIES - SUMMARY OF RESULTS

Hole No.	Sample				Soil Description	ρ	ρ_d	W	< 425 μm sieve	W_L	W_P	I_P	$I_P\#$	$I_P\#$	ρ_s	Remarks
	No.	Depth (m)		type												
		from	to													
						Mg/m ³		%		%	%	%	Penetration mm	Correlation	Mg/m ³	
RBH301		3.10		D	Brown slightly gravelly sandy CLAY			12.0	94 h	27 a ▲	12	15				
RBH301		4.60	4.70	D	Brown slightly sandy slightly gravelly CLAY. Gravel is mudstone			13.9	90 h	27 a ▲	18	9				
RBH302		1.00	1.20	D	Brown slightly sandy slightly gravelly CLAY			15.1	95 h	20 a ▲	14	6				
RBH302		1.20	1.65	U	Brown slightly sandy slightly gravelly CLAY				95 h	23 a ▲	12	11				
RBH302		2.00		D	Brown slightly sandy slightly gravelly CLAY. Gravel is mudstone			12.4	87 h	29 a ▲	17	12				
WS301		2.00		D	Brown slightly sandy slightly gravelly CLAY			13.4	89 n	23 a ▲	11	12				
WS302		3.30	3.50	D	Brown slightly sandy slightly gravelly CALY			11.0	93 h	21 a ▲	12	9				
WS303		2.00		D	Brown slightly sandy slightly gravelly CLAY.			12.9	92 h	22 a ▲	12	10				
WS305		1.20	1.45	D	Brown slightly sandy slightly gravelly CLAY.			13.9	86 h	23 a ▲	12	11				

General notes: All above tests carried out to BS EN ISO 17892 unless annotated otherwise. Cone type used 80g / 30 degrees. See Remarks for further details

Key : p bulk density, linear

p_d dry density

w water content

▼ Water content decreased

▲ Water content increased

a 4 point cone test

b 1 point cone test

I_p Plasticity Index

$I_p \#$ Plasticity Index 1 point test

o oven dried prior to testing

W_P Plastic limit

W_L Liquid limit

NP non - plastic

* test carried out to BS1377 1990

d Deviation to standard, minimum mass requirement not achieved

<425um preparation

n from natural soil

s sieved specimen

ρ_s particle density

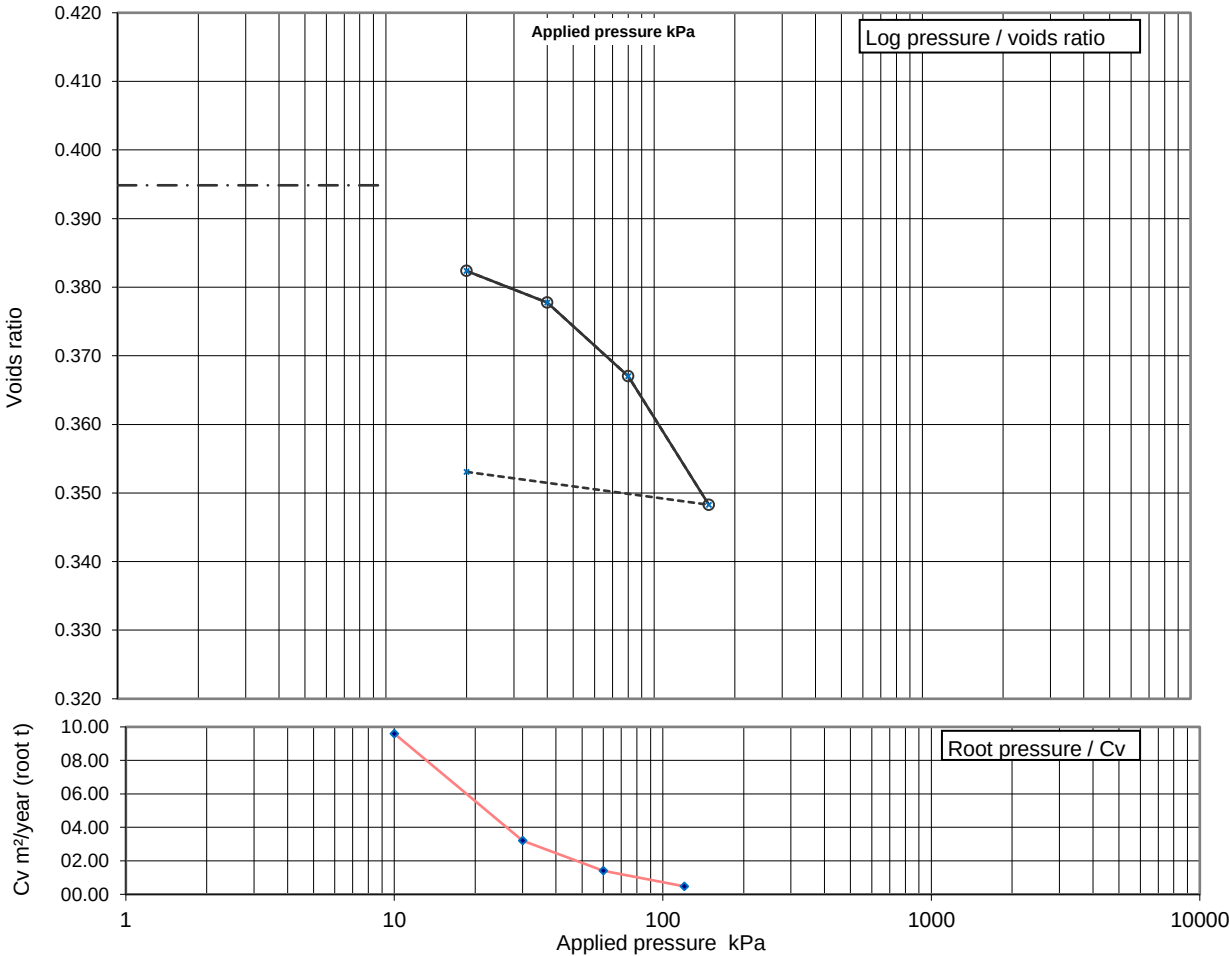
-g = gas jar BS1377 2022 Part 9.2

-p = small pyknometer

h removed by hand

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Table with sample details: Sample ID (SOCO202411070), Hole No (RBH302), Sample Depth (1.20 - 1.65), Sample Type and No (U), Specimen Ref.



Soil description

Table with soil description: Firm brown slightly sandy gravelly CLAY. Undisturbed. Liquid limit %, Plastic limit %.

Preparation

Index properties

(if available)

Specimen details

Particle density

Diameter

Height

Voids ratio

Water content

Bulk density

Dry density

Saturation

Average temperature for test

Swelling pressure

Notes :

Table with specimen details: Initial/Final values for particle density, diameter, height, voids ratio, water content, bulk density, dry density, saturation, and average temperature.

Table with test results: Applied Pressure (kPa), Voids ratio, mv (m2/MN), cv (t50, log) (m2/year), cv (t90, root) (m2/year).

Specimen taken 10 mm from base of sample

QA Ref SLR 5.3 Rev 2.22 Feb 19



0001



Project No N4003-24
Project Name Plot H5 Manchester Airport

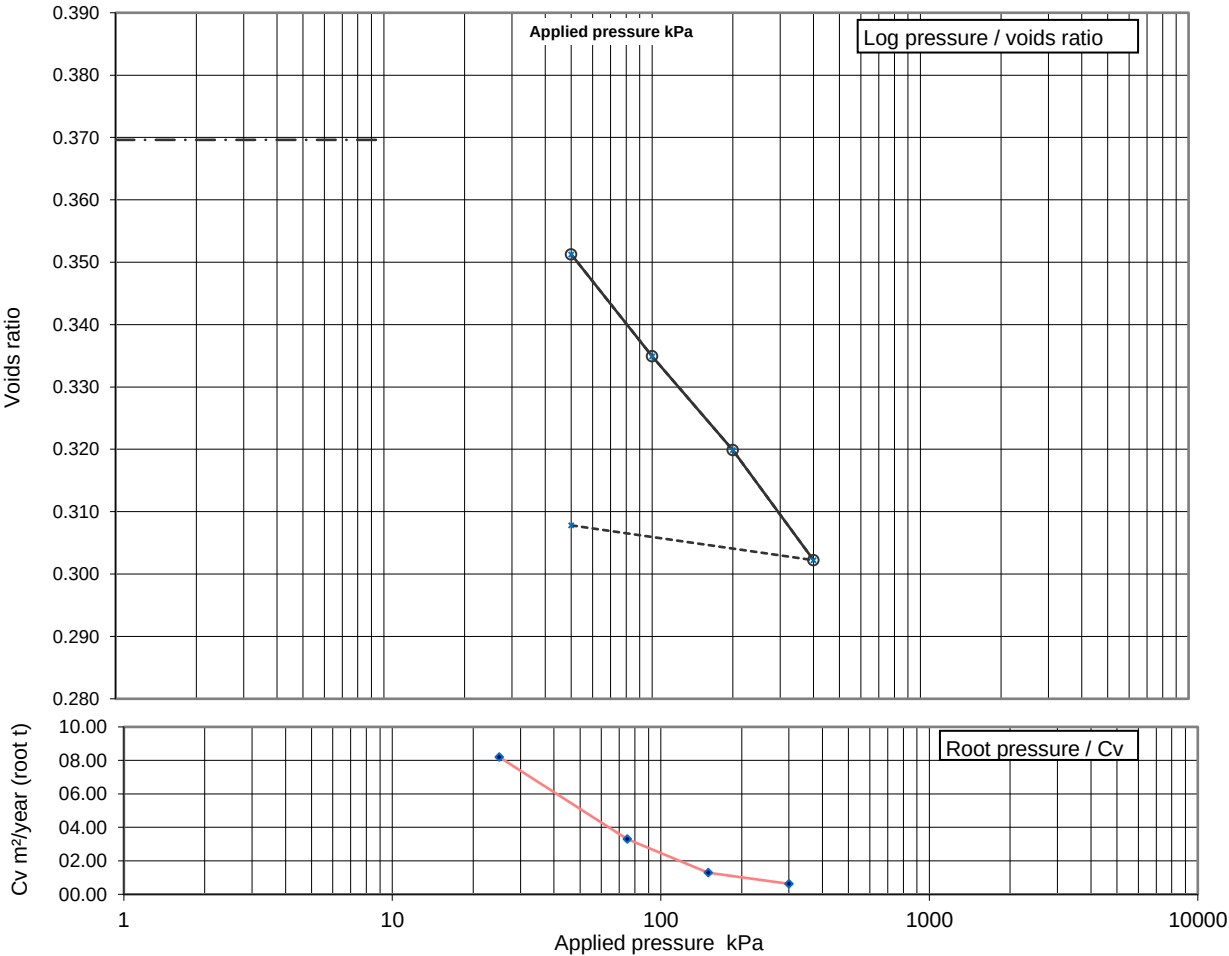
The results reported relate only to the samples tested; opinions and interpretations expressed herein are outside the scope of UKAS accreditation. © Copyright 2019 SOCOTEC UK Limited

Figure OED

Printed: 06/12/2024 08:08

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Table with sample details: SAMPLE ID: SOCO202411071, Hole No: RBH302, Sample Depth (m BGL): 1.65 - 2.10, Sample Type and No: U, Specimen Ref.



Soil description

Table with soil description: Firm brown slightly sandy gravelly CLAY. Undisturbed. Liquid limit %, Plastic limit %.

Preparation

Index properties

(if available)

Specimen details

Particle density

Diameter

Height

Voids ratio

Water content

Bulk density

Dry density

Saturation

Average temperature for test

Swelling pressure

Notes :

Table with specimen details: Initial/Final values for particle density, diameter, height, water content, bulk density, dry density, saturation, and average temperature.

Table with consolidation data: Applied Pressure kPa, Voids ratio, mv m2/MN, cv (t50, log) m2/year, cv (t90, root) m2/year.

Specimen taken 10 mm from base of sample

QA Ref
SLR 5.3
Rev 2.22
Feb 19



Project No N4003-24
Project Name Plot H5 Manchester Airport

The results reported relate only to the samples tested; opinions and interpretations expressed herein are outside the scope of UKAS accreditation. © Copyright 2019 SOCOTEC UK Limited

Figure
OED

Printed:
06/12/2024 08:08

Point Load Index Test
ISRM 2007, pg 121 Suggested method for determining point load strength

All specimens tested at as received water content unless shown otherwise

Test Type

D - Diametral, A - Axial, I - Irregular Lump, B - Block

Direction (U = unknown or random)

L - parallel to planes of weakness

P - perpendicular to planes of weakness

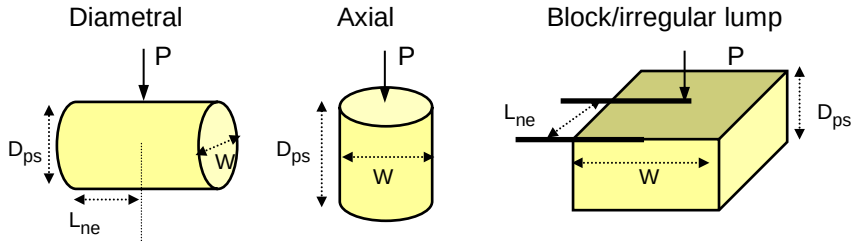
Dimensions

Dps - Distance between platens (platen separation)

Dps' - at failure

Lne - Length from platens to nearest free end

W - Width of shortest dimension perpendicular to load, P



Borehole	Depth, m	Sample Ref	Sample Type	Specimen Ref	Specimen Depth	Rock type	Test Type see ISRM Fig 5 and 8		Failure Valid (Y/N)	Dimensions				LOAD P kN	De equivalent diameter, mm	Point Load Index MPa F = (De/50)0.45		Remarks
							Type (D, A, I, B)	Direction (L, P or U)		Lne mm	W mm	Dps mm	Dps' mm			Is	Is(50)	
RBH301	5.10		C			MUDSTONE	A	P	Y		89.6	62.0	37.0	0.50	64.97	0.12	0.13	
RBH301	6.20		C			SILTSTONE	A	P	Y		86.4	49.0	43.0	0.10	68.78	0.02	0.02	
RBH301	6.86		C			SILTSTONE	A	P	Y		89.1	48.0	37.0	4.80	64.77	1.14	1.29	
RBH301	8.70		C			MUDSTONE	A	P	Y		88.2	26.0	20.0	0.10	47.40	0.04	0.04	
RBH301	9.82		C			SILTSTONE	A	P	Y		84.8	62.0	37.0	1.60	63.19	0.40	0.45	
RBH301	12.48		C			SILTSTONE	A	P	Y		90.3	17.0	15.0	1.80	41.52	1.04	0.96	
RBH301	14.09		C			SILTSTONE	A	P	Y		88.2	39.0	33.0	3.60	60.89	0.97	1.06	
RBH301	14.80		C			MUDSTONE	A	P	Y		91.6	22.0	19.0	1.00	47.06	0.45	0.44	
RBH301	15.64		C			SILTSTONE	A	P	Y		89.5	37.0	34.0	2.00	62.26	0.52	0.57	
RBH301	16.35		C			MUDSTONE	A	P	Y		86.1	45.0	27.0	1.50	54.39	0.51	0.53	
RBH301	17.05		C			MUDSTONE	A	P	Y		90.1	27.0	21.0	1.50	49.08	0.62	0.62	
RBH301	17.33		C			SILTSTONE	A	P	Y		89.0	40.0	32.0	1.10	60.20	0.30	0.33	

Test method notes: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007, p123

QA Ref ISRM 85 Rev 2.12 Aug 17	 0001		Project No	N4003-24	Figure PLT
			Project Name	Plot H5 Manchester Airport	
			The results reported relate only to the samples tested; opinions and interpretations expressed herein are outside the scope of UKAS accreditation. © Copyright 2017 SOCOTEC UK Limited		Sheet Printed 06/12/2024 08:09

Point Load Index Test
ISRM 2007, pg 121 Suggested method for determining point load strength

All specimens tested at as received water content unless shown otherwise

Test Type

D - Diametral, A - Axial, I - Irregular Lump, B - Block

Direction (U = unknown or random)

L - parallel to planes of weakness

P - perpendicular to planes of weakness

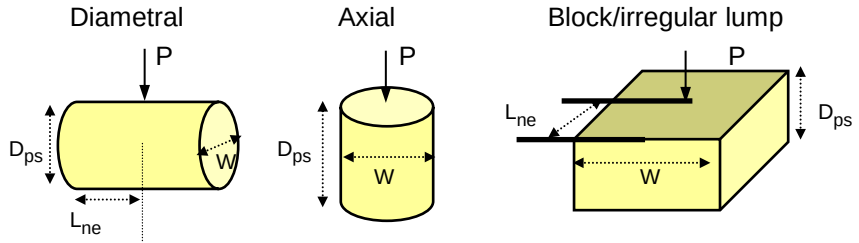
Dimensions

Dps - Distance between platens (platen separation)

Dps' - at failure

Lne - Length from platens to nearest free end

W - Width of shortest dimension perpendicular to load, P



Borehole	Depth, m	Sample Ref	Sample Type	Specimen Ref	Specimen Depth	Rock type	Test Type see ISRM Fig 5 and 8		Failure Valid (Y/N)	Dimensions				LOAD P kN	De equivalent diameter, mm	Point Load Index MPa F = (De/50)0.45		Remarks
							Type (D, A, I, B)	Direction (L, P or U)		Lne mm	W mm	Dps mm	Dps' mm			Is	Is(50)	
RBH301	18.06		C			SILTSTONE	A	P	Y		89.8	23.0	12.0	0.80	37.04	0.58	0.51	
RBH301	18.94		C			SILTSTONE	A	P	Y		89.1	27.0	22.0	2.90	49.95	1.16	1.16	
RBH302	4.10		C			SILTSTONE	A	P	Y		93.0	18.0	22.0	0.10	51.04	0.04	0.04	
RBH302	5.36		C			MUDSTONE	A	P	Y		87.0	40.0	32.0	0.70	59.52	0.20	0.21	
RBH302	6.21		C			MUDSTONE	A	P	Y		88.9	30.0	26.0	0.30	54.26	0.10	0.11	
RBH302	7.70		C			MUDSTONE	A	P	Y		89+6	54.0	40.0	0.20				
RBH302	8.40		C			MUDSTONE	A	P	Y		91.4	46.0	35.0	0.60	63.81	0.15	0.16	
RBH302	9.55		C			MUDSTONE	A	P	Y		89.7	25.0	19.0	0.10	46.59	0.05	0.04	
RBH302	10.45		C			SILTSTONE	A	P	Y		87.9	40.0	36.0	4.10	63.46	1.02	1.13	
RBH302	11.60		C			MUDSTONE	A	P	Y		89.6	37.0	20.0	1.20	47.78	0.53	0.52	
RBH302	12.05		C			MUDSTONE	A	P	Y		90.4	42.0	38.0	0.10	66.14	0.02	0.03	
RBH302	12.50		C			SILTSTONE	A	P	Y		89.2	27.0	23.0	2.90	51.12	1.11	1.12	

Test method notes: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007, p123

QA Ref
ISRM 85
Rev 2.12
Aug 17

0001

Project No
N4003-24

Project Name
Plot H5 Manchester Airport

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Figure
PLT

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Point Load Index Test
ISRM 2007, pg 121 Suggested method for determining point load strength

All specimens tested at as received water content unless shown otherwise

Test Type

D - Diametral, A - Axial, I - Irregular Lump, B - Block

Direction (U = unknown or random)

L - parallel to planes of weakness

P - perpendicular to planes of weakness

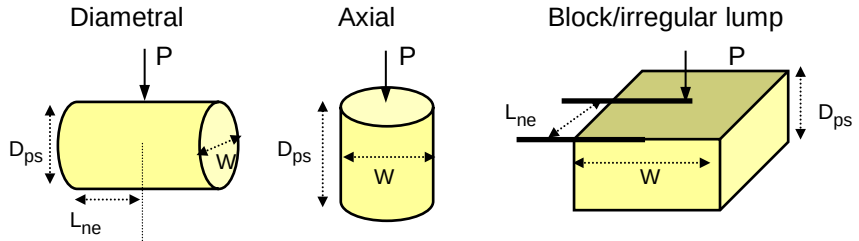
Dimensions

Dps - Distance between platens (platen separation)

Dps' - at failure

Lne - Length from platens to nearest free end

W - Width of shortest dimension perpendicular to load, P



Borehole	Depth, m	Sample Ref	Sample Type	Specimen Ref	Specimen Depth	Rock type	Test Type see ISRM Fig 5 and 8		Failure Valid (Y/N)	Dimensions				LOAD P kN	De equivalent diameter, mm	Point Load Index MPa F = (De/50)0.45		Remarks
							Type (D, A, I, B)	Direction (L, P or U)		Lne mm	W mm	Dps mm	Dps' mm			Is	Is(50)	
RBH302	13.00		C			SILTSTONE	A	P	Y		90.3	29.0	25.0	3.50	53.60	1.22	1.26	
RBH302	13.74		C			SILTSTONE	A	P	Y		88.9	44.0	38.0	4.00	65.58	0.93	1.05	
RBH302	14.79		C			MUDSTONE	A	P	Y		90.8	68.0	43.0	2.10	70.52	0.42	0.49	
RBH302	16.59		C			SILTSTONE	A	P	Y		89.0	27.0	9.0	3.10	31.93	3.04	2.49	
RBH302	17.34		C			SILTSTONE	A	P	Y		89.5	32.0	31.0	1.20	59.42	0.34	0.37	
RBH302	19.35		C			MUDSTONE	A	P	Y		89.7	49.0	30.0	1.10	58.53	0.32	0.34	

Test method notes: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007, p123

QA Ref
ISRM 85
Rev 2.12
Aug 17

0001

Project No
N4003-24

Project Name
Plot H5 Manchester Airport

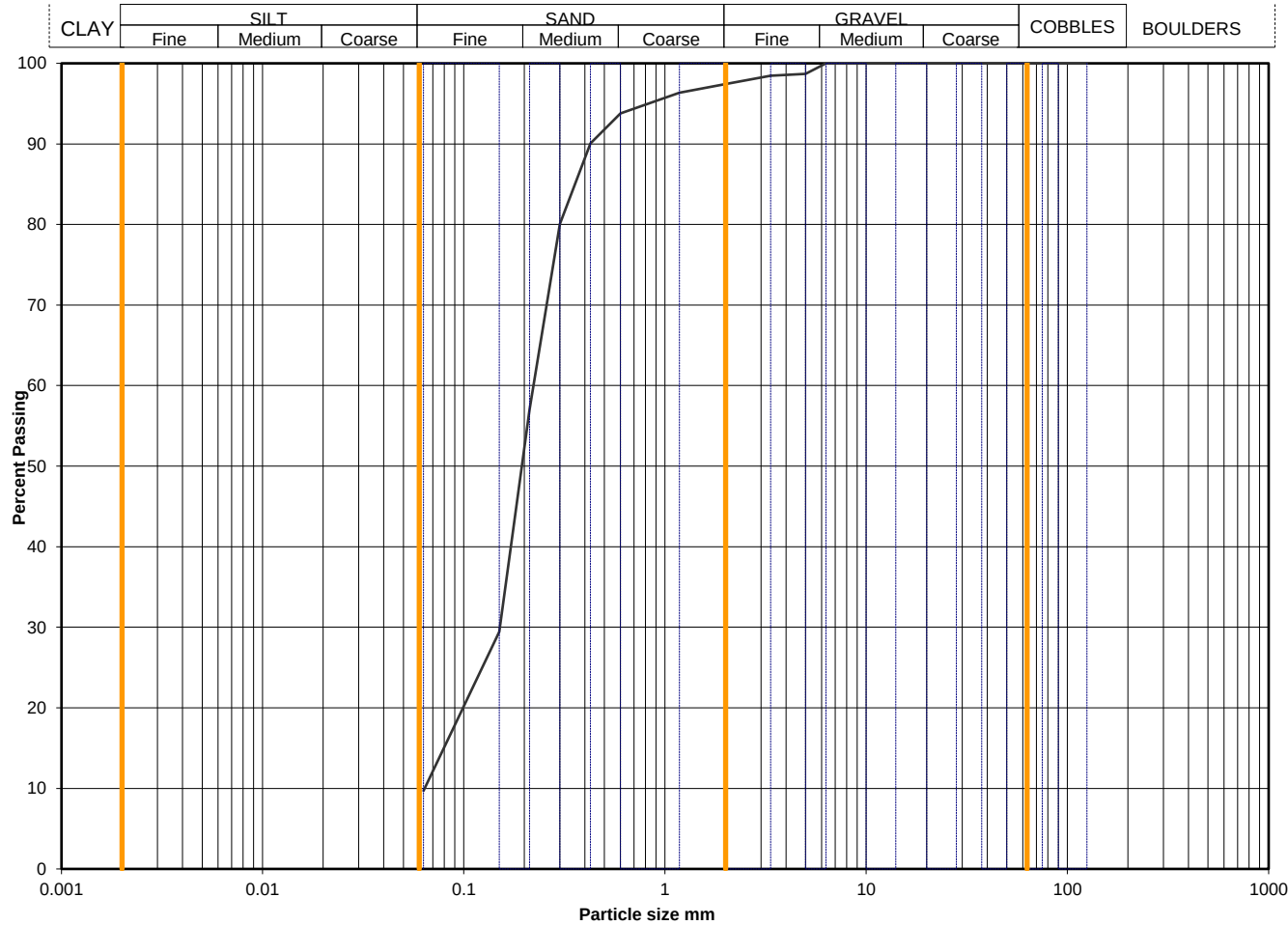
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Figure
PLT

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Particle Size Distribution Analysis

Sample Details:	SAMPLE ID:	Hole No	RBH301
	SOCO2024110734	Sample Depth (m BGL)	2.20 - 3.00
		Sample Type and No	B
		Specimen Ref	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	99		
3.35	98		
2	97		
1.18	96		
0.6	94		
0.425	90		
0.3	80		
0.212	57		
0.15	29		
0.063	10		

Dry mass of sample, kg	
9.3	

Soil description	Brown slightly gravelly silty SAND
Preparation / Pretreatment	Sieve: natural material
Remarks	

Sample Proportions	Cobbles / boulders Gravel Sand Silt Clay	Whole	*<63mm
		0	0
		3	3
		88	88
		silt+clay =	
		10	10
*<63mm values to aid description only			

Uniformity Coefficient		D60 / D10	4
Test Method	BS EN ISO 17892-4		
	Sieving	5.2	wet sieve
	Sedimentation		none

QA Ref
SLR 2,9
Rev 2.23
Jul 17



Project No N4003-24
Project Name Plot H5 Manchester Airport

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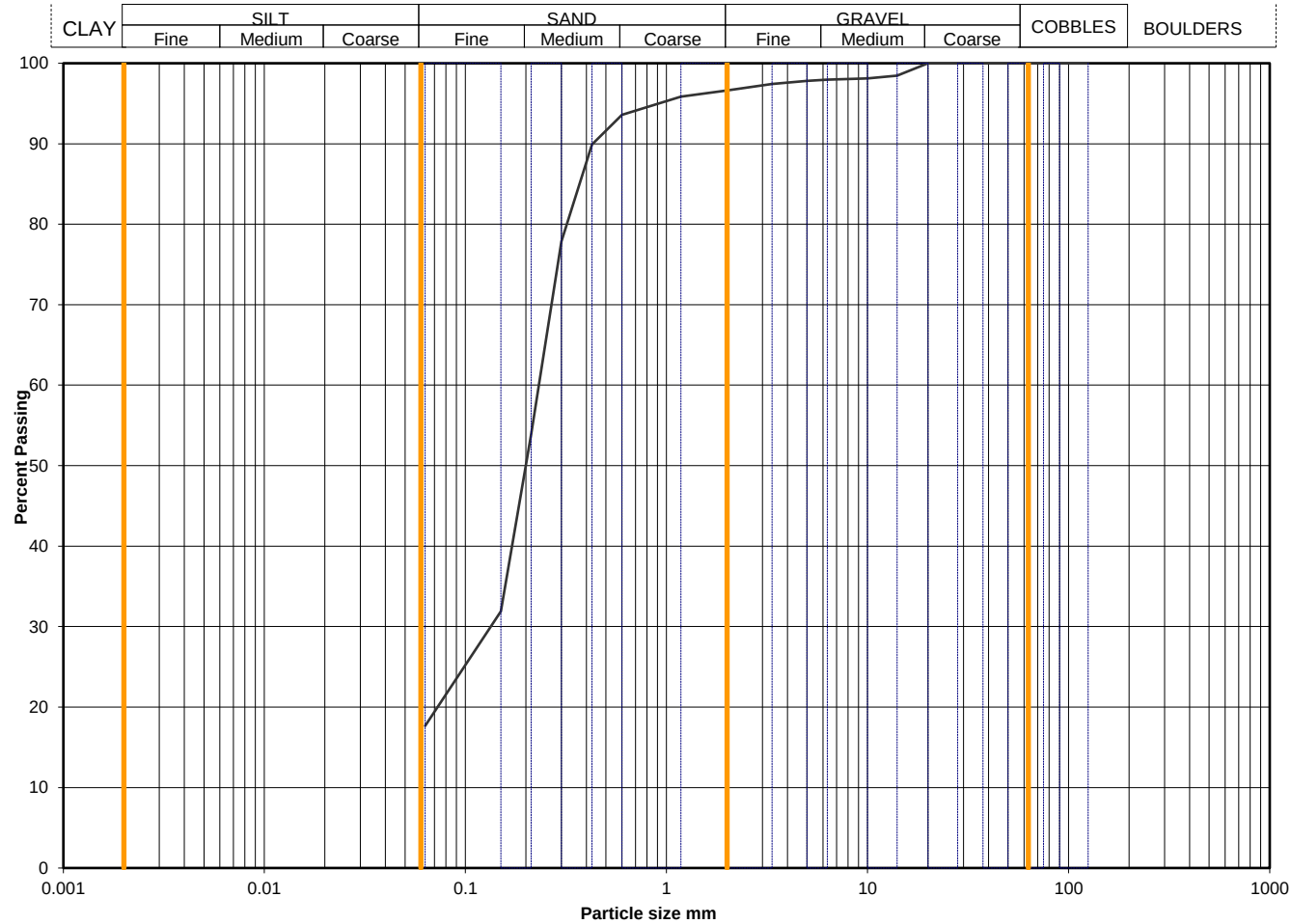
Figure

PSD

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Particle Size Distribution Analysis

Sample Details:	SAMPLE ID:	Hole No	WS301
	SOCO2024110737	Sample Depth (m BGL)	0.60 - 1.60
		Sample Type and No	B
		Specimen Ref	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	98		
10	98		
6.3	98		
5	98		
3.35	97		
2	97		
1.18	96		
0.6	94		
0.425	90		
0.3	78		
0.212	54		
0.15	32		
0.063	18		

Dry mass of sample, kg	
11.4	

Soil description	Brown slightly gravelly SAND with many pockets of clay
Preparation / Pretreatment	Sieve: natural material
Remarks	

Sample Proportions	Cobbles / boulders Gravel Sand Silt Clay	Whole	*<63mm
		0	0
		3	3
		79	79
		silt+clay =	
		18	18
*<63mm values to aid description only			

Uniformity Coefficient		D60 / D10	Not applicable
Test Method	BS EN ISO 17892-4		
	Sieving	5.2	wet sieve
	Sedimentation		none

QA Ref
SLR 2,9
Rev 2.23
Jul 17



Project No N4003-24
Project Name Plot H5 Manchester Airport

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Figure

PSD

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Legend	UU - single stage test (single and multiple specimens)	σ_3	Cell pressure	Mode of failure ;	B - Brittle
	UUM - Multistage test on a single specimen	$\sigma_1 - \sigma_3$	Maximum corrected deviator stress		P - Plastic
	suffix R - remoulded or recompacted	c_u	Undrained shear strength, $\frac{1}{2}(\sigma_1 - \sigma_3)$		C - Compound

UU SUM

Uniaxial Compressive Strength Of Rock - Summary of Results

Hole No.	Sample				Rock Type	Specimen Dimensions ²			Bulk Density ² Mg/m ³	Water Content ¹ %	Uniaxial Compression ³				Remarks
	No.	Depth (m)		type		Dia. mm	Height mm	H/D			Stress Rate MPa/s	Time to failure secs	Mode of failure	UCS MPa	
		from	to												
RBH301		15.06	15.39	C	SILTSTONE	88.8	178.3	2.0	2.45	6.9	0.0	416	fragmented	12.1	Outside ISRM Specification.

Notes :

Test Specification : International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

1 ISRM p87 test 1, water content at 105 ± 3 °C, specimen as received at the laboratory

2 ISRM p86 clause (vii), Caliper method used for determination of bulk volume and derivation of bulk density

3 ISRM p153 part 1, determination of Uniaxial Compressive Strength (UCS) of Rock Materials

above notes apply unless annotated otherwise in the remarks

Mode of failure :

S - Single shear

MS - multiple shear

AC - Axial cleavage

F - Fragmented

QA Ref
RLR 2
Rev 2.19
Apr 19



SOCOTEC

Project No

N4003-24

Project Name

Plot H5 Manchester Airport

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Figure

RUCS

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COMPLEX CHALLENGES ...
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APPENDIX E – GROUND GAS / WATER MONITORING RESULTS

 Civil, Structural & Environmental Engineers Commercial Wharf, 6 Commercial St, MCR, M15 4PZ	Job No:	4700	Site:	Plot H5 Manchester Airport
	Date:	31/10/2024	Client:	MAG Property
	Engineer:	PN	Equipment:	GA5000 - G503222

	2 Days Prior	1 Day Prior	On day of Monitoring
Weather Conditions:	Cloudy	Cloudy	Raining
Barometric Pressure Trend:	Rising	Falling	Falling
Surface Ground Conditions:	Wet		

VISIT ONE	Start	Finish
Time:	1000	1233
Barometric Pressure:	1017	1017
Background Oxygen:	20.9	21.0

Monitoring Point	Gas Concentration												Groundwater			Remarks
	Flow Rate (l/h)	Peak					Flow Rate (l/h)	Steady					Depth to Water	Depth to Base	Head of water	
BH N°		CH ₄ %	CO ₂ %	O ₂ %	LEL %	H2S/C O (ppm)		CH ₄ %	CO ₂ %	O ₂ %	LEL %	H2S/CO (ppm)				
WS301	0	0	0.5	18.6	0	0/0	0	0	0.2	20.4	0	0/0	1.15	1.84	0.69	
WS302	0	0.4	2.4	1.9	8	0/1	0	0.4	2.4	1.9	8	0/0	1.23	2.56	1.33	
WS304	0	0	0.7	16.4	0	0/221	0	0	0.7	18	0	0/7	0.86	2.94	2.08	
WS305	2.2	0	1.7	19.6	0	0/29	0.2	0	1	20.3	0	0/5	0.94	2.11	1.17	
RBH301	0	0	0.2	20.3	0	1/398	0	0	0.1	20.4	0	0/343	2.71	10.77	8.06	
RBH302	0	0	1.7	18.5	0	>>>/1	0	0	1.7	18.5	0	>>>/1	4.20	11.60	7.40	

Comments:

 <p>Civil, Structural & Environmental Engineers</p> <p>Commercial Wharf, 6 Commercial St, MCR, M15 4PZ</p>	Job No:	4700	Site:	Plot H5 Manchester Airport
	Date:	07/11/2024	Client:	MAG Property
	Engineer:	PN	Equipment:	GA5000 - G503222

	2 Days Prior	1 Day Prior	On day of Monitoring
Weather Conditions:	Cloudy	Cloudy	Overcast
Barometric Pressure Trend:	Rising	Rising	Falling
Surface Ground Conditions:	Dry		

VISIT TWO	Start	Finish
Time:	0812	1028
Barometric Pressure:	1015	1020
Background Oxygen:	20.8	20.8

Monitoring Point	Gas Concentration												Groundwater			Remarks
	Flow Rate (l/h)	Peak						Flow Rate (l/h)	Steady						Depth to Water	
CH ₄ %		CO ₂ %	O ₂ %	LEL %	H ₂ S/C O (ppm)	CH ₄ %	CO ₂ %		O ₂ %	LEL %	H ₂ S/C O (ppm)					
WS301	0	0	1.7	13.9	0	0/0	0	0	1.6	14	0	0/0	1.2	1.79	0.59	
WS302	-0.1	0.2	2	0	4	0/1	-0.1	0.2	2	0	4	0/1	1.33	2.56	1.23	
WS304	0	0	1.6	17.9	0	0/0	0	0	1.6	17.9	0	0/0	0.88	2.94	2.06	
WS305	0	0	1.9	19.3	0	0/0	0	0	1.5	19.6	0	0/0	1.39	2.11	0.72	
RBH301	0	0	1	18.3	0	>>>/4	0	0	1	18.3	0	>>>/4	2.84	11.15	8.31	
RBH302	0	0	1	16.8	0	0/1	0	0	1	18.9	0	0/0	4.29	11.58	7.29	

Comments:

 <p>Civil, Structural & Environmental Engineers</p> <p>Commercial Wharf, 6 Commercial St, MCR, M15 4PZ</p>	Job No:	4700	Site:	Plot H5 Manchester Airport
	Date:	14/11/2024	Client:	MAG Property
	Engineer:	PN	Equipment:	GA5000 - G503222

	2 Days Prior	1 Day Prior	On day of Monitoring
Weather Conditions:	Sunny	Cloudy	Sunny
Barometric Pressure Trend:	Falling	Falling	Falling
Surface Ground Conditions:	Wet		

VISIT THREE	Start	Finish
Time:	0908	1018
Barometric Pressure:	1023	1024
Background Oxygen:	20.9	20.6

Monitoring Point	Gas Concentration												Groundwater			Remarks
	Flow Rate (l/h)	Peak						Flow Rate (l/h)	Steady					Depth to Water	Depth to Base	
BH N°		CH ₄ %	CO ₂ %	O ₂ %	LEL %	H ₂ S/C O (ppm)	CH ₄ %		CO ₂ %	O ₂ %	LEL %	H ₂ S/C O (ppm)				
WS301	0	0	2.3	8.9	0	0/0	0	0	0	1.9	0	0/0	1.29	1.79	0.5	
WS302	-0.1	0	1.5	0	0	0/0	-0.1	0	1.6	0	0	0/0	1.35	2.56	1.21	
WS304	0	0	1.9	17.3	0	0/0	0	0	1.8	17.3	0	0/0	1.94	2.95	1.01	
WS305	0	0	2.4	18.8	0	0/0	0	0	1.9	19.3	0	0/0	1.69	2.11	0.42	
RBH301	1.6	0	1.6	11.1	9	0/2	1.5	0	1.6	11.1	0	0/2	3.1	11.07	7.97	
RBH302	0	0	1.7	15.7	9	0/2	0	0	0.8	19.3	0	0/0	4.35	11.53	7.18	

Comments:

 <p>Civil, Structural & Environmental Engineers</p> <p>Commercial Wharf, 6 Commercial St, MCR, M15 4PZ</p>	Job No:	4700	Site:	Plot H5 Manchester Airport
	Date:	22/11/2024	Client:	MAG Property
	Engineer:	PN	Equipment:	GA5000 - G503222

	2 Days Prior	1 Day Prior	On day of Monitoring
Weather Conditions:	Sunny	Sunny	Raining
Barometric Pressure Trend:	Rising	Falling	Rising
Surface Ground Conditions:	Wet		

VISIT FOUR	Start	Finish
Time:	1026	1139
Barometric Pressure:	997	997
Background Oxygen:	20.8	21

Monitoring Point	Gas Concentration												Groundwater			Remarks
	Flow Rate (l/h)	Peak						Flow Rate (l/h)	Steady					Depth to Water	Depth to Base	
CH ₄ %		CO ₂ %	O ₂ %	LEL %	H ₂ S/C O (ppm)	CH ₄ %	CO ₂ %		O ₂ %	LEL %	H ₂ S/C O (ppm)					
WS301	-0.1	0	2.6	4.6	0	0/0	-0.1	0	1.9	10.9	0	0/0	1.27	1.78	0.51	
WS302	-0.2	0.1	1.1	0	2	0/1	-0.2	0.1	1.1	0	2	0/0	1.27	2.55	1.28	
WS304	0	0	2.2	16.7	0	0/2	0	0	2.1	17.1	0	0/0	1.94	2.94	1	
WS305	10.1	0	1.8	19.4	0	0/1	2.3	0	0.9	21	0	0/0	0.91	2.11	1.2	
RBH301	-2.7	0.1	1.9	9.1	2	0/3	-0.2	0.1	1.9	9.1	2	0/2	3.1	10.99	7.89	
RBH302	0.3	0	1.6	14.3	0	0/4	0/3	0	0/5	19.8	0	0/1	4.38	11.5	7.12	

Comments:

 <p>Civil, Structural & Environmental Engineers</p> <p>Commercial Wharf, 6 Commercial St, MCR, M15 4PZ</p>	Job No:	4700	Site:	Plot H5 Manchester Airport
	Date:	29/11/2024	Client:	MAG Property
	Engineer:	PN	Equipment:	GA5000 - G503222

	2 Days Prior	1 Day Prior	On day of Monitoring
Weather Conditions:	Sunny	Sunny	Overcast
Barometric Pressure Trend:	Rising	Fluctuating	Falling
Surface Ground Conditions:	Wet		

VISIT FIVE	Start	Finish
Time:	0908	1026
Barometric Pressure:	1013	1013
Background Oxygen:	20.8	20.7

Monitoring Point	Gas Concentration												Groundwater			Remarks
	Flow Rate (l/h)	Peak						Flow Rate (l/h)	Steady					Depth to Water	Depth to Base	
CH ₄ %		CO ₂ %	O ₂ %	LEL %	H ₂ S/C O (ppm)	CH ₄ %	CO ₂ %		O ₂ %	LEL %	H ₂ S/C O (ppm)					
WS301	1.5	0	0.4	16.2	0	0/29	0.8	0	0.3	17.9	0	0/14	1.08	1.76	0.68	
WS302	0.3	0.1	1.5	0	2	0/1	0.3	0.1	1.5	0	2	0/0	1.27	2.54	1.27	
WS304	0.1	0	2.1	17.1	0	0/0	0.1	0	2.1	17.4	0	0/0	1.94	2.95	1.01	
WS305	-0.3	0	0.6	20.2	0	0/2	-0.3	0	0.5	20.6	0	0/0	0.92	2.12	1.2	
RBH301	4.8	0	1.6	10.9	0	0/2	0.4	0	1.6	11.1	0	0/2	2.75	10.96	8.21	
RBH302	0.1	0	1.6	1.7.3	0	0/1	0.1	0	0.3	20.9	0	0/0	4.23	11.46	7.23	

Comments:

 <p>Civil, Structural & Environmental Engineers</p> <p>Commercial Wharf, 6 Commercial St, MCR, M15 4PZ</p>	Job No:	4700	Site:	Plot H5 Manchester Airport
	Date:	06/12/2024	Client:	MAG Property
	Engineer:	PN	Equipment:	GA5000 - G503222

	2 Days Prior	1 Day Prior	On day of Monitoring
Weather Conditions:	Raining	Raining	Overcast
Barometric Pressure Trend:	Falling	Falling	Falling
Surface Ground Conditions:	Wet		

VISIT SIX	Start	Finish
Time:	0740	0900
Barometric Pressure:	1006	1006
Background Oxygen:	20.9	21.0

Monitoring Point	Gas Concentration												Groundwater			Remarks
	Flow Rate (l/h)	Peak						Flow Rate (l/h)	Steady					Depth to Water	Depth to Base	
CH ₄ %		CO ₂ %	O ₂ %	LEL %	H ₂ S/C O (ppm)	CH ₄ %	CO ₂ %		O ₂ %	LEL %	H ₂ S/C O (ppm)					
WS301	-2.4	0	0.3	13.9	0	0/2	-0.1	0	0.1	17.3	9	0/1	0.88	1.77	0.89	
WS302	-1.5	0.1	1.5	0	2	0/1	0.1	0.1	1.5	0	2	0/0	1.17	2.54	1.37	
WS304	0.4	0	2.3	17	0	0/3	0.4	0	2.3	17.1	0	0/0	1.81	2.94	1.13	
WS305	4.8	0	0.5	20.7	0	0/2	1.2	0	0.3	21	0	0/0	0.71	2.12	1.41	
RBH301	-0.7	0	1.3	14.5	0	0/15	0.1	0	1.3	14.5	0	0/5	2.63	10.94	8.31	
RBH302	0.1	0	1.9	15.4	0	0/5	0.1	0	0.3	21.3	0	0/0	4.21	11.49	7.28	

Comments:



COMPLEX CHALLENGES ...
MADE SIMPLE

APPENDIX F – EQUIPMENT CALIBRATION CERTIFICATES

CERTIFICATION OF CALIBRATION



No. 66916



Date Of Calibration: 02-Aug-2024

Certificate Number: G503222_2/36133

Issued by: QED Environmental Systems Inc.

Customer: STRUCTURAL SOILS LIMITED

SPRING LODGE 172 CHESTER ROAD HELSBY FRODSHAM, CHESHIRE WA6 0AR
GB

Description:

Model: GA5000

Serial Number: G503222

Accredited Results:

Methane (CH ₄)		
Certified Gas (%)	Instrument Reading (%)	Uncertainty (%)
5.0	5.0	0.42
15.1	15.2	0.66
60.0	59.7	1.03

Carbon Dioxide (CO ₂)		
Certified Gas (%)	Instrument Reading (%)	Uncertainty (%)
5.0	4.9	0.43
15.0	14.8	0.71
39.9	39.9	1.19

Oxygen (O ₂)		
Certified Gas (%)	Instrument Reading (%)	Uncertainty (%)
20.9	21.0	0.25

Gas cylinders are traceable and details can be provided if requested.

CH₄, CO₂ readings recorded at: 33.1 °C/91.6 °F

Barometric Pressure: 0979 mbar/28.92 "Hg

O₂ readings recorded at: 23.7 °C/74.6 °F

Method of Test : The analyzer is calibrated in a temperature controlled chamber using a series of reference gases, in compliance with procedure ISP17.

Instrument has passed calibration as the measurement result is within the specification limit. The specification limit takes into account the measurement uncertainty.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with NIST requirements.

The calibration results published in this certificate were obtained using equipment capable of producing results that are traceable through NIST to the International System of Units (SI). Certification only applies to results shown. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

Calibration Instance: 118

IGC Instance: 118

Page 1 of 3 | LP015LNANIST-1.1

www.qedenv.com (800) 624-2026 info@qedenv.com

QED Environmental Systems Inc. 2355 Bishop Circle West, Dexter, MI 48130

CERTIFICATION OF CALIBRATION



No. 66916



Date Of Calibration: 02-Aug-2024

Certificate Number: G503222_2/36133

Issued by: QED Environmental Systems Inc.

Non Accredited results:

Pressure Transducers (inches of water column)					
Transducer	Certified (Low)	Reading (Low)	Certified (High)	Reading (High)	Accuracy
Relative	0"	0"	40"	40.44"	2.0"

Barometer (mbar)	
Reference	Instrument Reading
0979 mbar / 28.92 "Hg	0979 mbar / 28.92 "Hg

Additional Gas Cells		
Gas	Certified Gas (ppm)	Instrument Reading (ppm)
CO	500	50
H ₂ S	49.80	50

Internal Flow	
Applied	Measured
25	25..2
10	10.1
5	5.0

As received gas check readings are only recorded if the instrument is received in a working condition.
Where the instrument is received damaged no reading can be taken.

Date of Issue : 05 Aug 2024

Approved By Signatory

Linda Ostrowski
Laboratory Inspection

The calibration results published in this certificate were obtained using equipment capable of producing results that are traceable through NIST to the International System of Units (SI). Certification only applies to results shown. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

Calibration Instance: 118

IGC Instance: 118

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APPENDIX G – RSK GACS

Generic assessment criteria for human health: commercial scenario for volatile contaminants in soils at depths >0.3m bgl

Background

RSK's generic assessment criteria (GAC) were initially prepared following the publication by the Environment Agency (EA) of soil guideline value (SGV) and toxicological (TOX) reports, and associated publications in 2009⁽¹⁾. RSK GAC were updated following the publication of GAC by LQM/CIEH in 2009⁽²⁾. RSK GAC are periodically revised when updated information on toxicological, land use or receptor parameters is published.

Updates to the RSK GAC

In 2014, the publication of Category 4 Screening Levels (C4SL)^(3,4), as part of the Defra-funded research project SP1010, included modifications to certain exposure assumptions documented within EA Science Report SC050221/SR3 (herein after referred to as SR3)⁽⁵⁾ used in the generation of SGVs.

C4SL were initially published for six substances (cadmium, arsenic, benzene, benzo(a)pyrene, chromium VI and lead) for a sandy loam soil type with 6% soil organic matter, based on a low level of toxicological concern (LLTC; see Section 2.3 of research project report SP1010⁽³⁾). Further C4SL were published in 2021 for vinyl chloride, tetrachloroethene (PCE) and trichloroethene (TCE). Where a C4SL has been published, the RSK GAC duplicates the C4SL using relevant input parameters within the SP1010 final project report⁽³⁾ and associated chemical specific reports⁽⁶⁾.

For all other substances the C4SL exposure modifications relevant for residential without home-grown produce end use or a commercial end use have been applied to the current RSK GAC for soil borne contaminants at depth, beneath a cover layer.

The RSK GAC have also been revised with updated toxicology published by LQM/CIEH in 2015⁽⁷⁾, where a C4SL has not been published.

Basis for soil GAC >0.3m bgl

Contaminants in soil are typically present throughout the soil profile at a site and GAC, modelled in the Contaminated Land Exposure Assessment (CLEA) tool using default input parameters, assume that soil contamination is uniformly distributed across the site from the surface to a depth of at least one metre.

A cover system, at a site where contamination has been identified, is intended to break the exposure pathways associated with dermal contact, soil and dust ingestion, and soil and dust inhalation. The top 30cm is the actual soil to which human receptors in a residential setting are most likely to be exposed to in garden and soft landscaped areas⁽¹⁴⁾, with receptors in a commercial scenario likely to be exposed to even shallower soil, if at all. The typical minimum depth over a cover system is 30cm (300mm) for a commercial land use.

Consideration needs to be given to the actual depth at which contamination is present, following the placement of a cover system, which incorporates an aggregate break layer or geotextile membrane (or similar). When the above exposure pathways have been broken by the implementation of a cover system or hardstanding, the remaining exposure pathways to soil-borne contaminants are the inhalation of indoor and outdoor vapour. Consequently, GAC have only been derived for a list of common volatile contaminants.

Due to the potential for mixing between soils within the cover system and underlying soils, these GACs are for use on the assumption that there is an aggregate break layer or geotextile membrane (or similar), which remains insitu to prevent soils at depth (i.e. below 30cm) from mixing with shallower soils that form the cover system.

Further to the above, the GAC presented in this document relate to the protection of commercial human health receptors only. If any controlled water receptors are identified in the Conceptual Site Model (CSM) potential risks to these receptors must be assessed separately and suitably protective re-use criteria derived.

RSK GAC derivation

Model selection

Soil assessment criteria (SAC) were calculated using the Contaminated Land Exposure Assessment (CLEA) tool v1.071, supporting EA guidance^(5,8,9) and revised exposure scenarios published for the C4SL⁽³⁾. The SAC are also termed GAC.

Conceptual model – commercial

In accordance with SR3⁽⁵⁾, the commercial scenario considers risks to a female worker who works from the age of 16 to 65 years. It should be noted that this end use is not suitable for a workplace nursery but may be appropriate for a sports centre or shopping centre where children are present.

The pathways considered for production of the SAC for these this scenario, where contaminants are at depth and are beneath a cover layer are:

- inhalation of indoor and outdoor vapours.

With respect to volatilisation, the CLEA model assumes a simple linear partitioning of a chemical in the soil between the sorbed, dissolved and vapour phase⁽⁹⁾. The upper boundaries of this partitioning are represented by the maximum aqueous solubility and pure saturated vapour concentration of the chemical. The CLEA model estimates saturated soil concentrations where these limits are reached⁽⁹⁾. The CLEA software uses a traffic light system to identify when individual and/or combined assessment criteria exceed the lower of either the aqueous- or vapour-based soil saturation limits. Model output cells are flagged red where the saturated soil concentration has been exceeded and the contribution of the indoor and outdoor vapour pathway to total exposure is greater than 10%. In this case, further consideration of the following is required⁽⁹⁾:

- Free phase contamination may be present.
- Exposure from the vapour pathways will be over-predicted by the model, as in reality the vapour phase concentration will not increase at concentrations above saturation limits
- Where the vapour pathway contribution is greater than 90%, it is unlikely the relevant health criteria value (HCV) will be exceeded at soil concentrations at least a factor of ten higher than the relevant HCV.

Where the vapour pathway is the predominant pathway (contributes greater than 90% of exposure) or the only exposure route considered and the cell is highlighted red (SAC exceeds saturation limit), the risk based on the assumed conceptual model is likely to be negligible as the vapour risk is assumed to be tolerable at maximum possible soil concentrations. In such circumstances, the vapour pathway exposure should be considered based on the presence of

free phase or non-aqueous phase liquid sources and the measured concentrations of volatile organic compounds (VOC) in the vapour phase. Screening could be considered based on setting the SAC as the modelled soil saturation limits. However, as stated within the CLEA handbook⁽⁹⁾, this is likely to not be practical in many cases because of the very low saturation limits and, in any case, is highly conservative.

It should also be noted that for mixtures of compounds, free phase may be present where soil (or groundwater) concentrations are well below saturation limits for individual compounds.

Where the vapour pathway is only one of the exposure pathways considered, an additional approach can then be utilised as detailed within Section 4.12 of the CLEA model handbook⁽⁹⁾, which explains how to calculate an effective assessment criterion manually.

SR3⁽⁵⁾ states that, as a general rule of thumb, it is recognised that estimating vapour phase concentrations from dissolved and sorbed phase contamination by petroleum hydrocarbons are at least a factor of ten higher than those likely to be measured on-site. RSK has therefore applied an empirical subsurface to indoor air correction factor of 10 into the CLEA model chemical database for all petroleum hydrocarbon fractions (including BTEX, trimethylbenzenes and the polycyclic aromatic hydrocarbons (PAH) naphthalene, acenaphthene and acenaphthylene) to reduce this conservatism.

Input selection

The most up-to-date published chemical and toxicological data was obtained from EA Report SC050021/SR7⁽¹⁰⁾, the EA TOX⁽¹⁾ reports, the C4SL SP1010 project report and associated chemical specific reports^(3,6), the 2015 LQM/CIEH report⁽⁷⁾ or the USEPA IRIS database⁽¹⁴⁾. Where a LLTC has been published, the RSK GAC has used these input parameters to derive the RSK GAC. Toxicological and specific chemical parameters for 1,2,4-trimethylbenzene, methyl tertiary-butyl ether (MTBE), 1,1,2-trichloroethane, 1,1-dichloroethene, 1,2-dichloropropane, 2-chloronaphthalene, chloroethane, chloromethane, cis 1,2-dichloroethene, dichloromethane, hexachloroethane and trans 1,2-dichloroethene were obtained from the CL:AIRE Soil Generic Assessment Criteria report⁽¹¹⁾.

For TPH, aromatic hydrocarbons C₅–C₈ were not modelled, as this range comprises benzene (>EC5-EC7) and toluene (>EC7-EC8), which are modelled separately.

Physical parameters – commercial

For the commercial end use scenario, the CLEA default pre-1970s three storey office building was used. SR3⁽⁵⁾ notes this commercial building type to be the most conservative in terms of potential for vapour intrusion. The building parameters used in the production of the RSK GACs are the default CLEA inputs presented in Table 3.3 of SR3⁽³⁾.

The parameters for a sandy loam soil type were used in line with Table 4.4 of SR3⁽⁵⁾. This includes a value of 6% for the percentage of soil organic matter (SOM) within the soil. In RSK's experience, this is rather high for many sites. To avoid undertaking site-specific risk assessments for this SOM, RSK has produced an additional set of GAC for SOM of 1% and 2.5% for all substances using the CLEA tool.

Depth to top of source (beneath building) represents the depth from the soil surface to the top of the contamination source beneath the building, used to calculate the soil gas ingress rate if generic rates are not used. This parameter has been set to the CLEA default of 65cm, reflecting 15cm for the foundation slab thickness and 50cm from beneath the building to the top of the contamination source.

The depth to top of source (no building) represents the depth from the soil surface to the top of the contamination source; the default assumption in the CLEA model for a commercial scenario is that soil contamination is uniformly distributed across the site from the surface to depth of at least one metre. This input parameter has been altered to reflect an assumed depth of unimpacted soil to 30cm (300mm). This depth represents the typical minimum depth of a cover system (also known as a capping system), which involves placing an appropriate thickness of suitable subsoil and/or topsoil over areas of a site affected by contamination, underlain by an aggregate break layer or geotextile membrane (or similar).

Summary of modifications to the default CLEA SR3⁽⁵⁾ input parameters – commercial

In summary, the RSK GAC were produced using the default input parameters for soil properties, the air dispersion model and building properties. Modifications to the default SR3⁽⁵⁾ exposure scenarios based on the C4SL exposure scenarios⁽³⁾ are presented in Table 1 below and modification to the default SR3⁽⁵⁾ soil and building data (vapour model) are presented in Table 2 below.

The CLEA model outputs are presented in Table 3 and the final selected GAC are presented in Table 4.

Table 1: Modified receptor data (AC1-AC6 for commercial scenario)

Parameter	Unit	Age class
		17
Inhalation rate	m ³ day ⁻¹	15.7
Justification	Mean value USEPA, 2011 ⁽¹²⁾ ; Table 3.2, SP1010 ⁽³⁾	

Table 2: Modified building parameters (commercial scenario)

Parameter	Unit	Scenario
		Commercial
Depth to top of source (no building)	cm	30
Justification	Typical cover system depth for landscaped areas	

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GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - COMMERCIAL SOILS >0.3m bgl



Table 3

Human health generic assessment criteria by pathway for commercial land use - soils >0.3m bgl

Compound	Notes	SAC appropriate to pathway SOM 1% (mg/kg)			Soil saturation limit (mg/kg)	SAC appropriate to pathway SOM 2.5% (mg/kg)			Soil saturation limit (mg/kg)	SAC appropriate to pathway SOM 6% (mg/kg)			Soil saturation limit (mg/kg)
		Oral	Inhalation	Combined		Oral	Inhalation	Combined		Oral	Inhalation	Combined	
Metals													
Arsenic	(a,b)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Barium	(b)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Boron		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	(a)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Chromium (III) - trivalent	(c)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Chromium (VI) - hexavalent	(a,d)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Copper		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Lead	(a)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Elemental Mercury (Hg ⁰)	(d)	NR	1.74E+01	NR	4.31E+00	NR	4.34E+01	NR	1.07E+01	NR	1.04E+02	NR	2.58E+01
Inorganic Mercury (Hg ²⁺)		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Methyl Mercury (Hg ⁴⁺)		NR	2.20E+03	2.20E+03	7.33E+01	NR	4.12E+03	4.12E+03	1.42E+02	NR	8.30E+03	8.30E+03	3.04E+02
Nickel	(d)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	(b)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Vanadium		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Zinc	(b)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Cyanide (free)		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Volatile Organic Compounds													
Benzene	(a)	NR	2.79E+01	2.79E+01	1.22E+03	NR	5.19E+01	5.19E+01	2.26E+03	NR	1.08E+02	1.08E+02	4.71E+03
Toluene		NR	6.49E+04	6.49E+04	8.69E+02	NR	1.43E+05	1.43E+05	1.92E+03	NR	3.24E+05	3.24E+05	4.36E+03
Ethylbenzene		NR	5.89E+03	5.89E+03	5.18E+02	NR	1.38E+04	1.38E+04	1.22E+03	NR	3.21E+04	3.21E+04	2.84E+03
Xylene - m		NR	6.27E+03	6.27E+03	6.25E+02	NR	1.47E+04	1.47E+04	1.47E+03	NR	3.44E+04	3.44E+04	3.46E+03
Xylene - o		NR	6.74E+03	6.74E+03	4.78E+02	NR	1.57E+04	1.57E+04	1.12E+03	NR	3.66E+04	3.66E+04	2.62E+03
Xylene - p		NR	6.03E+03	6.03E+03	5.76E+02	NR	1.41E+04	1.41E+04	1.35E+03	NR	3.29E+04	3.29E+04	3.17E+03
Total xylene		NR	6.03E+03	6.03E+03	6.25E+02	NR	1.41E+04	1.41E+04	1.47E+03	NR	3.29E+04	3.29E+04	3.46E+03
Methyl tertiary-Butyl ether (MTBE)		NR	7.58E+03	7.58E+03	2.04E+04	NR	1.23E+04	1.23E+04	3.31E+04	NR	2.34E+04	2.34E+04	6.27E+04
1,1,1,2-Tetrachloroethane		NR	1.09E+02	1.09E+02	2.60E+03	NR	2.53E+02	2.53E+02	6.02E+03	NR	5.89E+02	5.89E+02	1.40E+04
1,1,2,2-Tetrachloroethane		NR	2.81E+02	2.81E+02	2.67E+03	NR	5.75E+02	5.75E+02	5.46E+03	NR	1.26E+03	1.26E+03	1.20E+04
1,1,1-Trichloroethane		NR	6.60E+02	6.60E+02	1.43E+03	NR	1.35E+03	1.35E+03	2.92E+03	NR	2.96E+03	2.96E+03	6.39E+03
1,1,2-Trichloroethane		NR	9.02E+01	9.02E+01	4.03E+03	NR	1.84E+02	1.84E+02	8.21E+03	NR	4.02E+02	4.02E+02	1.80E+04
1,1-Dichloroethene		NR	2.43E+01	2.43E+01	2.23E+03	NR	4.30E+01	4.30E+01	3.94E+03	NR	8.68E+01	8.68E+01	7.94E+03
1,2-Dichloroethane		NR	6.73E-01	6.73E-01	3.41E+03	NR	9.71E-01	9.71E-01	4.91E+03	NR	1.67E+00	1.67E+00	8.43E+03
1,2,4-Trimethylbenzene		NR	3.98E+02	NR	4.74E+02	NR	9.69E+02	NR	1.16E+03	NR	2.29E+03	NR	2.76E+03
1,3,5-Trimethylbenzene	(e)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
1,2-Dichloropropane		NR	3.14E+00	3.14E+00	1.19E+03	NR	5.54E+00	5.54E+00	2.11E+03	NR	1.11E+01	1.11E+01	4.24E+03
Carbon Tetrachloride		NR	2.87E+00	2.87E+00	1.52E+03	NR	6.29E+00	6.29E+00	3.32E+03	NR	1.43E+01	1.43E+01	7.54E+03
Chloroethane		NR	9.02E+02	NR	2.61E+03	NR	1.22E+03	NR	3.54E+03	NR	1.97E+03	NR	5.71E+03
Chloromethane		NR	9.54E-01	NR	1.91E+03	NR	1.11E+00	NR	2.24E+03	NR	1.49E+00	NR	2.99E+03
Cis 1,2-Dichloroethene		1.37E+01	NR	NR	3.94E+03	2.29E+01	NR	NR	6.61E+03	4.46E+01	NR	NR	1.29E+04
Dichloromethane		NR	2.63E+02	2.63E+02	7.27E+03	NR	3.50E+02	3.50E+02	9.68E+03	NR	5.53E+02	5.53E+02	1.53E+04
Tetrachloroethene (PCE)		NR	2.45E+01	2.45E+01	4.24E+02	NR	5.49E+01	5.49E+01	9.51E+02	NR	1.26E+02	1.26E+02	2.18E+03
Trans 1,2-Dichloroethene		NR	2.07E+01	NR	3.42E+03	NR	3.74E+01	NR	6.17E+03	NR	7.63E+01	NR	1.26E+04
Trichloroethene (TCE)		7.31E-01	2.59E+00	NR	1.54E+03	1.53E+00	5.43E+00	NR	3.22E+03	3.39E+00	1.20E+01	NR	7.14E+03
Vinyl Chloride (chloroethene)		NR	1.13E+00	1.13E+00	1.36E+03	NR	1.46E+00	1.46E+00	1.76E+03	NR	2.24E+00	2.24E+00	2.69E+03
Semi-Volatile Organic Compounds													
2-Chloronaphthalene		NR	3.73E+02	3.73E+02	1.14E+02	NR	9.16E+02	9.16E+02	2.80E+02	NR	2.18E+03	2.18E+03	6.69E+02
Acenaphthene		NR	3.20E+06	3.20E+06	5.70E+01	NR	7.38E+06	7.38E+06	1.41E+02	NR	1.60E+07	1.60E+07	3.36E+02
Acenaphthylene		NR	3.10E+06	3.10E+06	8.61E+01	NR	7.12E+06	7.12E+06	2.12E+02	NR	1.54E+07	1.54E+07	5.06E+02

GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - COMMERCIAL SOILS >0.3m bgl



Table 3

Human health generic assessment criteria by pathway for commercial land use - soils >0.3m bgl

Compound	Notes	SAC appropriate to pathway SOM 1% (mg/kg)			Soil saturation limit (mg/kg)	SAC appropriate to pathway SOM 2.5% (mg/kg)			Soil saturation limit (mg/kg)	SAC appropriate to pathway SOM 6% (mg/kg)			Soil saturation limit (mg/kg)
		Oral	Inhalation	Combined		Oral	Inhalation	Combined		Oral	Inhalation	Combined	
Anthracene		NR	1.27E+07	1.27E+07	1.17E+00	NR	3.09E+07	3.09E+07	2.91E+00	NR	7.13E+07	7.13E+07	6.96E+00
Benzo(a)anthracene		NR	2.42E+03	2.42E+03	1.71E+00	NR	4.98E+03	4.98E+03	4.28E+00	NR	9.47E+03	9.47E+03	1.03E+01
Benzo(a)pyrene	(a)	2.30E+05	1.64E+03	NR	9.11E-01	3.75E+05	2.68E+03	NR	2.28E+00	5.92E+05	4.23E+03	NR	5.46E+00
Benzo(b)fluoranthene		NR	1.84E+03	1.84E+03	1.22E+00	NR	3.03E+03	3.03E+03	3.04E+00	NR	4.81E+03	4.81E+03	7.29E+00
Benzo(g,h,i)perylene		NR	3.32E+05	3.32E+05	1.54E-02	NR	5.40E+05	5.40E+05	3.85E-02	NR	8.51E+05	8.51E+05	9.23E-02
Benzo(k)fluoranthene		NR	5.94E+04	5.94E+04	6.87E-01	NR	9.66E+04	9.66E+04	1.72E+00	NR	1.52E+05	1.52E+05	4.12E+00
Chrysene		NR	9.26E+03	9.26E+03	4.40E-01	NR	1.58E+04	1.58E+04	1.10E+00	NR	2.56E+04	2.56E+04	2.64E+00
Dibenzo(a,h)anthracene		NR	1.80E+02	1.80E+02	3.93E-03	NR	3.07E+02	3.07E+02	9.82E-03	NR	4.98E+02	4.98E+02	2.36E-02
Fluoranthene		NR	3.52E+06	3.52E+06	1.89E+01	NR	8.13E+06	8.13E+06	4.73E+01	NR	1.75E+07	1.75E+07	1.13E+02
Fluorene		NR	4.71E+05	4.71E+05	3.09E+01	NR	1.15E+06	1.15E+06	7.65E+01	NR	2.71E+06	2.71E+06	1.83E+02
Hexachloroethane		2.13E+01	NR	NR	8.17E+00	5.26E+01	NR	NR	2.01E+01	1.25E+02	NR	NR	4.81E+01
Indeno(1,2,3-cd)pyrene		NR	1.91E+04	1.91E+04	6.13E-02	NR	3.15E+04	3.15E+04	1.53E-01	NR	5.01E+04	5.01E+04	3.68E-01
Naphthalene			1.89E+03	1.89E+03	7.64E+01		4.46E+03	4.46E+03	1.83E+02		1.03E+04	1.03E+04	4.32E+02
Phenanthrene		NR	6.15E+05	6.15E+05	3.60E+01	NR	1.49E+06	1.49E+06	8.96E+01	NR	3.42E+06	3.42E+06	2.14E+02
Pyrene		NR	8.20E+06	8.20E+06	2.20E+00	NR	1.89E+07	1.89E+07	5.49E+00	NR	4.06E+07	4.06E+07	1.32E+01
Phenol		NR	7.30E+04	7.30E+04	2.42E+04	NR	1.13E+05	1.13E+05	3.81E+04	NR	2.02E+05	2.02E+05	7.03E+04

Total petroleum hydrocarbons

Aliphatic hydrocarbons EC5-EC6		NR	3.19E+03	3.19E+03	3.04E+02	NR	5.86E+03	5.86E+03	5.58E+02	NR	1.21E+04	1.21E+04	1.15E+03
Aliphatic hydrocarbons >EC6-EC8		NR	7.79E+03	7.79E+03	1.44E+02	NR	1.74E+04	1.74E+04	3.22E+02	NR	3.97E+04	3.97E+04	7.36E+02
Aliphatic hydrocarbons >EC8-EC10		NR	2.02E+03	2.02E+03	7.77E+01	NR	4.92E+03	4.92E+03	1.90E+02	NR	1.17E+04	1.17E+04	4.51E+02
Aliphatic hydrocarbons >EC10-EC12		NR	9.97E+03	9.97E+03	4.75E+01	NR	2.47E+04	2.47E+04	1.18E+02	NR	5.90E+04	5.90E+04	2.83E+02
Aliphatic hydrocarbons >EC12-EC16		NR	8.27E+04	8.27E+04	2.37E+01	NR	2.05E+05	2.05E+05	5.91E+01	NR	4.86E+05	4.86E+05	1.42E+02
Aliphatic hydrocarbons >EC16-EC35	(b)	9.35E+06	NR	NR	8.48E+00	2.26E+07	NR	NR	2.12E+01	5.20E+07	NR	NR	5.09E+01
Aliphatic hydrocarbons >EC35-EC44	(b)	9.35E+06	NR	NR	8.48E+00	2.26E+07	NR	NR	2.12E+01	5.20E+07	NR	NR	5.09E+01
Aromatic hydrocarbons >EC8-EC10		NR	3.55E+03	3.55E+03	6.13E+02	NR	8.66E+03	8.66E+03	1.50E+03	NR	2.05E+04	2.05E+04	3.58E+03
Aromatic hydrocarbons >EC10-EC12		NR	1.92E+04	1.92E+04	3.64E+02	NR	4.71E+04	4.71E+04	8.99E+02	NR	1.11E+05	1.11E+05	2.15E+03
Aromatic hydrocarbons >EC12-EC16		NR	2.07E+05	2.07E+05	1.69E+02	NR	5.00E+05	5.00E+05	4.19E+02	NR	1.15E+06	1.15E+06	1.00E+03
Aromatic hydrocarbons >EC16-EC21	(b)	3.20E+06	NR	NR	5.37E+01	6.90E+06	NR	NR	1.34E+02	1.38E+07	NR	NR	3.21E+02
Aromatic hydrocarbons >EC21-EC35	(b)	4.89E+07	NR	NR	4.83E+00	7.93E+07	NR	NR	1.21E+01	1.25E+08	NR	NR	2.90E+01
Aromatic hydrocarbons >EC35-EC44	(b)	4.89E+07	NR	NR	4.83E+00	7.93E+07	NR	NR	1.21E+01	1.25E+08	NR	NR	2.90E+01

Notes:

NR Not required as contaminant or pathway not applicable

EC - equivalent carbon. GrAC - groundwater screening value. SAC - soil screening value.

The CLEA model output is colour coded depending upon whether the soil saturation limit has been exceeded.

	Calculated SAC exceeds soil saturation limit and may significantly affect the interpretation of any exceedances as the contribution of the indoor and outdoor vapour pathway to total exposure is >10%
	Calculated SAC exceeds soil saturation limit but the exceedance will not affect the SAC significantly as the contribution of the indoor and outdoor vapour pathway to total exposure is <10%.
	Calculated SAC does not exceed the soil saturation limit.

The SAC for organic compounds are dependant upon soil organic matter (SOM) (%) content. To obtain SOM from total organic carbon (TOC) (%) divide by 0.58. 1% SOM is 0.58% TOC. DL Rowell Soil Science: Methods and Applications, Longmans, 1994.

SAC for TPH fractions, PAHs naphthalene, acenaphthene and acenaphthylene, BTEX and trimethylbenzene compounds were produced using an attenuation factor for the indoor air inhalation pathway of 10 to reduce conservatism associated with the vapour inhalation pathway (Section 10.1.1, SR3)

(a) SAC for arsenic, benzene, benzo(a)pyrene, cadmium, chromium VI and lead are derived using the C4SL toxicology data.

(b) SAC for barium and selenium should not include the inhalation pathway as no expert group HCV has been derived; aliphatic and aromatic hydrocarbons >EC16 should not include inhalation pathway due to their non-volatile nature and inhalation exposure being minimal (oral, dermal and inhalation exposure is compared to the oral HCV); arsenic should only be based on oral contribution (rather than combined) owing to the relative small contribution from inhalation in accordance with the SGV report. The Oral SAC should be adopted for zinc and benzo(a)pyrene.

(c) SAC for CrIII should be based on the lower of the oral and inhalation SAC (see LQM/CIEH 2015 Section 6.8).

(d) SAC for elemental mercury, chromium VI and nickel should be based on the inhalation pathway only.

(e) SAC for 1,3,5-trimethylbenzene is not recorded owing to the lack of toxicological data, SAC for 1,2,4 trimethylbenzene may be used.



Table 4

Human Health Generic Assessment Criteria for Commercial Land Use - soils >0.3m bgl

Compound	SAC for Soil SOM 1% (mg/kg)	SAC for Soil SOM 2.5% (mg/kg)	SAC for Soil SOM 6% (mg/kg)
Metals			
Arsenic	NR	NR	NR
Barium	NR	NR	NR
Beryllium	NR	NR	NR
Boron	NR	NR	NR
Cadmium	NR	NR	NR
Chromium (III) - trivalent	NR	NR	NR
Chromium (VI) - hexavalent	NR	NR	NR
Copper	NR	NR	NR
Lead	NR	NR	NR
Elemental Mercury (Hg ⁰)	17 (4)	43 (11)	104 (26)
Inorganic Mercury (Hg ²⁺)	NR	NR	NR
Methyl Mercury (Hg ⁴⁺)	2,200 (73)	4,120 (142)	8,300 (304)
Nickel	NR	NR	NR
Selenium	NR	NR	NR
Vanadium	NR	NR	NR
Zinc	NR	NR	NR
Cyanide (free)	NR	NR	NR
Volatile Organic Compounds			
Benzene	28	52	108
Toluene	64,900 (869)	142,700 (1,916)	323,700 (4,357)
Ethylbenzene	5,890 (518)	13,780 (1,216)	32,120 (2,844)
Xylene - m	6,270 (625)	14,750 (1,474)	34,430 (3,457)
Xylene - o	6,740 (478)	15,740 (1,120)	36,620 (2,618)
Xylene - p	6,030 (576)	14,120 (1,353)	32,890 (3,167)
Total xylene	6,030 (625)	14,120 (1,474)	32,890 (3,457)
Methyl tertiary-Butyl ether (MTBE)	7,580	12,320	23,360
1,1,1,2 Tetrachloroethane	109	253	589
1,1,2,2-Tetrachloroethane	281	575	1,260
1,1,1-Trichloroethane	660	1,351	2,962
1,1,2 Trichloroethane	90	184	402
1,1 Dichloroethene	24	43	87
1,2-Dichloroethane	0.67	0.97	1.67
1,2,4-Trimethylbenzene	398	969	2,286
1,3,5-Trimethylbenzene	NR	NR	NR
1,2 Dichloropropane	3.1	5.5	11.1
Carbon Tetrachloride	2.9	6.3	14.3
Chloroethane	902	1,223	1,973
Chloromethane	1.0	1.1	1.5
Cis 1,2 Dichloroethene	14	23	45
Dichloromethane	263	350	553
Tetrachloroethene (PCE)	25	55	126
Trans 1,2 Dichloroethene	21	37	76
Trichloroethene (TCE)	2.6	5.4	12.0
Vinyl Chloride (chloroethene)	1.1	1.5	2.2
Semi-Volatile Organic Compounds			
2 Chloronaphthalene	NR (1,536)	NR (3,216)	NR (7,138)
Acenaphthene	1,000,000**	1,000,000**	1,000,000**
Acenaphthylene	1,000,000**	1,000,000**	1,000,000**
Anthracene	1,000,000**	1,000,000**	1,000,000**
Benzo(a)anthracene	2,420 (1.7)	4,980 (4.3)	9,470 (10.3)
Benzo(a)pyrene	1,640 (0.9)	2,680 (2.3)	4,230 (5.5)
Benzo(b)fluoranthene	1,840 (1.2)	3,030 (3.0)	4,810 (7.3)
Benzo(g,h,i)perylene	331,700 (0.02)	539,600 (0.04)	850,800 (0.09)
Benzo(k)fluoranthene	59,400 (0.7)	96,600 (1.7)	152,400 (4.1)
Chrysene	9,300 (0.4)	15,800 (1.1)	25,600 (2.6)
Dibenzo(a,h)anthracene	180 (0.004)	307 (0.010)	498 (0.024)
Fluoranthene	1,000,000**	1,000,000**	1,000,000**
Fluorene	471,000 (31)	1,000,000**	1,000,000**
Hexachloroethane	21 (8)	53 (20)	125 (48)
Indeno(1,2,3-cd)pyrene	19,100 (0.1)	31,500 (0.2)	50,100 (0.4)
Naphthalene	1,900 (76)	4,500 (183)	10,300 (432)
Phenanthrene	615,000 (36)	1,000,000**	1,000,000**
Pyrene	1,000,000**	1,000,000**	1,000,000**
Phenol	73,000 (24,200)	112,600 (38,100)	201,700 (70,300)
Total Petroleum Hydrocarbons			
Aliphatic hydrocarbons EC ₅ -EC ₆	3,200 (304)	5,900 (558)	12,100 (1,150)
Aliphatic hydrocarbons >EC ₆ -EC ₈	7,800 (144)	17,400 (322)	39,700 (736)
Aliphatic hydrocarbons >EC ₈ -EC ₁₀	2,000 (78)	4,900 (190)	11,700 (451)
Aliphatic hydrocarbons >EC ₁₀ -EC ₁₂	10,000 (48)	24,700 (118)	59,000 (283)
Aliphatic hydrocarbons >EC ₁₂ -EC ₁₆	83,000 (24)	205,000 (59)	486,000 (142)
Aliphatic hydrocarbons >EC ₁₆ -EC ₃₅	1,000,000**	1,000,000**	1,000,000**
Aliphatic hydrocarbons >EC ₃₅ -EC ₄₄	1,000,000**	1,000,000**	1,000,000**
Aromatic hydrocarbons >EC ₈ -EC ₁₀	3,500 (613)	8,700 (1,503)	20,500 (3,580)
Aromatic hydrocarbons >EC ₁₀ -EC ₁₂	19,200 (364)	47,100 (899)	111,100 (2,150)
Aromatic hydrocarbons >EC ₁₂ -EC ₁₆	206,600 (169)	499,800 (419)	1,000,000**
Aromatic hydrocarbons >EC ₁₆ -EC ₂₁	1,000,000**	1,000,000**	1,000,000**
Aromatic hydrocarbons >EC ₂₁ -EC ₃₅	1,000,000**	1,000,000**	1,000,000**
Aromatic hydrocarbons >EC ₃₅ -EC ₄₄	1,000,000**	1,000,000**	1,000,000**
Minerals			
Asbestos	No asbestos detected (to be reviewed on a site-specific basis)		
Notes:			
NR - Not required as contaminant or pathway not applicable			
NR - SAC for 1,3,5-trimethylbenzene is not recorded owing to the lack of toxicological data, SAC for 1,2,4 trimethylbenzene may be used			
EC - equivalent carbon. GRAC - groundwater assessment criteria. SAC - soil assessment criteria.			
The SAC for organic compounds are dependent on Soil Organic Matter (SOM) (%) content. To obtain SOM from total organic carbon (TOC) (%) divide by 0.58. 1% SOM is 0.58% TOC. DL Rowell Soil Science: Methods and Applications, Longmans, 1994.			
SAC for TPH fractions, PAHs naphthalene, acenaphthene and acenaphthylene, BTEX and trimethylbenzene compounds were produced using an attenuation factor for the indoor air inhalation pathway of 10 to reduce conservatism associated with the vapour inhalation pathway, section 10.1.1, SR3.			
** Denoted SAC calculated exceeds 100% contaminant, hence 100% (1,000,000mg/kg) has been taken as SAC			
(VALUE IN BRACKETS)			
RSK has adopted an approach for petroleum hydrocarbons in accordance with LQM/CIEH whereby the concentration modelled for each petroleum hydrocarbon fraction has been tabulated as the SAC with the corresponding solubility or vapour saturation limits given in brackets.			
In the absence of an inhalation HCV the oral HCV has been used. For TCE the inhalation SAC has been chosen due to the absence of oral exposure pathways in this scenario.			

GENERIC ASSESSMENT CRITERIA FOR CONTROLLED WATERS

Protection of the water environment

The water environment in the United Kingdom is protected under a number of regulatory regimes. The relevant environmental regulator is consulted where there may be a risk that pollution of 'controlled waters' may occur or may have occurred in the past.

The term 'controlled waters' refers to coastal waters, inland freshwaters and groundwater. The EU Water Framework Directive (WFD) (2000/60/EC) is implemented via domestic regulations and guidance, covering aspects of groundwater and surface water protection as well as drinking water supply policy. Domestic legislation and guidance will vary across the United Kingdom. Therefore, the relevant legislation for England, Wales, Northern Ireland and Scotland should be reviewed, alongside guidance provided by the Environment Agency (EA), Natural Resource Wales (NRW), the Scottish Environmental Protection Agency (SEPA) or the Northern Ireland Environment Agency (NIEA), as appropriate.

The main objectives of the protection and remediation of groundwater under threat from land contamination are set out within "The Environment Agency's approach to groundwater protection", version 1.0 (March 2017)⁽¹⁾ and the associated guidance "Land contamination groundwater compliance points: quantitative risk assessments (March 2017)^(1a) that have replaced the previous guidance document "Groundwater Principles and Practice (GP3)". When assessing risks to groundwater, the following need to be considered:

- Where pollutants have not yet entered groundwater, all necessary and reasonable measures must be taken to:
 - **prevent** the input of **hazardous** substances into groundwater (see description of hazardous substances below)
 - **limit** the entry of other (non-hazardous) pollutants into groundwater to avoid pollution, deterioration in the status of groundwater bodies and to prevent sustained, upward trends in pollutant concentrations in groundwater.
- Where pollutants have already entered groundwater, the priority is to take all necessary and reasonable measures to:
 - **minimise** further entry of "contaminants" where there is a defined source
 - **limit the pollution** of groundwater or any effect on the status of the groundwater body from the future expansion of the 'plume', if necessary, by actively reducing its extent.

Within the context of groundwater risk assessments on sites affected by land contamination, "reasonable" means feasible without involving disproportionate costs. What costs are "disproportionate" depends on site-specific circumstances, which may include:

- Considerations of technical feasibility such as identified by the remedial options appraisal, this may be due to the distribution or nature of the contamination and the available remedial methods to treat the identified contamination;
- Sustainability considerations.

DEFINITIONS AND SUBSTANCE CLASSIFICATIONS

Risks to surface waters:

When assessing risks to surface waters, the following list of definitions should be understood:

Priority substances (PS) are harmful substances originally identified under the Water Framework Directive (WFD) 2000/60/EC as substances ‘presenting a significant risk to or via the aquatic environment’ at a European level. Member States are required to incorporate the identified **PS** into their country-wide monitoring programmes. There are currently 33 **PS** defined within the Priority Substances Directive (2013/39/EU; Annex 1), with a further 12 additional substances due to come into force from 22 December 2018. Directive 2013/39/EU has been transposed into domestic legislation for England and Wales by The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.

Under the umbrella of **PS**, there is a sub-set of substances identified as being “hazardous”, and these are referred to as **Priority hazardous substances (PHS)**. The list of **PHS** is defined at EU level within the Priority Substances Directive (2013/39/EU). The WFD defines hazardous substances as ‘substances (or groups of substances) that are toxic, persistent and liable to bio-accumulate, and other substances or groups of substances that give rise to an equivalent level of concern.’ There are currently **21 PHS** (previously 15 PHS, with a further 6 substances added in 22 December 2018).

There is also another group of substances defined at EU level and which are referred to as **other pollutants (OP)** in Directive 2013/39/EU. These are additional substances which although not **priority substances**, have EQS which are identical to those laid down in the legislation which applied prior to 13 January 2009 (Directive 2008/105/EU). The **OP** are listed along with the **priority substance (PS)** within the Priority Substances Directive (2013/39/EU), and their associated EQS are also listed therein. There are 6 **OP** defined within the Priority Substances Directive (2013/39/EU).

In addition to the EU level substances, there are also a group of pollutants defined at a Member State level, referred to as **Specific pollutants (SP)**. These substances are pollutants which are released in significant quantities into water bodies in each of the individual European Member States. Under the WFD, Member States are required to set their own EQS for these substances. An indicative list of **SP** is given in Annex VIII of the WFD. Many of the substances categorised as **SP** in the UK were formerly List 2 substances under the old Groundwater Directive (80/68/EEC). The **SP** are defined within Part 2 (Table 1) of The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.

Risks to groundwater:

When assessing risks to groundwater, the following definitions should be understood:

Under the requirements of the Groundwater Daughter Directive (2006/118/EU), the UK has published a list of substances it considers to be **hazardous substances** with respect to groundwater. In their advisory capacity to the government, this list has been derived by the UK Joint Agencies Groundwater Directive Advisory Group (JAGDAG), of which the Environment Agency is a member. The latest JAGDAG list of **hazardous substances** was published in January 2019 and the Environment Agency will use the updated list of hazardous substances from this date for all new activities that may lead to the discharge of hazardous substances to groundwater. The list is extensive and can be found in full at:

<https://www.wfduk.org/stakeholders/jagdag>

Selecting the appropriate assessment criteria

When assessing the risks to controlled waters, various assessment criteria apply, depending on the nature of the assessment and the conceptual site model.

Where a surface water body is involved, then Environmental Quality Standards (EQS) are the relevant assessment criteria as they are designed to be protective of surface water ecology.

Where a public water supply or a Principal aquifer is involved, then the standards defined in The Water Supply (Water Quality) Regulations⁽²⁾ are the primary source of assessment criteria. The Private Water Supplies Regulations⁽³⁾ may also be applicable in some cases. For instances where there are no UK assessment criteria, then the World Health Organisation (WHO) drinking water guidelines⁽⁴⁾ may be used.

This appendix presents the generic assessment criteria (GAC) that RSK considers suitable for assessing risks to controlled waters for our most commonly encountered determinants. A full list of EQS for England and Wales are included in The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.

The RSK GAC for controlled waters are presented in **Table 1** and **Table 2**. In line with the Environment Agency's Remedial Targets Methodology, the GAC for controlled waters are termed 'target concentrations'.

The appropriate target concentrations should be selected with consideration to:

- the site conceptual model (i.e. the receptor at potential risk);
- whether the substance is already present in groundwater at the site;
- whether or not the substance is classified as a priority hazardous substance under the Priority Substances Directive (2013/39/EC) (see above), or as a hazardous substance according to the current list of JAGDAG determinations⁽⁵⁾; and
- background concentrations in the aquifer (if applicable).

It is important to remember that the WFD and Environment Agency guidance^(1 & 1a) support a sustainable, risk-based approach be applied to groundwater contamination. Exceedance of any target concentration does not necessarily imply that an unacceptable risk exists or that remediation is inevitably required.

Target concentrations shaded in green are <u>statutory values</u>	Target concentrations shaded in orange are <u>non-statutory values</u>
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Note: Units µg/l throughout (unless otherwise stated)

Table 1: Target concentrations for controlled waters (excluding TPH CWG fractions)

Substance classification		Determinant	Target concentrations (µg/l)			
Groundwater receptors ⁽⁵⁾	Surface water receptors ⁽⁶⁾		Minimum reporting value	UK drinking water standard (or best equivalent)	EQS or best equivalent	
					Freshwater	Transitional (estuaries) and coastal waters
Metals & other inorganics						
Hazardous substance	Specific pollutant	Arsenic	-	10 ⁽²⁾	50 ^(6a)	25 ^(6a)
Non-hazardous pollutant	Priority substance	Cadmium	0.1 ⁽⁷⁾	5 ⁽²⁾	≤0.08, 0.08, 0.09, 0.15, 0.25 ^(6b)	0.2 ^(6a)
(Not determined)	-	Chromium (total)	-	50 ⁽²⁾	8.1 Sum values for chromium III and VI	-
(Not determined)	Specific pollutant	Chromium (III)	-	Use value for total chromium	4.7 ^(6a)	-
Hazardous substance	Specific pollutant	Chromium (VI)			3.4 ^(6a)	0.6 ^(6a)

Substance classification		Determinant	Target concentrations (µg/l)			
Groundwater receptors ⁽⁵⁾	Surface water receptors ⁽⁶⁾		Minimum reporting value	UK drinking water standard (or best equivalent)	EQS or best equivalent	
					Freshwater	Transitional (estuaries) and coastal waters
(Not determined)	Specific pollutant	Copper	-	2,000 ⁽²⁾	1 bioavailable ^(6a)	3.76 dissolved, where DOC ≤1mg/l ^(6a)
						3.76µg/l + (2.677µg/l x ((DOC/2) – 0.5µg/l)) dissolved, where DOC >1mg/l ^(6a)
Hazardous substance	Priority substance	Lead	-	10 ⁽²⁾	1.2 bioavailable ^(6a)	1.3 ^(6a)
Hazardous substance	Priority hazardous substance	Mercury	0.01 ⁽⁷⁾	1 ⁽²⁾	0.07 ^(6c)	0.07 ^(6c)
Non-hazardous pollutant	Priority substance	Nickel	-	20 ⁽²⁾	4.0 bioavailable ^(6a)	8.6 ^(6a)
Non-hazardous pollutant	-	Selenium	-	10 ⁽²⁾	-	-
Non-hazardous pollutant	Specific pollutant	Zinc	-	3,000 ⁽⁸⁾	10.9 bioavailable ^(6a)	6.8 dissolved ^(6a)
(Not determined)	Specific pollutant	Iron	-	200 ⁽²⁾	1000 ^(6a) *1	1000 ^(6a))*1
(Not determined)	Specific pollutant	Manganese	-	50 ⁽²⁾ (0.05mg/l)	123 bioavailable ^(6a) (0.123mg/l)	-
(Not determined)	-	Aluminium	-	200 ⁽²⁾	-	-

Substance classification		Determinant	Target concentrations (µg/l)			
Groundwater receptors ⁽⁵⁾	Surface water receptors ⁽⁶⁾		Minimum reporting value	UK drinking water standard (or best equivalent)	EQS or best equivalent	
					Freshwater	Transitional (estuaries) and coastal waters
Hazardous substance	Priority hazardous substance	Tributyltin compounds (Tributyltin-cation)	0.001 ⁽⁷⁾	-	0.0002 ^(6a)	0.0002 ^(6a)
(Not determined)	-	Sodium	-	200,000 ⁽²⁾ (200 mg/l)	-	-
Non-hazardous pollutant	Specific pollutant	Cyanide (Hydrogen cyanide)	-	50 ⁽²⁾ (0.05 mg/l)	1 ^(6a) (0.001 mg/l)	1 ^(6a) (0.001 mg/l)
Non-hazardous pollutant	-	Total ammoniacal nitrogen [§]	-	500 ⁽²⁾ (0.5 mg/l) as NH ₄ (472 expressed as NH ₃ ; 389 expressed as N)	300 ^(6f) (0.3 mg/l) as N (364 expressed as NH ₃ ; 386 expressed as NH ₄)	-
Non-hazardous pollutant	Specific pollutant	Ammonia un-ionised (equilibrium ratio calculated) (NH ₃)	-	-	-	21 ^(6a) (0.021 mg/l)
Non-hazardous pollutant	Specific pollutant	Chlorine	-	-	2 ^(6a) (0.002 mg/l)	10 ^(6d) (0.01 mg/l)
(Not determined)	-	Chloride	-	250,000 ⁽²⁾ (250 mg/l)	-	-
(Not determined)	-	Sulphate	-	250,000 ⁽²⁾ (250 mg/l)	-	-
(Not determined)	-	Nitrate (as NO ₃)	-	50,000 ⁽²⁾ (50 mg/l)	-	-

Substance classification		Determinant	Target concentrations (µg/l)			
Groundwater receptors ⁽⁵⁾	Surface water receptors ⁽⁶⁾		Minimum reporting value	UK drinking water standard (or best equivalent)	EQS or best equivalent	
					Freshwater	Transitional (estuaries) and coastal waters
(Not determined)	-	Nitrite (as NO ₂)	-	500 ⁽²⁾ (0.5 mg/l)	10 ⁽⁹⁾ (0.01 mg/l)	-
Volatile organic compounds (VOC)						
Non-hazardous pollutant	Other pollutant	Tetrachloroethene (tetrachloroethylene; PCE)	0.1 ⁽⁷⁾	10 ⁽²⁾ sum of TCE and PCE	10 ^(6a)	10 ^(6a)
Hazardous substance	Other pollutant	Trichloroethene (trichloroethylene; TCE)	0.1 ⁽⁷⁾		10 ^(6a)	10 ^(6a)
Hazardous substance (1,1,2,2-tetra - chloroethane)	Specific pollutant	Tetrachloroethane	-	-	140 ^(6a)	-
Hazardous substance	Other pollutant	Carbon tetrachloride (tetrachloromethane)	0.1 ⁽⁷⁾	3.0 ⁽²⁾	12 ^(6a)	12 ^(6a)
Non-hazardous pollutant	Priority substance	1,2-Dichloroethane	1.0 ⁽⁷⁾	3.0 ⁽²⁾	10 ^(6a)	10 ^(6a)
Non-hazardous pollutant	-	1.2-Dichloroethene (DCE) sum of cis and trans	-	50.0 ⁽⁴⁾	-	-
Hazardous substance	-	Vinyl chloride (chloroethene, chloroethylene)	-	0.5 ⁽²⁾	-	-
Non-hazardous pollutant	Priority substance	Dichloromethane	-	20 ⁽⁴⁾	20 ^(6a)	20 ^(6a)

Substance classification		Determinant	Target concentrations (µg/l)			
Groundwater receptors ⁽⁵⁾	Surface water receptors ⁽⁶⁾		Minimum reporting value	UK drinking water standard (or best equivalent)	EQS or best equivalent	
					Freshwater	Transitional (estuaries) and coastal waters
Non-hazardous pollutant	Priority substance	Trichlorobenzenes	0.01 ⁽⁷⁾	-	0.4 ^(6a)	0.4 ^(6a)
Hazardous substance	Priority substance	Trichloromethane (Chloroform)	0.1 ⁽⁷⁾	100 ^(2a) (sum of trihalomethanes – chloroform, bromform, dibromochloromethane, bromodichloromethane)	2.5 ^(6a)	2.5 ^(6a)
(Not determined)	-	Bromoform	-		-	-
(Not determined)	-	Dibromochloromethane	-		-	-
(Not determined)	-	Bromodichloromethane	-		-	-
Non-hazardous pollutant	Priority hazardous substance	Di(2-ethylhexyl) phthalate (bis(2-ethylhexyl) phthalate, DEHP)	-	8 ⁽⁴⁾	1.3 ^(6a)	1.3 ^(6a)
(Not determined)	Specific pollutant	Benzyl butyl phthalate	-	-	7.5 ^(6a)	0.75 ^(6e)
Hazardous substance	Priority hazardous substance	Hexachlorobutadiene (as a pesticide, but reported in a VOC suite)	0.005 ⁽⁷⁾	0.1 ⁽²⁾	0.6 ^(6c)	0.6 ^(6c)
Semi-volatile organic compounds (SVOC)						
(Not determined) Not to be confused with acenaphthene, which is a hazardous substance	-	Acenaphthylene (Aro EC12-EC16)	-	-	5.8 ⁽¹⁰⁾	
Hazardous substance	Priority hazardous substance	Anthracene (Aro EC16-EC21)	-	-	0.1 ^(6a)	0.1 ^(6a)

Substance classification		Determinant	Target concentrations (µg/l)			
Groundwater receptors ⁽⁵⁾	Surface water receptors ⁽⁶⁾		Minimum reporting value	UK drinking water standard (or best equivalent)	EQS or best equivalent	
					Freshwater	Transitional (estuaries) and coastal waters
Non-hazardous pollutant	Priority substance	Naphthalene (Aro EC10-EC12)	-	-	2 ^(6a)	2 ^(6a)
Hazardous substance	Priority substance	Fluoranthene (Aro EC21-EC35) not used as an indicator for this EC band	-	-	0.0063 ^(6a)	0.0063 ^(6a)
Hazardous substance(s)	Priority hazardous substance(s)	Benzo(a)pyrene (Aro EC21-EC35)	-	0.01 ⁽²⁾	0.00017 ^(6a)	0.00017 ^(6a)
		Benzo(b)fluoranthene (Aro EC21-EC35)	-	0.1 ⁽²⁾ sum of the concentration of the four specified compounds	No EQS for these substances. B(a)P should be used as the indicator compound instead.	
		Benzo(k)fluoranthene (Aro EC21-EC35)	-			
		Benzo(g,h,i)perylene (Aro EC21-EC35)	-			
		Indeno(1,2,3-cd) pyrene (Aro EC21-EC35)	-			
Non-hazardous pollutant	Specific pollutant	Phenol	-	-	7.7 ^(6a)	7.7 ^(6a)
Hazardous substance	Specific pollutant	2,4-Dichlorophenol	0.1 ⁽⁷⁾	-	4.2 ^(6a)	0.42 ^(6a)

Substance classification		Determinant	Target concentrations (µg/l)			
Groundwater receptors ⁽⁵⁾	Surface water receptors ⁽⁶⁾		Minimum reporting value	UK drinking water standard (or best equivalent)	EQS or best equivalent	
					Freshwater	Transitional (estuaries) and coastal waters
Hazardous substance	Priority substance	Pentachloro-phenol (PCP) (as a pesticide, but reported in an SVOC suite)	0.1 ⁽⁷⁾	0.1 ⁽²⁾	0.4 ^(6a)	0.4 ^(6a)
Petroleum hydrocarbons						
Hazardous substance	-	Total petroleum hydrocarbons	-	See Table 2 for individual (non-statutory) TPH CWG fractions with respect to drinking water receptors	See individual risk driving compounds (i.e. BTEX and PAH) for specific EQS	
Hazardous substance	Priority substance	Benzene (Aro EC5-EC7)	1 ⁽⁷⁾	1 ⁽²⁾	10 ^(6a)	8 ^(6a)
Hazardous substance	Specific pollutant	Toluene (Aro EC7-EC8)	4 ⁽⁷⁾	700 ⁽⁴⁾	74 ^(6a)	74 ^(6a)
Hazardous substance	-	Ethylbenzene (Aro EC8-EC10)	-	300 ⁽⁴⁾	300 ⁽¹¹⁾	-
Hazardous substance	-	Xylenes (Aro EC8-EC10)	3 ⁽⁷⁾	500 ⁽⁴⁾	30 ⁽¹¹⁾	-
Non-hazardous pollutant	-	Methyl tertiary butyl ether (MTBE)	-	15 ⁽¹²⁾	-	

Substance classification		Determinant	Target concentrations (µg/l)			
Groundwater receptors ⁽⁵⁾	Surface water receptors ⁽⁶⁾		Minimum reporting value	UK drinking water standard (or best equivalent)	EQS or best equivalent	
					Freshwater	Transitional (estuaries) and coastal waters
Pesticides, fungicides, insecticides and herbicides						
(Not determined) – assume to be Hazardous Substance as per below	-	Total pesticides	-	0.5 ⁽²⁾	-	-
(Not determined) - assume to be Hazardous Substance as per below	-	Other individual pesticides (unless otherwise detailed below)	-	0.1 ⁽²⁾	-	-
Hazardous substance(s)	Other pollutant (Cyclodiene pesticides)	Aldrin	0.003 ⁽⁷⁾	0.03 ⁽²⁾	0.01 ^(6a) (sum of all four)	0.005 ^(6a) (sum of all four)
		Dieldrin	0.003 ⁽⁷⁾	0.03 ⁽²⁾		
		Endrin	0.003 ⁽⁷⁾	0.1 ^(2b) ('other individual pesticide')		
		Isodrin*2	0.003 ⁽⁷⁾	0.1 ^(2b) ('other individual pesticide')		
Hazardous substance	Other pollutant	DDT (total)	0.002 ⁽⁷⁾	0.1 ⁽²⁾ ('other individual pesticide')	0.025 ^(6a)	0.025 ^(6a)
Hazardous substance	Specific pollutant	Carbendazim	-	0.1 ⁽²⁾ ('other individual pesticide')	0.15 ^(6a)	-

Substance classification		Determinant	Target concentrations (µg/l)			
Groundwater receptors ⁽⁵⁾	Surface water receptors ⁽⁶⁾		Minimum reporting value	UK drinking water standard (or best equivalent)	EQS or best equivalent	
					Freshwater	Transitional (estuaries) and coastal waters
Hazardous substance	Specific pollutant	Chlorothalonil	-	0.1 ⁽²⁾ (‘other individual pesticide’)	0.035 ^(6a)	-
Hazardous substance	Priority substance	Cypermethrin	-	0.1 ⁽²⁾ (‘other individual pesticide’)	8.0E ^{-5(6a)}	8.0E ^{-6(6a)}
Hazardous substance	Specific pollutant	Dimethoate	0.01 ⁽⁷⁾	0.1 ⁽²⁾ (‘other individual pesticide’)	0.48 ^(6a)	0.48 ^(6a)
(Not determined)	Specific pollutant	Glyphosate	-	0.1 ⁽²⁾ (‘other individual pesticide’)	196 ^(6a)	196 ^(6a)
Hazardous substance	Specific pollutant	Linuron	-	0.1 ⁽²⁾ (‘other individual pesticide’)	0.5 ^(6a)	0.5 ^(6a)
Non-hazardous pollutant	Specific pollutant	Mecoprop	0.04 ⁽⁷⁾	0.1 ⁽²⁾ (‘other individual pesticide’)	18 ^(6a)	18 ^(6a)
Non-hazardous pollutant	Specific pollutant	Methiocarb	-	0.1 ⁽²⁾ (‘other individual pesticide’)	0.01 ^(6a)	-
Non-hazardous pollutant	Specific pollutant	Pendimethalin	-	0.1 ⁽²⁾ (‘other individual pesticide’)	0.3 ^(6a)	-

Substance classification		Determinant	Target concentrations (µg/l)			
Groundwater receptors ⁽⁵⁾	Surface water receptors ⁽⁶⁾		Minimum reporting value	UK drinking water standard (or best equivalent)	EQS or best equivalent	
					Freshwater	Transitional (estuaries) and coastal waters
Hazardous substance	Specific pollutant	Permethrin	0.001 ⁽⁷⁾	0.1 ⁽²⁾ (‘other individual pesticide’)	0.001 ^(6a)	0.0002 ^(6a)
Hazardous substance	Priority substance	Alachlor	-	0.1 ⁽²⁾ (‘other individual pesticide’)	0.3 ^(6a)	0.3 ^(6a)
Hazardous substance	Priority substance	Atrazine	0.03 ⁽⁷⁾	100 ⁽⁴⁾ (‘other individual pesticide’)	0.6 ^(6a)	0.6 ^(6a)
Hazardous substance	Priority substance	Diuron	-	0.1 ⁽²⁾ (‘other individual pesticide’)	0.2 ^(6a)	0.2 ^(6a)
Hazardous substance	Priority hazardous substance	Endosulphan	0.005 ⁽⁷⁾	0.1 ⁽²⁾ (‘other individual pesticide’)	0.005 ^(6a)	0.0005 ^(6a)
Non-hazardous pollutant	Priority substance	Isoproturon	-	0.1 ⁽²⁾ (‘other individual pesticide’)	0.3 ^(6a)	0.3 ^(6a)
Hazardous substance	Priority substance	Simazine	0.03 ⁽⁷⁾	0.1 ⁽²⁾ (‘other individual pesticide’)	1 ^(6a)	1 ^(6a)
Hazardous substance	Priority hazardous substance	Trifluralin	0.01 ⁽⁷⁾	0.1 ⁽²⁾ (‘other individual pesticide’)	0.03 ^(6a)	0.03 ^(6a)

Substance classification		Determinant	Target concentrations (µg/l)			
Groundwater receptors ⁽⁵⁾	Surface water receptors ⁽⁶⁾		Minimum reporting value	UK drinking water standard (or best equivalent)	EQS or best equivalent	
					Freshwater	Transitional (estuaries) and coastal waters
Hazardous substance	Priority substance	Dichlorvos	-	0.1 ⁽²⁾ (‘other individual pesticide’)	6.0E ^{-4(6a)}	6.0E ^{-5(6a)}
Hazardous substance	Priority substance	Heptachlor and heptachlor epoxide	-	0.03 ⁽²⁾	2.0E ^{-7(6a)}	1.0E ^{-08(6a)}
Miscellaneous						
(Not determined)	Specific pollutant	Triclosan (antibacterial agent)	-	-	0.1 ^(6a)	0.1 ^(6a)
Hazardous substance	Priority hazardous substance	Perfluoro-octane sulfonic acid (and its derivatives) (PFOS)	-	-	6.5E ^{-4(6a)}	1.3E ^{-4(6a)}
Hazardous substance	Priority hazardous substance	Hexabromo cyclododecane (HBCDD)	-	-	0.0016 ^(6a)	0.0008 ^(6a)

Substance classification		Determinant	Target concentrations (µg/l)			
Groundwater receptors ⁽⁵⁾	Surface water receptors ⁽⁶⁾		Minimum reporting value	UK drinking water standard (or best equivalent)	EQS or best equivalent	
					Freshwater	Transitional (estuaries) and coastal waters

Notes:

‘-’ A target concentration is not available.

\$Please note that total ammonia (NH₄⁺ and NH₃) is equivalent to ammoniacal nitrogen in laboratory reports

*¹ Please note that although iron is listed in the 2015 Direction as 1.000 µg/l, the EQS remains at 1mg/l in Scotland and it is assumed this is an error and should read either 1,000 or 1000µg/l.

*² Please note that although Isodrin is not listed in name within the group of “Cyclodiene pesticides” in Table 1 of Schedule 3 Part 3 of the 2015 Direction⁽⁶⁾, the CAS number for Isodrin (465-73-6) is listed and therefore it is assumed that it has been missed off the named list of substances.

*³ Total petroleum hydrocarbons is used for consistency, but is an analytical method-defined measurement for a mixture of hydrocarbons subject to environmental analysis¹¹.

“Bioavailable” in relation to copper, zinc, nickel and manganese (but not lead) is the generic EQSbioavailable^(6a) derived from the Metal Bioavailability Assessment Tool (M-BAT) developed by the Water Framework Directive UK Technical Advisory Group (WFDTAG). Exceedance of this value should prompt a site-specific assessment using the M-BAT with pH, DOC and Ca to derive a site-specific EQS termed the PNEC_{dissolved}.
<http://www.wfduk.org/resources/rivers-lakes-metal-bioavailability-assessment-tool-m-bat>.

For zinc, if there is an exceedance of the EQSbioavailable in an initial GQRA, Tier 2 required that the EQS for zinc should also have the ambient background concentration of zinc added as well

Table 2: World Health Organization (WHO) guide values for TPH CWG fractions in drinking water⁽¹³⁾ (as referenced in CL:AIRE, 2017⁽¹¹⁾)

TPH CWG fraction	WHO guide value for drinking water ⁽¹³⁾ (µg/l)
Aliphatic fractions:	
Aliphatic EC5-EC6	15,000
Aliphatic >EC6-EC8	15,000
Aliphatic >EC8-EC10	300
Aliphatic >EC10-EC12	300
Aliphatic >EC12-EC16	300
Aliphatic >EC16-EC21	-
Aliphatic >EC21-EC35	-
Aromatic fractions:	
Aromatic EC5-EC6	10 (benzene)
Aromatic >EC6-EC8	700 (toluene)
Aromatic >EC8-EC10	300 (ethyl benzene) 500 (xylenes)
Aromatic >EC10-EC12	90
Aromatic >EC12-EC16	90
Aromatic >EC16-EC21	90
Aromatic >EC21-EC35	90
Reference: World Health Organisation (WHO), 2008. Petroleum products in drinking-water. Background document for development of WHO guidelines for drinking water quality. WHO/SDE/WSH/05.08/123. World Health Organisation, Geneva ⁽¹³⁾ .	

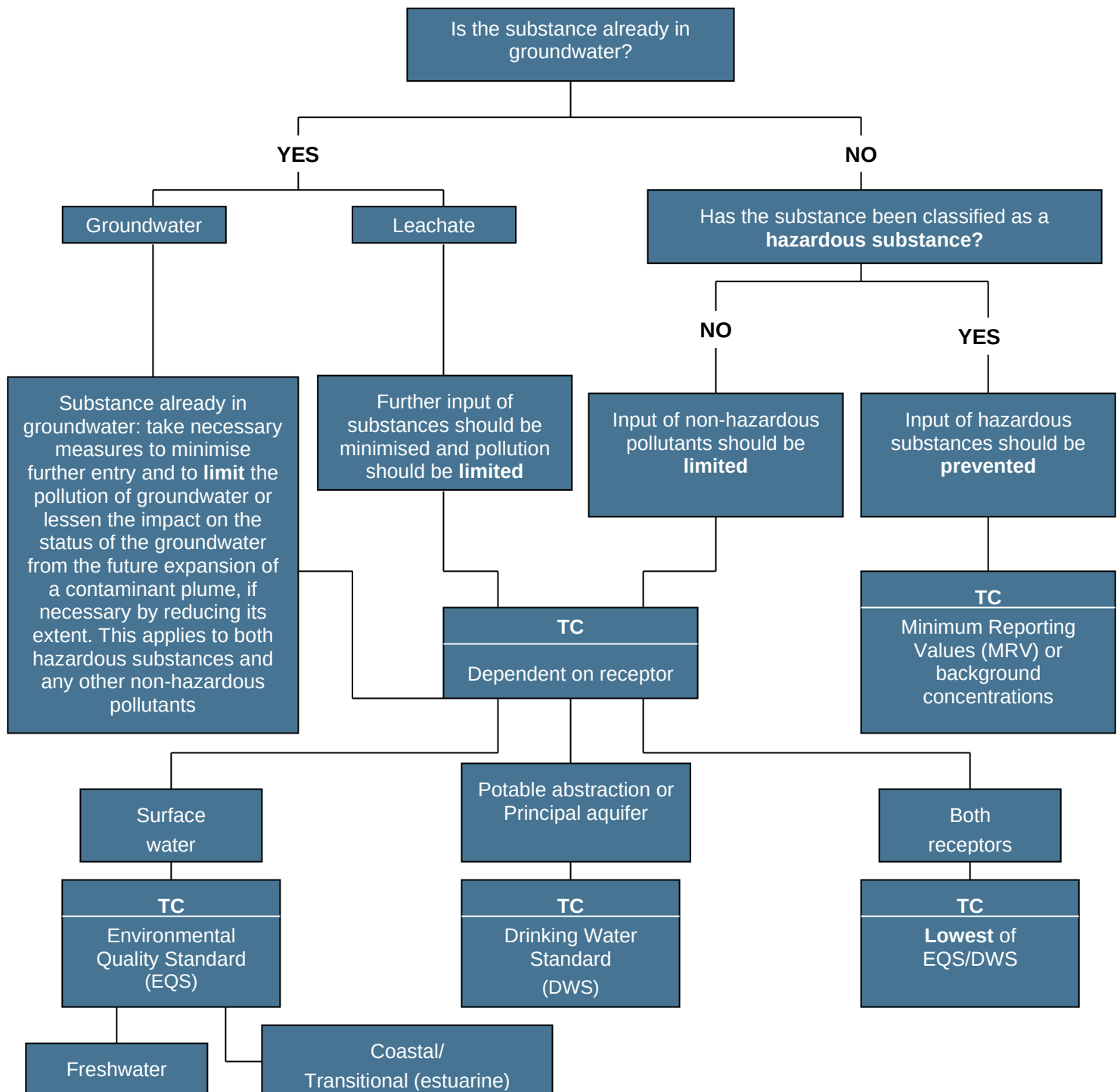
References

1. Environment Agency (2018), 'The Environment Agency's approach to groundwater protection', version 1.2, February 2018 (formerly contained within GP3).
<https://www.gov.uk/government/collections/groundwater-protection>
- 1a. Environment Agency (2017), 'Land contamination groundwater compliance points: quantitative risk assessments', March 2017 (formerly contained within GP3) [accessed 29 March 2017].
<https://www.gov.uk/government/collections/groundwater-protection>
2. The Water Supply (Water Quality) Regulations 2016 (SI 2016/619)
 - 2a. Sum of chloroform, bromoform, dibromochloromethane and bromodichloromethane
 - 2b. Standard applies to individual pesticides except aldrin, dieldrin, heptachlor and heptachlor epoxide, for which a separate standard is defined.
3. The Private Water Supplies (England) Regulations 2016. SI 2016 / 618
4. WHO (2011), *Guidelines for drinking-water quality*, 4th edn
5. JAGDAG hazard substance determinations (January 2019): This list contains substances that are determined to be hazardous substances or non-hazardous pollutants for the purposes of the groundwater directive 2006/118/EC. <https://www.wfduk.org/stakeholders/jagdag> [accessed 1 February 2021]
The absence of an assessment or substance from the list means an assessment has not been completed and is therefore presented as 'Not determined'. For further details on how substances are assessed, see the Joint Agencies Groundwater Directive Advisory Group (JAGDAG) 'Methodology for the determination of hazardous substances in groundwater for the purposes of the groundwater directive 2006/118/EC' which is available from the JAGDAG website. The methodology is a UK –wide framework that sets criteria for how to assess whether a substance is a hazardous substances in groundwater.
6. The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.
 - 6a. The EQS for these substances are based on a "long term mean" or an "annual average (AA)" EQS.
 - 6b. For cadmium and its compounds the EQS values vary depending on the hardness of the water as specified in five class categories (Class 1: < 40 mg CaCO₃/l, Class 2: 40 to < 50 mg CaCO₃/l, Class 3: 50 to < 100 mg CaCO₃/l, Class 4: 100 to < 200 mg CaCO₃/l and Class 5: ≥ 200 mg CaCO₃/l).
 - 6c. The EQS for Mercury and hexachlorobutadiene are based on a "maximum acceptable concentration (MAC)" EQS in absence of an "annual average (AA)" EQS.
 - 6d. The EQS for chlorine in saltwater is based on the 95th percentile concentration of total residual oxidant, which refers to the sum of all oxidising agents existing in water, expressed as available chlorine.
 - 6e. The recommended saltwater standard is derived using a safety factor of 100. Where the standard is failed, it is recommended that supporting evidence of ecological damage should be obtained before committing to expensive action.
 - 6f. EQS for total ammonia is as per Schedule 3, Part 1, Table 7 of of the above directions. EQS applies to river types 1, 2 and 4 and 6 (namely upland and low alkalinity). The EQS for a lowland and high alkalinity rivers (types 3, 5 and 7) is 600µg/l (0.6mg/l).

Additional information on the Metal Bioavailability Assessment Tool (M-BAT) is available at <http://www.wfduk.org/resources/rivers-lakes-metal-bioavailability-assessment-tool-m-bat>

7. Minimum reporting values listed at <https://www.gov.uk/government/publications/values-for-groundwater-risk-assessments/hazardous-substances-to-groundwater-minimum-reporting-values> (updated 13 January 2017; accessed 29 March 2017). Note target concentration for xylenes is 3 µg/l each for o-xylene and m/p xylene as it may not be possible to separate m- and p-xylene; 135 tcb, 124 tcb, 123 tcb each to 0.01 µg/l)
8. The Surface Waters (Abstraction for Drinking Water) (Classification) Regulations 1996 (as amended). SI 1996 / 3001
9. Council Directive on the Quality of Fresh Waters Needing Protection or Improvement in Order to Support Fish Life (Freshwater Fish Directive) (78/659/EEC)
10. WRc plc (2002), R&D Technical Report P45.
11. CL:AIRE, 2017. Petroleum Hydrocarbons in Groundwater: Guidance on assessing petroleum hydrocarbons using existing hydrogeological risk assessment methodologies. V1.1.
12. Drinking Water Inspectorate (London, UK). Environmental Information Request on MTBE in drinking water. Ref. DWI 1/10/18; dated 28 November 2006. Value is based on the odour threshold for MTBE, which is lower than a health-based guideline value
13. World Health Organisation (WHO), 2008. Petroleum products in drinking-water. Background document for development of WHO guidelines for drinking water quality. WHO/SDE/WSH/05.08/123. World Health Organisation, Geneva. [accessed 29 March 2017] http://www.who.int/water_sanitation_health/dwg/chemicals/petroleumproducts_2add_june2008.pdf

FLOW CHART TO ASSIST WITH SELECTION OF TARGET CONCENTRATIONS



TC = Target concentration

When leachate is being assessed the 'compliance point' is the groundwater body. Therefore dilution within the groundwater body may be applied with caution before comparing with the TC.

When directly assessing a receptor, e.g., a river, the appropriate TC should be selected.



COMPLEX CHALLENGES ...
MADE SIMPLE

APPENDIX H – GQRA SCREENING TABLES (SOILS)

Project name	Plot H5 Manchester Airport		Notes	
Project code	4700			
Client name	MAG Property			
Address				
NGR				
Land use	Commercial Scenario			
SOM	1%			
GAC version	2021_00			

									Lab sample ID	24/10504/1	24/10272/3	24/10272/4	24/10272/6	24/10272/7	24/10272/1	24/10272/2	24/10272/5	24/10272/8	24/10272/9
									Client sample ID	RBH302	WS301	WS301	WS302	WS302	WS303	WS303	WS304	WS305	WS305
									Depth to top	0.5	0.3	2	0.6	1.8	0.55	2	1	0.15	0.8
									Depth to bottom	0.7	0.6		0.8	2	0.8			0.65	1
									Date sampled	28/10/24	21/10/24	21/10/24	22/10/24	22/10/24	21/10/24	21/10/24	22/10/24	22/10/24	22/10/24
Analyte	Unit	GAC	T1	Max	Min	Count	# Detects	# Non-detects											
Metals and Inorganics																			
Antimony	mg/kg				<5	10	0	10	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Arsenic	mg/kg	640		3	<1	10	4	6	3	<1		3	<1	<1	<1	<1	3	1	<1
Barium	mg/kg	22000		125	11	10	10	0	116	35	55	19	40	11	54	125	69	20	
Beryllium	mg/kg	12		1.4	<0.5	10	6	4	1.3	<0.5		0.8	<0.5		0.8	1.4	0.5	<0.5	
Boron (water soluble)	mg/kg	240000			<1.0	10	0	10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Cadmium	mg/kg	410		0.7	<0.5	10	1	9	<0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Chromium	mg/kg	8600	49	27	6	10	10	0	27	8	19	7	15	6	20	25	15	8	
Chromium (trivalent)	mg/kg	8600		27	6	10	10	0	27	8	19	7	15	6	20	25	15	8	
Chromium (hexavalent)	mg/kg	49			<1	10	0	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Copper	mg/kg	68000		36	2	10	10	0	16	4	36	4	13	2	13	14	12	5	
Lead	mg/kg	2300		12	<1	10	9	1	7	4	5	3	5	<1		5	6	12	3
Mercury	mg/kg	1120	15		<0.17	10	0	10	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	
Molybdenum	mg/kg				<1	10	0	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Nickel	mg/kg	980		26	5	10	10	0	26	8	19	6	14	5	19	24	17	8	
Selenium	mg/kg	12000			<1	10	0	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Vanadium	mg/kg	9000		28	6	10	10	0	28	6	20	7	15	8	20	27	13	9	
Zinc	mg/kg	740000		45	9	10	10	0	33	37	31	10	27	9	32	30	45	10	
Cyanide (total)	mg/kg		650		<1	10	0	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Asbestos																			
Asbestos in soil						2	0	2		NAD							NAD		
Petroleum Hydrocarbons																			
Ali >C5-C6	mg/kg	3200	304		<0.01	1	0	1							<0.01				
Ali >C6-C8	mg/kg	7800	144		<0.01	1	0	1							<0.01				
Ali >C8-C10	mg/kg	2000	78		<1	1	0	1							<1				
Ali >C10-C12	mg/kg	9700	48		<1	1	0	1							<1				
Ali >C12-C16	mg/kg	59000	24		<1	1	0	1							<1				
Ali >C16-C21	mg/kg				<1	1	0	1							<1				
Ali >C21-C35	mg/kg				<1	1	0	1							<1				
Ali >C16-C35 calculated	mg/kg	1000000			<1	1	0	1							<1				
Total Aliphatics	mg/kg				<1	1	0	1							<1				
Aro >C5-C7	mg/kg				<0.01	1	0	1							<0.01				
Aro >C7-C8	mg/kg				<0.01	1	0	1							<0.01				
Aro >C8-C10	mg/kg	3500	613		<1	1	0	1							<1				
Aro >C10-C12	mg/kg	16000	364		<1	1	0	1							<1				
Aro >C12-C16	mg/kg	36000	169		<1	1	0	1							<1				
Aro >C16-C21	mg/kg	28000			<1	1	0	1							<1				
Aro >C21-C35	mg/kg	28000			<1	1	0	1							<1				
Total Aromatics	mg/kg				<1	1	0	1							<1				

									Lab sample ID	24/10504/1	24/10272/3	24/10272/4	24/10272/6	24/10272/7	24/10272/1	24/10272/2	24/10272/5	24/10272/8	24/10272/9
									Client sample ID	RBH302	WS301	WS301	WS302	WS302	WS303	WS303	WS304	WS305	WS305
									Depth to top	0.5	0.3	2	0.6	1.8	0.55	2	1	0.15	0.8
									Depth to bottom	0.7	0.6		0.8	2	0.8			0.65	1
									Date sampled	28/10/24	21/10/24	21/10/24	22/10/24	22/10/24	21/10/24	21/10/24	22/10/24	22/10/24	22/10/24
Analyte	Unit	GAC	T1	Max	Min	Count	# Detects	# Non-detects											
TPH (Ali & Aro)	mg/kg				<1	1	0	1							<1				
BTEX - Benzene	mg/kg	27			<0.01	1	0	1							<0.01				
BTEX - Toluene	mg/kg	56000	869		<0.01	1	0	1							<0.01				
BTEX - Ethyl Benzene	mg/kg	6000	518		<0.01	1	0	1							<0.01				
BTEX - o Xylene	mg/kg	6600	478		<0.01	1	0	1							<0.01				
BTEX - m & p Xylene	mg/kg	5900	576		<0.01	1	0	1							<0.01				
BTEX Total (from VOC)	mg/kg				<0.001	1	0	1							<0.001				
EPH Total Ali & Aro (>C10-C16)	mg/kg				<1	1	0	1							<1				
EPH Total Ali & Aro (>C16-C35)	mg/kg				<1	1	0	1							<1				
EPH Total Ali & Aro (>C8-C10)	mg/kg				<1	1	0	1							<1				
VPH total (>C5-C8)	mg/kg				<0.01	1	0	1							<0.01				
Fuel oxygenates																			
MTBE	mg/kg	7500			<0.01	1	0	1							<0.01				
TAME	mg/kg				<0.1	1	0	1							<0.1				
Polycyclic aromatic hydrocarbons																			
Acenaphthene	mg/kg	110000			<0.01	10	0	10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	mg/kg	110000			<0.01	10	0	10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	mg/kg	520000			<0.02	10	0	10	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Benzo(a)anthracene	mg/kg	170			<0.04	10	0	10	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Benzo(a)pyrene	mg/kg	77			<0.04	10	0	10	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Benzo(b)fluoranthene	mg/kg	44			<0.05	10	0	10	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(ghi)perylene	mg/kg	3900			<0.05	10	0	10	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	mg/kg	1200			<0.07	10	0	10	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07
Chrysene	mg/kg	350			<0.06	10	0	10	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Dibenzo(ah)anthracene	mg/kg	3.5			<0.04	10	0	10	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Fluoranthene	mg/kg	23000			<0.08	10	0	10	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Fluorene	mg/kg	63000	31		<0.01	10	0	10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(123-cd)pyrene	mg/kg	500			<0.03	10	0	10	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Naphthalene	mg/kg	1800	76		<0.03	10	0	10	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Phenanthrene	mg/kg	22000		0.04	<0.03	10	1	9	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.04	<0.03
Pyrene	mg/kg	54000			<0.07	10	0	10	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07
Total PAH-16MS	mg/kg				<0.08	10	0	10	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Polycyclic aromatic hydrocarbons (SVOC)																			
Acenaphthene	mg/kg	110000			<0.1	1	0	1							<0.1				
Acenaphthylene	mg/kg	110000			<0.1	1	0	1							<0.1				
Anthracene	mg/kg	520000			<0.1	1	0	1							<0.1				
Benzo(a)anthracene	mg/kg	170			<0.1	1	0	1							<0.1				
Benzo(a)pyrene	mg/kg	77			<0.1	1	0	1							<0.1				
Benzo(b)fluoranthene	mg/kg	44			<0.1	1	0	1							<0.1				
Benzo(ghi)perylene	mg/kg	3900			<0.1	1	0	1							<0.1				
Benzo(k)fluoranthene	mg/kg	1200			<0.1	1	0	1							<0.1				
Chrysene	mg/kg	350			<0.1	1	0	1							<0.1				
Dibenzo(ah)anthracene	mg/kg	3.5			<0.1	1	0	1							<0.1				
Fluoranthene	mg/kg	23000			<0.1	1	0	1							<0.1				
Fluorene	mg/kg	63000	31		<0.1	1	0	1							<0.1				
Hexachlorobutadiene	mg/kg				<0.1	1	0	1							<0.1				
Indeno(1,2,3-cd)pyrene	mg/kg	500			<0.1	1	0	1							<0.1				
Naphthalene	mg/kg	1800	76		<0.1	1	0	1							<0.1				
Phenanthrene	mg/kg	22000			<0.1	1	0	1							<0.1				
Pyrene	mg/kg	54000			<0.1	1	0	1							<0.1				
Volatile Organic Compounds (VOC)																			

									Lab sample ID	24/10504/1	24/10272/3	24/10272/4	24/10272/6	24/10272/7	24/10272/1	24/10272/2	24/10272/5	24/10272/8	24/10272/9
									Client sample ID	RBH302	WS301	WS301	WS302	WS302	WS303	WS303	WS304	WS305	WS305
									Depth to top	0.5	0.3	2	0.6	1.8	0.55	2	1	0.15	0.8
									Depth to bottom	0.7	0.6		0.8	2	0.8			0.65	1
									Date sampled	28/10/24	21/10/24	21/10/24	22/10/24	22/10/24	21/10/24	21/10/24	22/10/24	22/10/24	22/10/24
Analyte	Unit	GAC	T1	Max	Min	Count	# Detects	# Non-detects											
1,1,1-Trichloroethane	mg/kg	700			<0.001	1	0	1							<0.001				
1,1,2,2-Tetrachloroethane	mg/kg	270			<0.001	1	0	1							<0.001				
1,1,2-Trichloroethane	mg/kg	89			<0.001	1	0	1							<0.001				
1,1-Dichloroethane	mg/kg				<0.001	1	0	1							<0.001				
1,1-Dichloroethene	mg/kg	24			<0.001	1	0	1							<0.001				
1,1-Dichloropropene	mg/kg				<0.001	1	0	1							<0.001				
1,2,3-Trichlorobenzene	mg/kg				<0.003	1	0	1							<0.003				
1,2,3-Trichloropropane	mg/kg				<0.001	1	0	1							<0.001				
1,2,4-Trichlorobenzene	mg/kg				<0.1	1	0	1							<0.1				
1,2,4-Trichlorobenzene	mg/kg				<0.003	1	0	1							<0.003				
1,2,4-Trimethylbenzene	mg/kg	330			<0.001	1	0	1							<0.001				
1,2-Dibromo-3-chloropropane	mg/kg				<0.002	1	0	1							<0.002				
1,2-Dibromoethane	mg/kg				<0.001	1	0	1							<0.001				
1,2-Dichlorobenzene	mg/kg				<0.1	1	0	1							<0.1				
1,2-Dichlorobenzene	mg/kg				<0.001	1	0	1							<0.001				
1,2-Dichloroethane	mg/kg	0.67			<0.002	1	0	1							<0.002				
1,2-Dichloropropane	mg/kg	3			<0.001	1	0	1							<0.001				
1,3,5-Trimethylbenzene	mg/kg	330			<0.001	1	0	1							<0.001				
1,3-Dichlorobenzene	mg/kg				<0.1	1	0	1							<0.1				
1,3-Dichlorobenzene	mg/kg				<0.001	1	0	1							<0.001				
1,3-Dichloropropane	mg/kg				<0.001	1	0	1							<0.001				
1,4-Dichlorobenzene	mg/kg				<0.1	1	0	1							<0.1				
1,4-Dichlorobenzene	mg/kg				<0.001	1	0	1							<0.001				
2,2-Dichloropropane	mg/kg				<0.001	1	0	1							<0.001				
2-Chlorotoluene	mg/kg				<0.001	1	0	1							<0.001				
4-Chlorotoluene	mg/kg				<0.001	1	0	1							<0.001				
4-Isopropyltoluene	mg/kg				<0.001	1	0	1							<0.001				
Benzene	mg/kg	27			<0.001	1	0	1							<0.001				
Bromobenzene	mg/kg				<0.001	1	0	1							<0.001				
Bromochloromethane	mg/kg				<0.005	1	0	1							<0.005				
Bromodichloromethane	mg/kg				<0.01	1	0	1							<0.01				
Bromoform	mg/kg				<0.003	1	0	1							<0.003				
Bromomethane	mg/kg				<0.001	1	0	1							<0.001				
Carbon Disulphide	mg/kg				<0.001	1	0	1							<0.001				
Carbon Tetrachloride	mg/kg	2.9			<0.001	1	0	1							<0.001				
Chlorobenzene	mg/kg				<0.001	1	0	1							<0.001				
Chloroethane	mg/kg	901			<0.001	1	0	1							<0.001				
Chloroform	mg/kg				<0.001	1	0	1							<0.001				
Chloromethane	mg/kg	1			<0.01	1	0	1							<0.01				
cis 1,2-Dichloroethene	mg/kg	14			<0.001	1	0	1							<0.001				
cis 1,3-Dichloropropene	mg/kg				<0.001	1	0	1							<0.001				
Dibromochloromethane	mg/kg				<0.003	1	0	1							<0.003				
Dibromomethane	mg/kg				<0.001	1	0	1							<0.001				
Dichlorodifluoromethane	mg/kg				<0.001	1	0	1							<0.001				
Dichloromethane	mg/kg	257			<0.005	1	0	1							<0.005				
Ethylbenzene	mg/kg	6000	518		<0.001	1	0	1							<0.001				
Hexachlorobutadiene	mg/kg				<0.001	1	0	1							<0.001				
Isopropylbenzene	mg/kg				<0.001	1	0	1							<0.001				
m & p Xylene	mg/kg	5900	576		<0.001	1	0	1							<0.001				
n-Butylbenzene	mg/kg				<0.001	1	0	1							<0.001				
n-Propylbenzene	mg/kg				<0.001	1	0	1							<0.001				

									Lab sample ID	24/10504/1	24/10272/3	24/10272/4	24/10272/6	24/10272/7	24/10272/1	24/10272/2	24/10272/5	24/10272/8	24/10272/9
									Client sample ID	RBH302	WS301	WS301	WS302	WS302	WS303	WS303	WS304	WS305	WS305
									Depth to top	0.5	0.3	2	0.6	1.8	0.55	2	1	0.15	0.8
									Depth to bottom	0.7	0.6		0.8	2	0.8			0.65	1
									Date sampled	28/10/24	21/10/24	21/10/24	22/10/24	22/10/24	21/10/24	21/10/24	22/10/24	22/10/24	22/10/24
Analyte	Unit	GAC	T1	Max	Min	Count	# Detects	# Non-detects											
o-Xylene	mg/kg	6600	478		<0.001	1	0	1							<0.001				
sec-Butylbenzene	mg/kg				<0.001	1	0	1							<0.001				
Styrene	mg/kg				<0.001	1	0	1							<0.001				
tert-Butylbenzene	mg/kg				<0.002	1	0	1							<0.002				
Tetrachloroethene	mg/kg	24			<0.001	1	0	1							<0.001				
Toluene	mg/kg	56000	869		<0.001	1	0	1							<0.001				
trans 1,2-Dichloroethene	mg/kg	21			<0.001	1	0	1							<0.001				
trans 1,3-Dichloropropene	mg/kg				<0.001	1	0	1							<0.001				
Trichloroethene	mg/kg	0.7			<0.001	1	0	1							<0.001				
Trichlorofluoromethane	mg/kg				<0.001	1	0	1							<0.001				
Vinyl Chloride	mg/kg	1.1			<0.001	1	0	1							<0.001				
Semi-Volatile Organic Compounds (SVOC)																			
2,4,5-Trichlorophenol	mg/kg				<0.1	1	0	1							<0.1				
2,4,6-Trichlorophenol	mg/kg				<0.1	1	0	1							<0.1				
2,4-Dichlorophenol	mg/kg				<0.1	1	0	1							<0.1				
2,4-Dimethylphenol	mg/kg				<0.1	1	0	1							<0.1				
2,4-Dinitrotoluene	mg/kg				<0.1	1	0	1							<0.1				
2,6-Dinitrotoluene	mg/kg				<0.1	1	0	1							<0.1				
2-Chloronaphthalene	mg/kg	370	114		<0.1	1	0	1							<0.1				
2-Chlorophenol	mg/kg				<0.1	1	0	1							<0.1				
2-Methylnaphthalene	mg/kg				<0.1	1	0	1							<0.1				
2-Methylphenol	mg/kg				<0.1	1	0	1							<0.1				
2-Nitrophenol	mg/kg				<0.1	1	0	1							<0.1				
4-Chloro-3-methylphenol	mg/kg				<0.1	1	0	1							<0.1				
4-Methylphenol	mg/kg				<0.1	1	0	1							<0.1				
4-Nitrophenol	mg/kg				<0.1	1	0	1							<0.1				
Bis(2-chloroethoxy)methane	mg/kg				<0.1	1	0	1							<0.1				
Bis(2-chloroethyl)ether	mg/kg				<0.1	1	0	1							<0.1				
Bis(2-chloroisopropyl)ether	mg/kg				<0.1	1	0	1							<0.1				
Bis(2-ethylhexyl)phthalate	mg/kg				<0.5	1	0	1							<0.5				
Butylbenzyl phthalate	mg/kg				<0.1	1	0	1							<0.1				
Carbazole	mg/kg				<0.1	1	0	1							<0.1				
Dibenzofuran	mg/kg				<0.1	1	0	1							<0.1				
Diethyl phthalate	mg/kg				<0.1	1	0	1							<0.1				
Dimethyl phthalate	mg/kg				<0.1	1	0	1							<0.1				
Hexachlorobenzene	mg/kg				<0.1	1	0	1							<0.1				
Hexachloroethane	mg/kg	21	8		<0.1	1	0	1							<0.1				
Isophorone	mg/kg				<0.1	1	0	1							<0.1				
n-Dibutylphthalate	mg/kg				<0.1	1	0	1							<0.1				
n-Dioctylphthalate	mg/kg				<0.5	1	0	1							<0.5				
Nitrobenzene	mg/kg				<0.1	1	0	1							<0.1				
n-Nitroso-n-dipropylamine	mg/kg				<0.1	1	0	1							<0.1				
Pentachlorophenol	mg/kg				<0.1	1	0	1							<0.1				
Perylene	mg/kg				<0.1	1	0	1							<0.1				
Phenols																			
Phenol	mg/kg	440			<0.1	1	0	1							<0.1				
Phenols - Total by HPLC	mg/kg	440			<0.2	10	0	10	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Phenols - Total by HPLC	mg/kg	440			<0.2	10	0	10	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Other analytes																			
% Moisture	% w/w			16.5	6.4	10	10	0	15.9	7.6	10.1	12.6	11.4	9.2	11.9	16.5	6.4	12.3	
% Stones >10mm	% w/w			36	<0.1	10	5	5	<0.1	18.9	<0.1	<0.1		3.5	2.4	2.4	<0.1	36	<0.1

									Lab sample ID	24/10504/1	24/10272/3	24/10272/4	24/10272/6	24/10272/7	24/10272/1	24/10272/2	24/10272/5	24/10272/8	24/10272/9
									Client sample ID	RBH302	WS301	WS301	WS302	WS302	WS303	WS303	WS304	WS305	WS305
									Depth to top	0.5	0.3	2	0.6	1.8	0.55	2	1	0.15	0.8
									Depth to bottom	0.7	0.6		0.8	2	0.8			0.65	1
									Date sampled	28/10/24	21/10/24	21/10/24	22/10/24	22/10/24	21/10/24	21/10/24	22/10/24	22/10/24	22/10/24
Analyte	Unit	GAC	T1	Max	Min	Count	# Detects	# Non-detects											
4-Bromophenyl phenyl ether	mg/kg				<0.1	1	0	1							<0.1				
BTEX and MTBE Total	mg/kg				<0.01	1	0	1							<0.01				
Cresol & Chlorinated Phenol Total	mg/kg				<0.1	1	0	1							<0.1				
Electrical conductivity @ 20degC	µs/cm			661	661	1	1	0							661				
Ethers Total (from SVOC)	mg/kg				<0.1	1	0	1							<0.1				
Fraction of organic carbon	N/A			0.01	0.0008	10	10	0	0.0031	0.0022	0.01	0.0009	0.0046	0.0014	0.0079	0.003	0.0047	0.0008	
pH	pH			9.53	7.89	10	10	0	7.89	9.53	8.59	8.25	8.29	8.32	8.93	8.27	8.82	8.33	
pH BRE	pH			8.93	8.27	3	3	0			8.59				8.93	8.27			
Phenols Total (from SVOC)	mg/kg				<0.1	1	0	1							<0.1				
Redox Potential (water soluble)	mV			172	172	1	1	0							172				
Sulphate BRE (acid sol)	% w/w				<0.02	3	0	3			<0.02				<0.02	<0.02			
Sulphate BRE (total potential)	% w/w			0.12	<0.03	3	1	2			0.12				<0.03	<0.03			
Sulphur BRE (total)	% w/w			0.04	<0.01	3	1	2			0.04				<0.01	<0.01			
SVOC Total (excl. PAH/Phenols/Cresols and Chlorophenols)	mg/kg				<0.1	1	0	1							<0.1				
SVOC Total (excl. PAH/Phenols/Cresols/Chlorophenols/Ethers/PAHs)	mg/kg				<0.1	1	0	1							<0.1				
VOC Total (excl. BTEX)	mg/kg				<0.01	1	0	1							<0.01				

Notes for GQRA (soil) Screening Tool Output		
1		Details of the GAC (landuse, SOM and GAC version) used in the GQRA are displayed at the top of the output screening sheet
2		Full details of the GAC derivation are included in a separate appendix document
3		The output screening sheet presents the reported Total Organic Carbon and the corresponding calculated Soil Organic Matter, using a conversion of TOC (%) divided by 0.58 to compute the SOM
4		Any laboratory results that are appended to the reported concentrations (e.g. Tentatively Identified Compounds, PAH Double Ratio Plots etc.) are not included in the output screening sheet.
	T1	First level screening threshold, equating to:
5		Chromium: total Cr concentration compared to Cr VI (conservative assessment)
		Chromium: total Cr concentration compared to Cr III
	<i>Comment</i>	Where Cr VI has been reported, the CrVI results are compared directly to the CrVI GAC
6		Mercury : total Hg concentration compared to elemental Hg (conservative assessment)
		Mercury : total Hg concentration compared to inorganic Hg
	<i>Comment</i>	The tool does not screen against methyl mercury (this parameter is only reported if mercury has been speciated)
7		Petroleum Hydrocarbons: The soil saturation limit has been exceeded
		Petroleum Hydrocarbons: The modelled GAC has been exceeded
	<i>Comment</i>	RSK has adopted an approach for petroleum hydrocarbons whereby the concentration modelled for each petroleum hydrocarbon fraction has been tabulated as the GAC with the corresponding solubility or vapour saturation limits given in brackets on the GAC appendix document. First level (T1) GQRA screening is against the soil saturation limit.
8		Free cyanide: Conservatively for sites where a child is the critical receptor, concentration compared to the SoBRA (2019) acute GAC for free CN
	<i>Comment</i>	Only applicable where the acute GAC of 24mg/kg for a child as the critical receptor is lower than the chronic GAC i.e. Residential without home-grown produce, POS Parks, POS Resi, Primary School and Secondary School land uses
9		Total cyanide: total CN compared to GAC for free CN or the SoBRA (2019) acute GAC for free CN (whichever is lowest)
	<i>Comment</i>	There is no GAC for total CN (risks are driven by free CN) therefore the first level GQRA screening is against free CN and no other screening is undertaken. For end uses where the critical receptor is a child the T1 is set at the acute GAC for free CN. Only applicable where the acute GAC of 24mg/kg is lower than the chronic GAC. The assumption that cyanide total comprises 100% free CN is conservative and consideration should be made on the suitability of this GAC based on the CSM.
10		Any analyte: First level screening threshold (T1) or GAC may be exceeded (e.g. lab results include a < or > symbol)
11		The GQRA screening for asbestos is in relation to presence or absence ('detect'). Presence is reported as asbestos type or quantification >0.001%. Absence is reported as < limit of quantification of 0.001% or No Asbestos Detected (NAD).
12		Where <u>individual</u> reported concentrations are presented in grey (not black) font, the result was below the laboratory method detection limit.
13		Where cells are shaded grey, <u>all</u> results for that analyte are below the laboratory method detection limit



COMPLEX CHALLENGES ...
MADE SIMPLE

APPENDIX I – GQRA SCREENING TABLES (WATER)





COMPLEX CHALLENGES ...
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APPENDIX J - WASTE ASSESSMENT DATA

Final Test Report

Envirolab Job Number: 24/10272
Issue Number: 1

Date: 30-Oct-24

Client: ROCP LIMITED
Commercial Wharf 6 Commercial Street
Castlefield
Manchester
M15 4PZ
Wakefield, WF2 0XJ

Project Manager: Reece McGuinness
Project Name: Plot H5 Manc Airport
Project Ref: 4700
Order No: PBJ20371

Date Samples Received: 23-Oct-24
Date Instructions Received: 24-Oct-24
Date Analysis Completed: 30-Oct-24

Notes - Soil analysis

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones >10mm are removed or excluded from the sample prior to analysis and reported results corrected to a whole sample basis.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis.

Notes - General

This report shall not be reproduced, except in full, without written approval from Envirolab.

Subscript "A" indicates analysis performed on the sample as received. "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve, unless asbestos is found to be present in which case all analysis is performed on the sample as received.

All analysis is performed on the dried and crushed sample for samples with Matrix Code 7 and this supercedes any "A" subscripts.

All analysis is performed on the sample as received for soil samples from outside the European Union and this supercedes any "D" subscripts

For complex, multi-compound analysis, quality control results do not always fall within chart limits for every compound and we have criteria for reporting in these situations.

If results are in italic font they are associated with such quality control failures and may be 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

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

Secondary Matrix Codes: A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

IS indicates Insufficient sample for analysis, NDP indicates No Determination Possible and NAD indicates No Asbestos Detected.

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.

Please contact us if you need any further information.

HWOL TPH Code: EH_CU_1D_AL: Extractable hydrocarbons - i.e. everything extracted by the solvent(s), Clean-up - e.g. by florisil, silica gel, GC - Single coil gas chromatography, Aliphatics only

Approved by:



Richard Wong
Client Manager

Sample Details								
Lab Sample ID	Method	ISO17025	MCERTS	24/10272/4	Landfill Waste Acceptance Criteria Limits			
Client Sample Number					Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill	
Client Sample ID				WS301				
Depth to Top				2				
Depth to Bottom								
Date Sampled				21/10/2024				
Sample Type				Soil				
Sample Matrix Code				3A				
Solid Waste Analysis								
pH (pH Units) _D	A-T-031	N	N	8.59		-	>6	-
ANC to pH 4 (mol/kg) _D	A-T-ANC	N	N	0.15		-	to be evaluated	to be evaluated
ANC to pH 6 (mol/kg) _D	A-T-ANC	N	N	0.12		-	to be evaluated	to be evaluated
Loss on Ignition (%) _D	A-T-030	N	N	2.2		-	-	10
Total Organic Carbon (%) _D	A-T-032	N	N	1		3	5	6
PAH Sum of 17 (mg/kg) _A	A-T-019	N	N	<0.08		100	-	-
Mineral Oil (mg/kg) _{A EH_CU_1D_AL}	A-T-007	N	N	<10		500	-	-
Sum of 7 PCBs (mg/kg) _A	A-T-004	N	N	<0.007		1	-	-
Sum of BTEX (mg/kg) _A	A-T-022	N	N	<0.01		6	-	-
Eluate Analysis				10:1 mg/l	10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic	A-T-025	N	N	<0.001	<0.01	0.5	2	25
Barium	A-T-025	N	N	0.027	0.270	20	100	300
Cadmium	A-T-025	N	N	<0.001	<0.01	0.04	1	5
Chromium	A-T-025	N	N	<0.001	<0.01	0.5	10	70
Copper	A-T-025	N	N	<0.004	<0.04	2	50	100
Mercury	A-T-025	N	N	<0.0005	<0.005	0.01	0.2	2
Molybdenum	A-T-025	N	N	<0.001	<0.01	0.5	10	30
Nickel	A-T-025	N	N	<0.002	<0.02	0.4	10	40
Lead	A-T-025	N	N	<0.001	<0.01	0.5	10	50
Antimony	A-T-025	N	N	<0.001	<0.01	0.06	0.7	5
Selenium	A-T-025	N	N	<0.001	<0.01	0.1	0.5	7
Zinc	A-T-025	N	N	0.005	0.050	4	50	200
Chloride	A-T-026	N	N	2	24	800	15000	25000
Fluoride	A-T-026	N	N	<0.10	<1	10	150	500
Sulphate as SO ₄	A-T-026	N	N	<1.00	<10	1000	20000	50000
Total Dissolved Solids	A-T-035	N	N	43	430	4000	60000	100000
Phenol Index	A-T-050	N	N	<0.01	<0.1	1	-	-
Dissolved Organic Carbon	A-T-032	N	N	<2.0	<200	500	800	1000
Leach Test Information								
pH (pH Units)	A-T-031	N	N	7.6				
Conductivity (µS/cm)	A-T-037	N	N	85				
Mass Sample (kg)				0.191				
Dry Matter (%)	A-T-044	N	N	91.5				
Stated acceptance limits are for guidance only and Envirolab cannot be held responsible for any discrepancies with current legislation								

Sample Details								
Lab Sample ID	Method	ISO17025	MCERTS	24/10272/8				
					Landfill Waste Acceptance Criteria Limits			
Client Sample Number					Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill	
Client Sample ID				WS305				
Depth to Top				0.15				
Depth to Bottom				0.65				
Date Sampled				22/10/2024				
Sample Type				Soil				
Sample Matrix Code				4A				
Solid Waste Analysis								
pH (pH Units) _D	A-T-031	N	N	8.82		-	>6	-
ANC to pH 4 (mol/kg) _D	A-T-ANC	N	N	0.05		-	to be evaluated	to be evaluated
ANC to pH 6 (mol/kg) _D	A-T-ANC	N	N	0.03		-	to be evaluated	to be evaluated
Loss on Ignition (%) _D	A-T-030	N	N	2		-	-	10
Total Organic Carbon (%) _D	A-T-032	N	N	0.47		3	5	6
PAH Sum of 17 (mg/kg) _A	A-T-019	N	N	<0.08		100	-	-
Mineral Oil (mg/kg) _{A EH_CU_1D_AL}	A-T-007	N	N	12		500	-	-
Sum of 7 PCBs (mg/kg) _A	A-T-004	N	N	<0.007		1	-	-
Sum of BTEX (mg/kg) _A	A-T-022	N	N	<0.01		6	-	-
Eluate Analysis				10:1 mg/l	10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic	A-T-025	N	N	<0.001	<0.01	0.5	2	25
Barium	A-T-025	N	N	0.006	0.060	20	100	300
Cadmium	A-T-025	N	N	<0.001	<0.01	0.04	1	5
Chromium	A-T-025	N	N	<0.001	<0.01	0.5	10	70
Copper	A-T-025	N	N	<0.004	<0.04	2	50	100
Mercury	A-T-025	N	N	<0.0005	<0.005	0.01	0.2	2
Molybdenum	A-T-025	N	N	0.001	0.010	0.5	10	30
Nickel	A-T-025	N	N	<0.002	<0.02	0.4	10	40
Lead	A-T-025	N	N	<0.001	<0.01	0.5	10	50
Antimony	A-T-025	N	N	<0.001	<0.01	0.06	0.7	5
Selenium	A-T-025	N	N	<0.001	<0.01	0.1	0.5	7
Zinc	A-T-025	N	N	0.008	0.080	4	50	200
Chloride	A-T-026	N	N	<1.00	<10	800	15000	25000
Fluoride	A-T-026	N	N	0.3	3.0	10	150	500
Sulphate as SO ₄	A-T-026	N	N	<1.00	<10	1000	20000	50000
Total Dissolved Solids	A-T-035	N	N	32	320	4000	60000	100000
Phenol Index	A-T-050	N	N	<0.01	<0.1	1	-	-
Dissolved Organic Carbon	A-T-032	N	N	<2.0	<200	500	800	1000
Leach Test Information								
pH (pH Units)	A-T-031	N	N	7.9				
Conductivity (µS/cm)	A-T-037			63				
Mass Sample (kg)				0.187				
Dry Matter (%)	A-T-044	N	N	93.7				
Stated acceptance limits are for guidance only and Envirolab cannot be held responsible for any discrepancies with current legislation								



Haswaste, developed by Dr. Iain Haslock.
Maintained by RSK Waste & Resources

Chemical Testing Laboratory and Report Ref(s):

Please enter available data in the rows associated with the test (grey) cells. Calculation cells initially display either "0.0000" or "N/DIV/0!".
If any calculation cells below state "0.00000", testing has NOT been undertaken that contributes to that Hazardous Property.

Sample Reference
Depth (m)
Envirolab reference
% Moisture %

pH (soil)
pH (leachate)
Arsenic mg/kg

Cadmium mg/kg

Copper mg/kg

CrVI or Chromium mg/kg

Lead mg/kg

Mercury mg/kg

Nickel mg/kg

Selenium mg/kg

Zinc mg/kg

Barium mg/kg

Beryllium mg/kg

Vanadium mg/kg

Cobalt mg/kg

Manganese mg/kg

Molybdenum mg/kg

Antimony mg/kg

Aluminium mg/kg

Bismuth mg/kg

CrIII mg/kg

Iron mg/kg

Strontium mg/kg

Tellurium mg/kg

Thallium mg/kg

Titanium mg/kg

Tungsten mg/kg

Ammoniacal N mg/kg

ws Boron mg/kg

PAH (Input Total PAH OR individual PAH results)
Acenaphthene mg/kg

Acenaphthylene mg/kg

Anthracene mg/kg

Benzo(a)anthracene mg/kg

Benzo(a)pyrene mg/kg

Benzo(b)fluoranthene mg/kg

Benzo(k)fluoranthene mg/kg

Chrysene mg/kg

Dibenzo(ah)anthracene mg/kg

Fluoranthene mg/kg

Fluorene mg/kg

Indeno(123cd)pyrene mg/kg

Naphthalene mg/kg

Phenanthrene mg/kg

Pyrene mg/kg

Coronene mg/kg

Total PAHs (16 or 17) mg/kg

TPH
Petrol mg/kg

Diesel mg/kg

Lube Oil mg/kg

Crude Oil
White Spirit / Kerosene mg/kg

Creosote mg/kg

Unknown TPH with ID mg/kg

Unknown TPH with ID -
(ID Source indicates a mixture of sources
including petrol/diesel) mg/kg

Unknown TPH without ID mg/kg

Assessment Undertaken by:	Reece McGuinness	RSK Project Reference	4770
Assessment Checked by:	Alex Smiles	Site Reference	-

WS303	WS303	WS301	WS301	WS304	WS302	WS302	WS305	WS305	RBH302
0.55	2.00	0.30	2.00	1.00	0.60	1.80	0.15	0.80	0.50

9.2	11.9	7.6	10.1	16.5	12.6	11.4	6.4	12.3	15.9
8.32	8.93	9.53	8.59	8.27	8.25	8.29	8.82	8.33	7.89

1.0	1.0	1.0	3.0	3.0	1.0	1.0	1.0	1.0	3.0
0.5	0.5	0.5	0.5	0.5	0.7	0.5	0.5	0.5	0.5
2.0	13.0	4.0	36.0	14.0	4.0	13.0	12.0	5.0	16.0
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1.0	5.0	4.0	5.0	6.0	3.0	5.0	12.0	3.0	7.0
0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
5.0	19.0	8.0	19.0	24.0	6.0	14.0	17.0	8.0	26.0
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
9.0	32.0	37.0	31.0	30.0	10.0	27.0	45.0	10.0	33.0

11.0	54.0	35.0	55.0	125.0	19.0	40.0	69.0	20.0	116.0
0.5	0.8	0.5	0.8	1.4	0.5	0.8	0.5	0.5	1.3
8.0	20.0	6.0	20.0	27.0	7.0	15.0	13.0	9.0	28.0

1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0

6.0	20.0	8.0	19.0	25.0	7.0	15.0	15.0	8.0	27.0
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07

1.0									



Haswaste, developed by Dr. Iain Haslock.
Maintained by RSK Waste & Resources

Assessment Undertaken by:	Reece McGuinness	RSK Project Reference	4770
Assessment Checked by:	Alex Smiles	Site Reference	-

Chemical Testing Laboratory and Report Ref(s):

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If any calculation cells below state "0.00000", testing has NOT been undertaken that contributes to that Hazardous Property.

Sample Reference

Depth (m)

Envirolab reference

WS303	WS303	WS301	WS301	WS304	WS302	WS302	WS305	WS305	RBH302
0.55	2.00	0.30	2.00	1.00	0.60	1.80	0.15	0.80	0.50

Cyanide/Sulphur compounds:

Total Sulphide	mg/kg
Complex Cyanide	mg/kg
Free (or Total) Cyanide	mg/kg
Thiocyanate	mg/kg
Elemental/Free Sulphur	mg/kg

Phenols Input Total Phenols HPLC OR individual Phenol results.

Phenol	mg/kg
Cresols	mg/kg
Xylenols	mg/kg
Resorcinol	mg/kg
Phenols Total by HPLC	mg/kg

BTEX Input Total BTEX OR individual BTEX results.

Benzene	mg/kg
Toluene	mg/kg
Ethylbenzene	mg/kg
Xylenes	mg/kg
Total BTEX	mg/kg

PCBs (POPs)

PCBs Total (eq EC7/WHO12)	mg/kg
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PBBs (POPs)

Hexabromobiphenyl (Total or PBB153; 2,2',4,4',5,5'- if only available)	mg/kg
--	-------

PFOS (POPs)

PFOS and PFOS derivatives	mg/kg
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PBDEs (POPs)

PBDEs (sum of concentrations):	
--------------------------------	--

POPs Dioxins and Furans Input Total Dioxins and Furans OR individual Dioxin and Furan results.

2,3,7,8-TeCDD	mg/kg
1,2,3,7,8-PeCDD	mg/kg
1,2,3,4,7,8-HxCDD	mg/kg
1,2,3,6,7,8-HxCDD	mg/kg
1,2,3,7,8,9-HxCDD	mg/kg
1,2,3,4,6,7,8-HpCDD	mg/kg
OCDD	mg/kg
2,3,7,8-TeCDF	mg/kg
1,2,3,7,8-PeCDF	mg/kg
2,3,4,7,8-PeCDF	mg/kg
1,2,3,4,7,8-HxCDF	mg/kg
1,2,3,6,7,8-HxCDF	mg/kg
2,3,4,6,7,8-HxCDF	mg/kg
1,2,3,7,8,9-HxCDF	mg/kg
1,2,3,4,6,7,8-HpCDF	mg/kg
OCDF	mg/kg
Total Dioxins and Furans	mg/kg



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Assessment Undertaken by:	Reece McGuinness	RSK Project Reference	4770
Assessment Checked by:	Alex Smiles	Site Reference	-

Chemical Testing Laboratory and Report Ref(s):

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Sample Reference

Depth (m)

Envirolab reference

Some Pesticides (POPs unless otherwise stated)

Aldrin	mg/kg
α Hexachlorocyclohexane (alpha-HCH) (leave empty if total HCH results used)	mg/kg
β Hexachlorocyclohexane (beta-HCH) (leave empty if total HCH results used)	mg/kg
α Cis-Chlordane (alpha) OR Total Chlordane	mg/kg
δ Hexachlorocyclohexane (delta-HCH) (leave empty if total HCH results used)	mg/kg
Dieldrin	mg/kg
Endrin	mg/kg
γ Hexachlorocyclohexane (gamma-HCH) (lindane) OR Total HCH	mg/kg
Heptachlor	mg/kg
Hexachlorobenzene	mg/kg
o,p'-DDT (leave empty if total DDT results used)	mg/kg
p,p'-DDT OR Total DDT	mg/kg
γ Trans-Chlordane (gamma) (leave empty if total Chlordane results used)	mg/kg
Chlordecone (kepone)	mg/kg
Pentachlorobenzene	mg/kg
Mirex	mg/kg
Toxaphene (camphechlor)	mg/kg

Tin

Tin (leave empty if Organotin and Tin excl Organotin results used)

Organotin

Dibutyltin; DIBT

Tributyltin; TriBT

Triphenyltin; TriPT

Tetrabutyltin; TeBT

Tin excluding Organotin

Tin excl Organotin

Asbestos in Soil

Asbestos detected in Soil (enter Y or N)

Asbestos % Composition in Soil (Matrix Loose Fibres or Microscopic Identifiable Pieces only)

Carcinogenic HP7 % Asbestos in Soil (fibres or micro pieces)

Please be advised, if the calculation cell is "0.00000" DOES NOT MEAN asbestos testing has been undertaken and the result is zero.

Asbestos Identifiable Pieces visible with the naked eye detected in the Soil (enter Y or N)

WS303	WS303	WS301	WS301	WS304	WS302	WS302	WS305	WS305	RBH302
0.55	2.00	0.30	2.00	1.00	0.60	1.80	0.15	0.80	0.50

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

		N					N		
--	--	---	--	--	--	--	---	--	--

If Asbestos in Soil above is "Y", the soil is Hazardous Waste HP5 and HP7

0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

If Asbestos in Soil above is "Y", but Asbestos % above is "<0.1%", the soil is Non Hazardous Waste. You can only use Asbestos % results where loose fibres or micro pieces are only present. You cannot use Asbestos % results when visual identifiable pieces are present.

--	--	--	--	--	--	--	--	--	--

If visual identifiable pieces of asbestos are present, you cannot use Asbestos % results, and the whole soil sample is Hazardous Waste HP5 and HP7 Construction material containing Asbestos 17 06 05. Therefore, if Asbestos in Soil above is "Y", the Asbestos % above is "<0.1%", but the Asbestos Identifiable Pieces visible with the naked eye is "Y", the soil is Hazardous Waste.

Identifiable Pieces are Cement, Fragments, Board, Rope etc. ie anything ACM that is not Loose Fibres.

All visual asbestos pieces need to be removed leaving only fibres (or micro pieces) with an Asbestos % Composition in Soil result of <0.1% for the soil to become non-hazardous waste.



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Assessment Undertaken by:	Reece McGuinness	RSK Project Reference	4770
Assessment Checked by:	Alex Smiles	Site Reference	-

Chemical Testing Laboratory and Report Ref(s):

Please enter available data in the rows associated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
If any calculation cells below state "0.0000", testing has NOT been undertaken that contributes to that Hazardous Property.

Sample Reference

Depth (m)

Envirolab reference

WS303	WS303	WS301	WS301	WS304	WS302	WS302	WS305	WS305	RBH302
0.55	2.00	0.30	2.00	1.00	0.60	1.80	0.15	0.80	0.50

Hazardous Property Waste Assessment Output

Hazardous Property Waste Assessment Output

Hazardous Property	Cut Off Value
Corrosive HP8	<1%
Irritant HP4	<1%
Irritant HP4	<1%
Specific Target Organ Toxicity HP5	
Specific Target Organ Toxicity HP5	
Specific Target Organ Toxicity HP5	
Specific Target Organ Toxicity HP5	
Specific Target Organ Toxicity HP5	
Aspiration Toxicity HP5	
Acute Toxicity HP6 (Oral)	<0.1%
Acute Toxicity HP6 (Oral)	<0.1%
Acute Toxicity HP6 (Oral)	<0.1%
Acute Toxicity HP6 (Dermal)	<0.1%
Acute Toxicity HP6 (Dermal)	<0.1%
Acute Toxicity HP6 (Dermal)	<0.1%
Acute Toxicity HP6 (Inhal)	<0.1%
Acute Toxicity HP6 (Inhal)	<0.1%
Acute Toxicity HP6 (Inhal)	<0.1%
Carcinogenic HP7	
Carcinogenic HP7	
Carcinogenic HP7 Unknown TPH with ID	
Carcinogenic HP7 b(a)p marker test (Unknown TPH with ID only) Cell only applicable if TPH >1,000mg/kg	
pH Corrosive HP8 pH (soil or leachate)	
pH Corrosive HP8 pH (soil or leachate)	
Toxic for Reproduction HP10	
Toxic for Reproduction HP10	
Mutagenic HP11	
Mutagenic HP11 Unknown TPH with ID	
Mutagenic HP11 b(a)p marker test (Unknown TPH with ID only) Cell only applicable if TPH >1,000mg/kg	
Mutagenic HP11	
Produces Toxic Gases HP12 Sulphide	
Produces Toxic Gases HP12 Cyanide	
Produces Toxic Gases HP12 Thiocyanate	
HP13 Sensitising	

If cells below turn yellow and the text turns red, the samples should be classified as Hazardous Waste.									
0.00141	0.00561	0.00392	0.00607	0.01218	0.00214	0.00426	0.00754	0.00225	0.01142078
0.00132	0.00662	0.00404	0.00919	0.01301	0.00225	0.00527	0.00850	0.00246	0.0124468
0.00206	0.00642	0.00293	0.00642	0.00776	0.00229	0.00491	0.00563	0.00278	0.008365259
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0
0.00129	0.00314	0.00099	0.00320	0.00401	0.00109	0.00237	0.00217	0.00140	0.00419
0.00129	0.00314	0.00099	0.00320	0.00401	0.00109	0.00237	0.00217	0.00140	0.00419
0.00129	0.00338	0.00149	0.00345	0.00405	0.00109	0.00251	0.00321	0.00142	0.00442
0.00013	0.00044	0.00037	0.00045	0.00050	0.00026	0.00044	0.00112	0.00026	0.00059
0.00009	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00014	0.00013	0.00014	0.00037	0.00034	0.00013	0.00013	0.00014	0.00013	0.00035
0.00292	0.00908	0.00513	0.00937	0.01651	0.00344	0.00695	0.00992	0.00386	0.01590
0.00207	0.00774	0.00342	0.01011	0.00897	0.00288	0.00625	0.00775	0.00326	0.00990
0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00017	0.00017	0.00018	0.00017	0.00016	0.00017	0.00017	0.00018	0.00017	0.00016
0.00005	0.00004	0.00005	0.00004	0.00004	0.00006	0.00004	0.00005	0.00004	0.00004
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00169	0.00364	0.00139	0.00372	0.00472	0.00147	0.00287	0.00257	0.00179	0.00487
0.00013	0.00012	0.00013	0.00013	0.00012	0.00012	0.00012	0.00013	0.00012	0.00012
0.00126	0.00516	0.00233	0.00760	0.00591	0.00178	0.00429	0.00565	0.00222	0.00657
0.00129	0.00338	0.00149	0.00345	0.00405	0.00109	0.00251	0.00321	0.00142	0.00442
0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.00000
0.00054	0.00053	0.00055	0.00054	0.00050	0.00052	0.00053	0.00056	0.00053	0.00050
0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.63200	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
8.32	8.93	9.53	8.59	8.27	8.25	8.29	8.82	8.33	7.89
8.32	8.93	9.53	8.59	8.27	8.25	8.29	8.82	8.33	7.89
0.00092	0.00338	0.00149	0.00345	0.00405	0.00106	0.00251	0.00321	0.00142	0.00442
0.00129	0.00314	0.00099	0.00320	0.00401	0.00109	0.00237	0.00217	0.00140	0.00419
0.00017	0.00017	0.00018	0.00017	0.00016	0.00017	0.00017	0.00018	0.00017	0.00016
0.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.63200	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
0.00129	0.00338	0.00149	0.00345	0.00405	0.00109	0.00251	0.00321	0.00142	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00092	0.00338	0.00149	0.00345	0.00405	0.00106	0.00251	0.00321	0.00142	0.00442



Haswaste, developed by Dr. Iain Haslock.
Maintained by RSK Waste & Resources

Chemical Testing Laboratory and Report Ref(s):

-

Please enter available data in the rows associated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
If any calculation cells below state "0.00000", testing has NOT been undertaken that contributes to that Hazardous Property.

Sample Reference
Depth (m)
Envirolab reference

Ecotoxic HP14 amended v6	<0.1%
Ecotoxic HP14 amended v6	<0.1% / 1.0%
Ecotoxic HP14 amended v6	<0.1% / 1.0%

Persistent Organic Pollutant (PCB, PBB, PFOS, & POP Pesticides)
Persistent Organic Pollutant (Total sum of PDBEs)
Persistent Organic Pollutant (Total Dioxins+Furans)
Persistent Organic Pollutant (Individual Dioxins+Furans)

WS303 0.55	WS303 2.00	WS301 0.30	WS301 2.00	WS304 1.00	WS302 0.60	WS302 1.80	WS305 0.15	WS305 0.80	RBH302 0.50
0.00277	0.00916	0.00710	0.01181	0.00971	0.00334	0.00776	0.01142	0.00379	0.01071
0.004	0.013	0.008	0.015	0.014	0.005	0.010	0.014	0.005	0.015
0.293	0.950	0.722	1.216	1.017	0.347	0.803	1.166	0.395	1.118
0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000

If other contaminants need adding to Haswaste, please contact RSK Waste and Resources

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