



Hamson Barron Smith



HBS

Fletcher Fold Bury Ground Investigation Report

On behalf of Bolton at Home

Report 23-12-115972/GIR1 Rev B

April 2024

Report Issue Record

Project No.:	23-12-115972
Project Title:	Fletcher Fold
Site Location:	Bury
Client:	Bolton at Home
Report Title:	Ground Investigation Report
Issue Date:	15 th April 2024
Report No.:	23-12-115972/GIR1
Revision:	Rev B – Proposed plan updated.

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Template No and Name:		Version:	Date:
21862	Phase 2 Site Investigation Report	3	December 2018

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Executive Summary

SITE INFORMATION	
Client	Bolton at Home.
Site	Fletcher Fold.
Location	Fletcher Fold Road, Bury, BL9 9RX. NGR 380649, 408678.
Approximate area	0.9Ha.
Topography	Elevation circa 75m OD, however site slopes gently to the south.
Current land use	Derelict land, former school.
Proposed development	Residential development comprising four bungalows and a two storey apartment building.

SITE SETTING	
Geology	Superficial deposits of Glacial Till over Trencherbone Rock (sandstone). Locally River Terrace Deposits may encroach onto the south eastern corner of the site. The Trencherbone Rock is a sandstone flag within the Pennine Lower Coal Measure Formation.
Hydrogeology	Non-productive strata over Secondary A Aquifer. The site does not lie in a source protection zone.
Hydrology	A lake (former reservoir) located 10m south. River Roach 115m east. River Irwell 340m south west.
History	The site was developed at the time of the first mapping in 1893. The structures are likely to have comprised residential properties. In the 1950s the southern end and western edge of the site were marked as allotment gardens. The site was redeveloped in the 1980s as Fletcher Fold school. The school remained on site until recently when the school was closed and the buildings demolished.

INVESTIGATION	
Previous site investigations	A Phase 1 desk based Phase I Geo-Environmental Site Assessment was completed in November 2018 for the site by E3P, reference 12-827-R1. A Phase II Geo-Environmental Site Assessment was undertaken by E3P in February 2019 and updated in November 2019 (report ref 12-827-R2). A Coal Mining Risk Assessment report by Hamson Barron Smith (ref 23-12-115972/DSR1 dated December 2023). Coal Mining Related Site Investigative Works Undertaken on Land at the Former Millwood School Site, Fletcher Fold Road, Bury BL9 9RX by The Land Consultancy Ltd (LCL), report number TLC1136 dated January 2021.

INVESTIGATION	
This site Investigation	Twenty two windowless sampler boreholes with 3 x 50mm standpipes & gas valves. Two hand dug inspection pits in on site stockpile.
Monitoring	Three gas and groundwater level monitoring visits commissioned, only one completed at this stage.
Ground conditions	Made Ground (0.50m to 1.80m) over a soft silty clay to at least 5m bgl. Superficial deposits (clay) grading into completely weathered bedrock (clay) is present to between 9.5m and 10.9m bgl. Bedrock comprising mudstone / sandstone was recorded from this depth to around 40m bgl. Shallow groundwater was encountered during the intrusive works at between 0.6m and 2.50m bgl. During subsequent monitoring of the standpipes in January 2024, groundwater was recorded at depths of between 0.9m and 1.32m bgl.

GEOTECHNICAL	
Foundations	Low strength clay present to at least 5m bgl. Alternative foundations, e.g. piles, likely to be required.
Shrinkable soils	Soils are low volume change potential.
Buried concrete	DS1 & AC1.
Floor slabs	Suspended floors recommended.
Gas protection	Gas monitoring is ongoing – requirement for protection measures yet to be confirmed. Not radon protection measures required.
Slope stability	Gradients are considered generally stable but careful assessment of changes of elevation or construction near existing slopes would still be needed.
Pavement	Design CBR 3%.
Soakaways	Underlying geology unlikely to be suitable for soakaway drainage due to shallow groundwater.
Natural cavities	None expected.
Mining	LCL's mining report concluded that the risk to the proposed development from unrecorded shallow workings was considered to be very low, and consolidation works (by drilling and grouting) were not considered necessary. In addition, the subsidence risk that the canal tunnel posed to the proposed development, should it collapse, was also likely to be very low. Consequently, consolidation works with respect to this feature were not considered necessary. The LCL report indicated that there remained a low risk of encountering unrecorded mine entries during the redevelopment of the site and recommended a watching brief should be maintained during the site strip for the presence of unrecorded mine entries. No evidence of Mine Entries was identified during the Enabling works.

CONTAMINATION	
Human health	No significant risks identified.
Controlled waters	No significant risks identified.
Water supply pipes	Localised elevated concentrations of hydrocarbons have been encountered, which may have the potential to attack plastics. Confirmation should be sought from the water supply company at the earliest opportunity as to their specific requirements.
Remediation	No remediation required.

1 Introduction

In January 2024 Hamson Barron Smith Ltd (HBS) was commissioned by Bolton at Home to undertake a ground investigation at Fletcher Fold, Bury.

The site comprises a parcel of brownfield land. The site historically contained a school however the former school buildings have been demolished. The location of the site is shown on Figure 1 and a site plan is included in Appendix A.

The site is being considered for residential redevelopment. A provisional development layout has been provided by Bolton at Home (reference Pozzoni drawing number 6071-POZ-XX-ZZ-DR-A-1200 P06 dated 14/03/24) and is presented in Appendix B.

This report describes the work undertaken and presents the data obtained together with an evaluation of their significance in relation to the proposed works.

1.1 Project Requirements and Scope of Works

Geo-Environmental Site Assessment was undertaken for the site in February 2019, however only limited / baseline contamination testing was undertaken as part of this investigation and no geotechnical testing or assessment was completed. Therefore, a development specific ground investigation was required for submission with the scheme planning application.

The objectives of the investigation were to:

- Establish the environmental setting, including sensitivity in relation to human health, surface water, groundwater and ecological receptors.
- Quantitatively assess the potential nature and extent of contamination from those uses and the environmental risks and liabilities which may be posed to the identified receptors (human health and the environment).
- Assess any potential geotechnical risks.
- Provide geotechnical recommendations to assist in construction design.

To address these objectives HBS proposed the following scope of works:

- An intrusive ground investigation consisting of dynamic sampler boreholes, groundwater and gas monitoring and laboratory chemical and geotechnical testing.
- Reporting on findings of the ground investigation and presentation of results.

1.2 Previous Investigations

Two phases of investigation have been undertaken for the site by E3P.

- A Phase 1 desk-based Phase I Geo-Environmental Site Assessment was completed in November 2018 for the site by E3P, reference 12-827-R1.
- A Phase II Geo-Environmental Site Assessment was undertaken in February 2019 and updated in November 2019 (report ref 12-827-R2).

As part of this commission, a Coal Mining Risk Assessment (CMRA) report was prepared by Hamson Barron Smith (ref 23-12-115972/CMRA1 dated 19th December 2023).

Subsequent to completion of the CMRA Report, it was identified that a mining ground investigation had already been completed for Bury Council.

- Coal Mining Related Site Investigative Works Undertaken on Land at the Former Millwood School Site, Fletcher Fold Road, Bury BL9 9RX by The Land Consultancy Ltd, report number TLC1136 dated January 2021.

During the production of this report the information in these reports has been reviewed and a summary of their findings is described in Section 4.

2 Site Location

Address: Fletcher Fold, Fletcher Fold Road, Bury

Post Code: BL9 9RX

National Grid Reference: 380649, 408678

The site is located off Fletcher Fold Road, approximately 2km south of Bury town centre as shown on Figure 1.



Figure 1 Site Location Plan

3 Site Description

The site consists of a parcel of brownfield land (former school) located off Fletcher Fold Road, approximately 1.8km south of Bury town centre. The site occupies an area of 0.9Ha and lies at an elevation of circa 75m OD with a slight fall in topography to the south.

Access to the site is gained off Fletcher Fold Road to the north.

The former school buildings were located on the northern edge of the site. These buildings have been demolished, the floor slab removed and the area reinstated with site generated material comprising excavated soils and crushed hardstanding. It is understood that relict foundation have also been removed.

A former tarmacadam car park was present in the north western corner of the site. The hardstanding has been removed from this area.

Soft landscaping in the areas of the former playing field is present on the southern portion of the site. However, debris, including tarmac and demolition rubble was noted in this area.

A small stockpile which is understood to comprise subsoil is present on the eastern edge of the site.

3.1 Surrounding Land-Use

The site is bounded on north, east and west sides by residential premises. A large pond lies to the south.

Figure 2 shows the site setting.

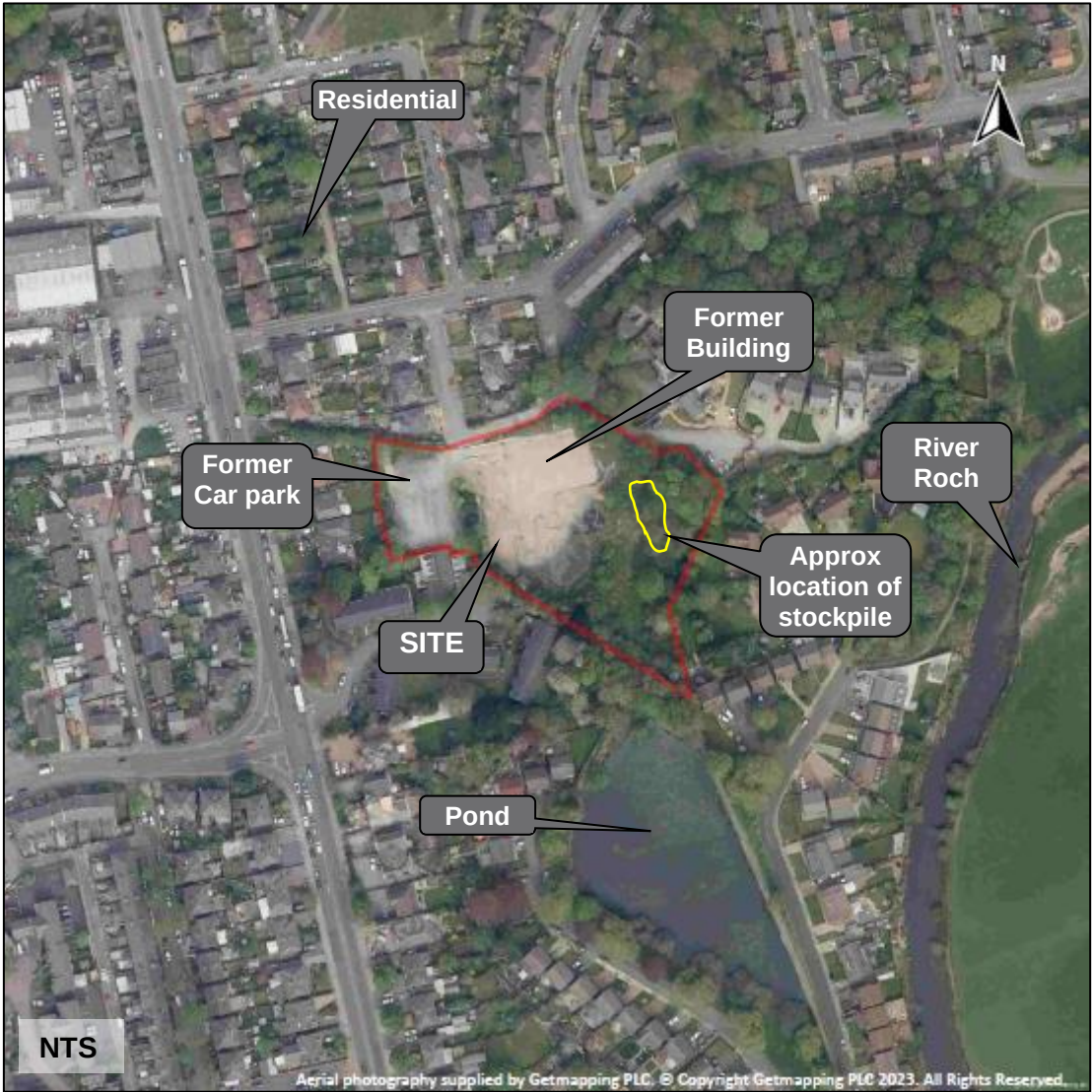


Figure 2 Site Plan

4 Summary of Previous Work

4.1 Introduction

As part of this commission Hamson Barron Smith has completed a Coal Mining Risk Assessment report (CMRA) ref 23-12-115972/DSR1 dated December 2023).

Subsequent to the completion of the CMRA Report, it was identified that a mining ground investigation had already been completed for Bury Council.

- Coal Mining Related Site Investigative Works Undertaken on Land at the Former Millwood School Site, Fletcher Fold Road, Bury BL9 9RX by The Land Consultancy Ltd, report number TLC1136 dated January 2021.

A copy of this report has been provided to Bolton at Home and it is understood that the Principal Contractor, Tyson Construction, are in the process of obtaining reliance on this document.

In addition, reports relating to two phases of investigation have been undertaken for the site by E3P.

- In November 2018, a desk-based Phase I Geo-Environmental Site Assessment was completed. The report was updated in November 2019 (report ref 12-827-R1).
- Following this a Phase II Geo-Environmental Site Assessment was undertaken in February 2019 and updated in November 2019 (report ref 12-827-R2).

4.2 HBS Coal Mining Risk Assessment (Desk Based)

Salient findings from this report are summarised below.

- There are three coal seams outcropping in the immediate vicinity of the site and within the fault plain on which the site is located. As the strata dips to the south / south west, the Trencherbone Mine which lies circa 65m north east of the site is likely to be present beneath the site. The Trencherbone Mine has a thickness varying between 2.0m and 4.8m in the area and is known to have been worked via both surface and deep mining techniques.

- The report indicated that the Coal Authority have no records of gas emission in the immediate vicinity of the site. However shallow coal seams are anticipated to be present beneath the site which have the potential to be a source of ground gas.
- There are no known mine entries within 100m of the site.
- There are no recorded of past underground mining beneath the site. However, although no known shallow mine workings are recorded by the Coal Authority beneath the site, there is the potential for unrecorded shallow mine workings to be present. The risk of shallow mining is considered to be low to moderate and consequently, specific mining ground investigation is deemed necessary for the proposed development.

4.3 Land Consultancy Coal Mining Ground Investigation

A mining ground investigation was undertaken in January 2021 at the site by The Land Consultancy Limited (LCL) for LK Consult Limited (LKC) on behalf of The Metropolitan Borough of Bury.

Salient findings from this report are summarised below.

- The report indicated that a canal tunnel, identified from the 1:10560 geological map, may encroach into the SE of the site at $\approx 45.7\text{m}$ below the rockhead surface.
- The Coal Authority (CA) have no record of any known coal workings having had taken place beneath the site. The CA indicate that the site is at risk from probable unrecorded workings within the Trencherbone coal seam. No known mine entries are indicated to be present within the site boundary or within at least $\approx 900\text{m}$ of the site.
- Three open hole rotary boreholes were drilled to determine whether the property was actually affected by shallow coal seams/workings. The boreholes were sunk to 39m bgl.

- During drilling operations, gas readings were taken at regular intervals from around the mouth of the drill hole and from around the rig using a calibrated gas analyser. None was recorded.
- Made Ground was recorded to between 0.3m and 0.9m in two of the boreholes located in the west and north east of the site. The third borehole located to the south of the site in the former playing field area did not record any Made Ground.
- Superficial clay deposits grading into clay deposits comprising completely weathered bedrock were recorded to between 9.50m and 10.90m bgl.
- Bedrock comprising mudstone / sandstone were recorded beneath the drift / completely weathered deposits and were proven to the base of the boreholes. No coal seams or evidence of former mine workings were recorded.
- The report concluded that the risk to the proposed development from unrecorded shallow workings within the Trencherbone coal seam is considered to be very low, and consolidation works (by drilling and grouting) are not considered necessary.
- The report also concluded that due to the amount of overlying rock cover, the subsidence risk that the canal tunnel poses to the proposed development, should it collapse, is also likely to be very low; consequently, consolidation works with respect to this feature are not considered necessary.
- The report indicated that there remained a low risk of encountering unrecorded mine entries during the redevelopment of the site. It recommended a watching brief should be maintained during the site strip for the presence of unrecorded mine entries.

4.4 E3P Desk Study

Salient findings from the Desk Study report are summarised below.

- Published geology indicates that site is underlain by superficial deposits of Glacial Till over the Trencherbone Rock (sandstone). The Trencherbone rock is a sandstone flag of the Pennine Lower Coal Measures Formation. Alluvium

is present circa 60m south east of the site in the vicinity of the River Roach and circa 190m west of the site in the vicinity of the River Irwell.

- The report confirmed that the proposed development site is located within an area deemed to be a High Risk from historic mine workings therefore a detailed coal mining risk assessment would be required prior to any future development.
- The Environment Agency classified the Glacial Till as Non-productive and the Trencherbone Rock as a Secondary A Aquifer. The site does not lie within a Source Protection Zone.
- A lake (former reservoir) was located 10m south of the site.
- There are no landfill sites (current or historic) or waste treatment facilities within a 250m radius of the site.
- At the time of the first mapping in 1893 the site was occupied by a number of unspecified structures and a well was present in the eastern portion. By the late 1970s the structures had been demolished and Fletchers Fold School constructed. The main school building was located to the north of the site with playing field to the south.
- Given the historic usage of the site the report confirmed that Made Ground, including relict foundations, is likely to be present at the site.
- The report concluded that given the historical use of the site, there were unlikely to be any significant site wide sources of contamination present. However, the underlying Made Ground could be a low-level source of Polycyclic Aromatic Hydrocarbon (PAH), hydrocarbon compounds, heavy metals and asbestos.
- In addition, it confirmed that the presence of Made Ground underlying the former structures may give rise to hazardous ground gas such as carbon dioxide and methane.

4.5 E3P Assessment Report

This report is described in the introduction as a baseline Geo-Environmental Site Assessment to determine potential contaminated land liabilities. No geotechnical assessment of the site was undertaken.

Salient findings from this report are summarised below.

- The investigations recorded Made Ground (sandy and/or clayey gravel) to a max depth of 0.9m. The Made Ground is underlain by sandy Gravel and or gravelly Sand over firm to stiff sandy clay.
- No groundwater was recorded during investigation.
- Two to four samples of the reworked topsoil, three samples of near surface Made Ground and three samples for natural clay were selected for chemical analysis for a standard contamination suite including metals, total cyanide, total phenols, speciated PAH (USEPA) and a limited speciated TPH Suite. In addition, the samples were subject to a BRE SD1 suite.
- All four samples of reworked topsoil were screened for the presence of Asbestos Containing Material (ACM); none was detected. In addition, two of the samples were tested for the standard contamination suite indicated above. The Arsenic concentration, recorded in one sample from HP102, slightly exceeded the GAC utilised in the report for Residential housing with private gardens.
- Three samples of the Made Ground from beneath the former school building footprint were screened for ACM. Chrysotile was recorded in two locations; quantification of the ACM confirmed the presence of loose fibres in one sample and hard cement type material in the other; however, in both samples' quantification confirmed <0.01% Asbestos. All of the Made Ground samples were also tested for a contamination suite as indicated above. The lead concentration recorded in one location, TP101, was significantly elevated with respect to the GAC used (residential housing with private gardens).
- Three samples of the underlying natural ground were tested for a contamination suite. No elevated concentrations were recorded.

In summary the preliminary Tier I Human Health risk assessment identified the presence of heavy metals (lead and arsenic) and asbestos within the shallow soils at the site.

In addition, as part of the Verification of the demolition works E3P confirmed that visible asbestos (insulating board fragments) was discovered during the demolition works to the underside of the slab and attached to a redundant pipe. It is understood that the demolition contractor submitted two fragments of the asbestos for testing which confirmed the asbestos to be amosite. The appendix (VII) containing the results are not included within the report provided.

E3P indicated that they believed that the visible asbestos fragments from within the Made Ground underlying the slab were handpicked and removed for off-site disposal during the demolition works.

4.6 Post E3P Works

The E3P Report confirms that the floor slab and foundations of the building were still in place following demolition of the main school at the time of their baseline ground investigation.

Subsequent to these works further works have been undertaken at the site as there now is a small stockpile of subsoil material located on the eastern edge of the site and the floor slabs, and potentially the former foundations have been removed. The site is currently covered over its northern half by Made Ground.

A search of Bury council planning applications confirmed that an application (ref 66306/FUL) was made in December 2020 for the completion of site enabling works including site clearance and remediation in preparation for its future development.

The following document is associated with the application.

- Fletcher Fold, Bury, Japanese knotweed Validation report was prepared by IPC for LK Remediate, report reference IPM 21 1054/ IPM211054VR, dated 27th August 2021.

- Enabling Works Verification Report for Fletcher Fold Road was prepared by LK Remediate for Bury Metropolitan Borough Council, report reference LKR211011_VR FINAL, dated September 2021.

During the production of the ground investigation report, these documents were made available to HBS. It is understood that currently no reliance upon the documents has been given to Bolton at Home or Tyson Construction but that they are in the process of potentially obtaining reliance. As the documents are relevant to the site a review and summary of the information within the reports is given in the following sections.

4.6.1 Japanese Knotweed Validation Report

Salient findings from the enabling works report are summarised below.

- Approximately 15m² of Japanese knotweed was identified with the site with approximately 1m² of the Japanese knotweed was identified within the Root Protection Zone of the trees to be retained.
- The proposed works involved the excavation of Japanese Knotweed from the development area of the site with all material being transferred to licensed landfill.
- It is understood that the works were to be followed by a 4-year spraying and monitoring programme where any remaining Japanese Knotweed was to be treated with herbicide.
- The works were undertaken on 29th April 2021 and involved the excavation of the Japanese knotweed impacted soils and off site disposal of the soils to an licensed landfill. Photos of the works undertaken and copies of the waste transfer notes are included within the report.
- It is understood that IPC are to continue to monitor the area and treat the remaining Japanese Knotweed within the RPZ on site for a period of 4 years. It is also understood that IPC are to issue reports and photographs following each visit.

4.6.2 Enabling Works Verification Report

A verification report was proposed in September 2021 by LK Remediate (LKR) on behalf of the Bury Metropolitan Borough Council.

LKR were commissioned by the council to undertake site remediation and enabling works at the site. The objective of the works was to ensure that the site had been suitably remediated to the extent that construction could commence at the site and that the site would be suitable for use for the proposed redevelopment, subject to any required construction remediation works.

The verification report makes reference to a ground investigation and remediation strategy undertaken by LKC “Phase 2 Geo-Environmental Investigation, Risk Assessment and Remediation Strategy (Ref. CL-602-LKC 20 1837-02 R1, dated January 2021)”. However, this document was not included on the planning portal.

Salient findings from the enabling works report are summarised below.

- The coal mining investigation considered the risk from shallow coal mining to be low and no grouting was recommended. A watching brief for the presence of unrecorded mine entries was recommended during the site strip. No evidence of shallow mine entries was noted during enabling works.
- The remediation works covered by the report included – breaking out and crushing hardstand and relic foundations; earthworks including excavation of Made Ground to remove obstructions, cut/fill, re-engineering of soils; Excavation, haulage, further assessment and management of potentially impacted materials; disposal of materials unsuitable for retention on site and placement of site-generated material with trimming and compacting of surfaces.
- Excavations to remove relict obstructions were supervised by a remediation site manager and geoenvironmental consultant. All areas of hardstanding, including redundant drainage and historical foundations were broken out and excavated to a stockpile. Hard materials (concrete, bricks, etc) encountered were crushed for reuse on site. Any large fragments of unsuitable materials

(e.g., wood, plastics etc.) were picked and placed in skips for removal to a suitably licensed landfill site or recycling facility.

- Made Ground was placed in layers (approximately 250mm thick) and graded to site levels. Site generated aggregates were placed, compacted and trimmed to form a level surface and minimise low areas as far as reasonably practicable.
- A stockpile (circa 65m³) of site won subsoil was retained on site for re-use as required as part of the construction phase development.
- The report concluded that, as confirmed in the ground investigation, that site won materials were suitable for use under a clean soil cover.
- Limited testing (two samples) of the subsoil confirmed there were no exceedances of generic assessment criteria for residential housing and that no asbestos was identified. It concluded that the subsoil is considered suitable for use as part of clean cover soils in gardens and soft landscaping.
- The report also highlighted that based on observations during the remedial works and site investigation there is potential that water flows may be encountered in shallow excavations. A system of surface water infiltration management (into trenches and stockpiles) should be implemented to minimise its impact during excavations and backfilling activities. Stockpiles should be sealed and prevailing weather conditions should be considered when undertaken certain aspects of groundwork. Shallow groundwater may need to be controlled in line with current guidance.

5 Ground Investigation

The intrusive investigation was proposed by Hamson Barron Smith. The investigation works were designed to investigate the potential contamination risks identified by the E3P report. It was also designed to allow gather geotechnical parameters to allow foundation and infrastructure design. No previous geotechnical assessment had been undertaken.

The investigation therefore included targeted and non-targeted investigation. The targeted investigation was directed to / around areas of potential contamination that required specific investigation. It also targeted the proposed building footprint to gain geotechnical information. The non-target investigation was designed to provide a wider coverage of the overall site for an assessment of general near surface ground conditions.

The investigation was undertaken in December 2023. The intrusive works comprised the following:

- Twenty-two windowless sampler boreholes.
- Seven dynamic probe holes undertaken adjacent to boreholes within the footprints of the proposed buildings.
- Ground & gas monitoring wells installed in three boreholes.
- Two hand dug inspection pits to take samples from the on-site stockpile.

Some of the locations were altered slightly on site due to surface flooding / ponding.

The procedures followed in this site investigation are based on BS 5930:2015 + A1:2020 - Code of Practice for Site Investigations. The soils and rocks encountered have been described in accordance with BS5930: 2015 + A1:2020 and BS EN ISO 14688-1:2018 and BS EN ISO 14689-1:2018.

The approximate positions of the exploratory holes are shown on the Exploratory Hole Location Plan Drawing 23-12-115972 D01 in Appendix C and the exploratory hole records are included in Appendix D.

5.1 Windowless Sampler Boreholes

Seven boreholes (WS1 to WS7) targeted the proposed building locations and were formed to depths of between 4.0m and 5.0m bgl using windowless sampling techniques in order to obtain samples for laboratory testing and to provide geotechnical information for foundation design.

Fifteen boreholes (WS8 to WS22) targeted areas of potential contamination / the wider site and were formed to a max depth of 1m bgl. The principal objective of these boreholes was to obtain samples for laboratory testing.

Representative disturbed small (1kg) and environmental (identified on the borehole logs as D and ES) samples of the soils encountered were obtained at regular intervals.

Standard Penetration Tests (SPTs) were carried out at metre intervals using either a split spoon sampler or a solid 60° cone. The results of these tests are given as a Standard Penetration “N” value or as a blow count for a given penetration on the borehole logs.

A detailed description of all strata and groundwater encountered, samples, in situ tests and other pertinent information observed are included on the borehole logs in Appendix D.

5.2 Dynamic Probing

Seven Dynamic Probe Holes (DP1 to DP7) were undertaken adjacent to the corresponding windowless sampler boreholes using super-heavy dynamic probe equipment. The dynamic probe apparatus conforms to BS 1377 (1990) Part 9 and effectively drives a 90° (sacrificial) cone into the ground using a 63.5kg automatic trip hammer falling over 750mm. The number of blows required to achieve increments of 100mm penetration is recorded and plotted graphically on the records, which are presented in Appendix D.

5.3 Installations

Gas / Groundwater monitoring wells were installed into three of the boreholes on completion, as detailed in Table 1. The wells were designed to allow monitoring of

ground gases and shallow groundwater within the superficial deposits. The response zone comprised slotted pipe with a 10mm inert gravel surround. The strata above the response zone were sealed with bentonite. All remaining exploratory holes were backfilled with arisings and the ground surface reinstated.

Table 1 Summary of Monitoring Installations

Hole	Base (m bgl)	Dia. (mm)	Response Zone (m bgl)	Headworks
WS1	4.00	50	1.00 to 4.00	Gas valve, flush locked cover
WS3	5.00	50	1.00 to 4.00	Gas valve, flush locked cover
WS6	4.00	50	1.00 to 4.00	Gas valve, flush locked cover

5.4 Inspection Pits

Two hand excavated pits were undertaken in the on-site stockpile to obtain samples for laboratory testing.

6 Laboratory Testing

6.1 General

All laboratory testing was scheduled by HBS and is summarised as follows:

6.2 Geotechnical Testing

Samples of soil retained from the exploratory holes were scheduled for geotechnical laboratory testing. The geotechnical analysis was carried out in accordance with BS1377: 1990 'Soils for Civil Engineering Purposes' BS EN ISO 17892-1:2014, BS EN ISO 17892-2:2014, BS EN ISO 17892-3:2015, BS EN ISO 17892-4:2016, and BS EN ISO 17892-12:2018 or BS EN ISO 17892-12:2018 as appropriate. The following tests were carried out on selected samples:

- Four particle size distribution (PSD) tests
- Six natural moisture contents and Atterberg Limits
- Five BRE SD1 sulphate suites

The results are presented in Appendix E with the results of the sulphate testing in Appendix F.

6.3 Chemical Testing

Twenty-two samples of soils were retained from the exploratory holes and were scheduled for chemical laboratory testing. The soil samples were analysed for a combination of the following (NOTE: not all samples were scheduled for all of the determinants):

Arsenic	Selenium
Boron (water soluble)	Zinc
Cadmium	pH
Chromium (total and VI)	Total Organic Carbon
Copper	Phenols
Lead	PAH (USEPA 16)
Mercury	TPH (CWG)
Nickel	Asbestos screen

In addition, following receipt of the total soils testing four samples were also submitted for leachate testing to establish the potential for any determinant to become mobile.

The chemical analysis was undertaken by MCERTS and UKAS accredited laboratory i2 Analytical Ltd. Certificates of analysis are included Appendix F.

7 Ground Conditions

7.1 General

Published geology indicated the site to be underlain by Glacial Till (Diamicton). Although not mapped at the site, a soft silty clay was recorded near surface which appears to be consistent with an alluvium material.

Alluvium is mapped circa 60m south east of the site in the vicinity of the River Roach and circa 190m west of the site in the vicinity of the River Irwell.

A summary of the strata encountered is presented in Table 2 and discussed in sections 7.2 to 7.5. For full details of the strata encountered reference should be made to the exploratory hole logs in Appendix D.

Table 2 Ground Conditions

Hole	Made Ground	Soft to firm clay	Loose to medium dense sand / gravel	Soft silty clay	Ground water
WS1	0.30	1.00	2.00	4.00*	0.78
WS2	1.00	-	1.75	4.00*	0.90
WS3	1.80	-	-	5.00*	0.82
WS4	1.55	2.00	-	5.00*	1.60
WS5	0.40	0.85	3.50	4.00*	1.50
WS6	1.20	-	2.00	5.00*	2.50
WS7	1.50	-	2.40	4.00*	2.00
WS8	0.30	1.00*	-	-	0.10
WS9	1.00*	-	-	-	0.12
WS10	0.80	1.00*	-	-	1.00
WS11	1.00*	-	-	-	0.60
WS12	1.00*	-	-	-	0.65
WS13	1.00*	-	-	-	0.85
WS14	1.00*	-	-	-	0.60
WS15	1.00*	-	-	-	Dry
WS16	1.00*	-	-	-	0.70
WS17	1.00*	-	-	-	Dry
WS18	0.50*	-	-	-	Dry
WS19	0.50*	-	-	-	Dry
WS20	0.50*	-	-	-	Dry
WS21	0.55*	-	-	-	Dry
WS22	0.90*	-	-	-	Dry

* Base of hole

7.2 Hardstanding

No hardstanding was still present at the site; however, cobbles/ lumps of tarmac were noted at the surface on the site.

7.3 Topsoil

No topsoil was encountered in any of the exploratory holes. However, a stockpile on the eastern edge of the site appears to comprise a subsoil / topsoil type material.

7.4 Made Ground

Made Ground materials were encountered in all locations to depths ranging from 0.50m to 1.80m bgl. The materials generally comprised dark brown gravelly clay. The gravel consisted of fine to coarse subangular to subrounded sandstone, mudstone, brick, concrete, clinker and tarmac with cobbles of sandstone, mudstone and concrete.

In WS10 the Made Ground comprised a slightly clayey gravelly sand. The gravel consisted of consisted of fine to coarse subangular to subrounded sandstone, mudstone and brick with cobbles of sandstone and mudstone.

In WS2, WS11, WS12, WS14 the Made Ground comprised a slightly clayey sandy gravel. The gravel consisted of consisted of fine to coarse subangular to subrounded sandstone, mudstone, brick and occasional clinker.

In WS12 and WS14 this granular layer was underlain at 0.6m and 0.4m bgl respectively by cohesive Made Ground.

7.5 Probable Alluvium

The Made Ground was underlain by a soft silty clay. The base of this stratum was not proven. Locally the upper layer of the clay was recorded as soft to firm.

In five locations, WS1, WS2, WS5, WS6 and WS7 the soft clay layer was interbedded with a layer of loose to medium dense clayey sandy gravel or clayey gravelly sand. This layer was located to between 1.75m and 3.50m bgl.

7.6 Glacial Till

This stratum was not proven in this investigation.

Two BGS boreholes located 45m to -100m north east of the site, and at a lower topography, recorded Glacial deposits comprising medium dense Sand and Gravel from between 2.00m and 3.80m bgl over Glacial Till comprising stiff gravelly Clay from between 4.0m and 5.6m bgl.

The boreholes were drilled for the proposed development at Medway, the elevation is not given on the borehole log however the area lies at around 3m to 5m lower than the site. Given similar topographical levels on the Glacial Till beneath the site, this would mean the Glacial Clay could lie at around 5m to 8m below the site's ground level. The dynamic probe holes may support this with more competent strata (>5 blows per 100m) typically recorded from between 5m and 6m bgl.

The LK Consult Limited mining investigation recorded superficial clay deposits, locally with coal traces, to between 6.9m and 7.6m bgl grading into clay of the completely weathered bedrock.

7.7 Trencherbone Rock (Pennine Lower Coal Measures Formation)

This stratum was not proven in this investigation.

Two BGS located 45m to 100m north east of the site, and at a lower topography, recorded moderately weak weathered purple grey mudstone / fine sandstone at between 5.30m and 6.70m bgl. As indicated above the Medway site lies around 3m to 5m lower than the site indicating bedrock beneath the site could lie at around 8m to 11m bgl.

This is confirmed by the LK Consult mining investigation where superficial clay deposits, locally with coal traces, were recorded to between 6.9m and 7.6m bgl grading into clay of the completely weathered bedrock which was recorded to between 9.50m and 10.90m bgl.

The superficial deposits / completely weathered bedrock were underlain by less weathered more competent bedrock comprising interbedded mudstone and sandstone. In one of the boreholes (RH2) below 14.6m the bedrock comprised a dark grey / red mudstone with occasional bands of black mudstone.

No coal seams or evidence of former mine workings were recorded.

7.8 Groundwater

Shallow groundwater was encountered during the intrusive works at depths ranging between 0.6m and 2.50m bgl. In two of the boreholes, the groundwater rose to between 0.10m and 0.12m bgl.

Monitoring of groundwater levels within the standpipes installed was undertaken on the 2nd January 2024. The results are presented in Table 3.

Table 3 Groundwater Monitoring Results

Hole	WS2	WS3	WS6
Depth to water	0.90m bgl	UN	1.32m bgl

UN – unable to monitor due to surface flooding.

Two further round of groundwater monitoring are still to be completed.

7.9 Field Observations of Contamination

With the exception of anthropogenic gravels, no visual or olfactory evidence of contamination was encountered.

7.10 Shrinkable Soils

Cohesive soils (clay and silt) may undergo volume change when subject to changes in moisture content. This can cause ground movement of soils where seasonal changes or tree root action affect the moisture content. Where foundations are constructed in such soils these movements can lead to damage of the superstructure. These movements are greatest where trees are removed or tree root systems are severed as this allows the soils to regain their equilibrium moisture content resulting in expansion.

The NHBC (National House Building Council) has derived minimum foundation depths and other precautions relating to ground movements in shrinkable soils. These

standards are set out in NHBC Chapter 4.2 “Building Near Trees” (2017) and are commonly adopted for both residential and non-residential structures.

The Modified Plasticity Index is related to volume change potential and NHBC recommended minimum foundation depths as indicated in Table 4.

Table 4 Volume Change Potential

Modified Plasticity Index	Volume Change Potential	Minimum Foundation Depth
40% or greater	High	1.00m
20% to <40%	Medium	0.90m
10% to <20%	Low	0.75m

Shrinkable soils are generally considered as clays having a modified plasticity index (I_p) of 10% or greater. The Modified Plasticity Index is defined as the Plasticity Index (I_p) of the soil multiplied by the percentage of particles less than 425µm. Soils containing less than 35% fine particles (< 63µm) are non-shrinkable.

The results of two particle size distribution tests on samples of the granular strata recorded < 63µm fractions ranging from 9% to 10%. On this basis the granular soils tested are not considered to be shrinkable and no precautions are needed in this regard.

The plasticity indices of six soil samples of the clay strata ranged from 5% to 18%, with the percentage of the soil <425µm ranging from 48% to 100%. The calculated modified plasticity indices ranged from 5% to 18%.

The clay soils would therefore be considered to be of **low volume change potential** with respect to NHBC Chapter 4.2 “Building Near Trees” (NHBC, 2017). Consequently, a minimum foundation depth of 0.75m is recommended where foundations are outside the influence zone of trees.

7.11 Soil Strength

The values of the Standard Penetration Tests (SPTs) were as summarised (see Figure 3).

- Made Ground – ranged from 7 to 29.
- Clay – ranged from 3 to 15.

- Sand / gravel – ranged from 7 to 22.

Based on a plasticity index of 15%, the correlation proposed by Stroud 1975 gives a factor f_1 of 5.5 between the SPT N values and undrained shear strength. This equates to values of 17kPa to 77kPa. The results of hand shear vane tests ranged from 12kPa to 90kPa. The shear strength values are shown on Figure 4. Based on the correlation of Peck, Hansen and Thornburn (1974), the corrected N values equate to soil friction values of 29 to 33 degrees.

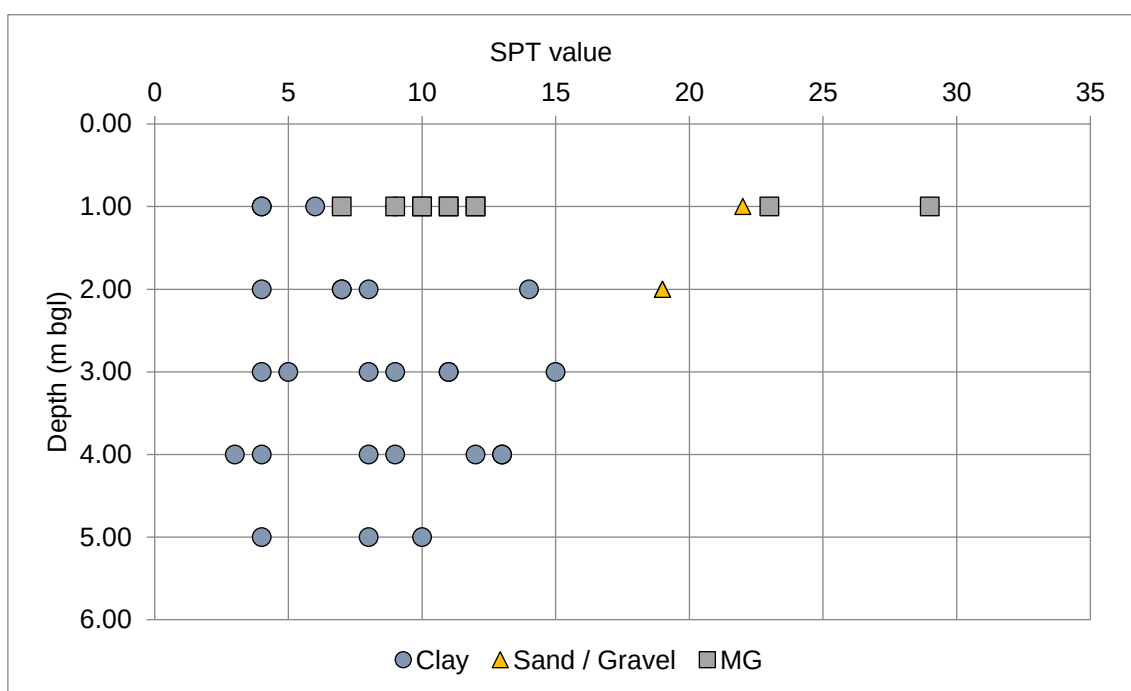


Figure 3 SPT N Values

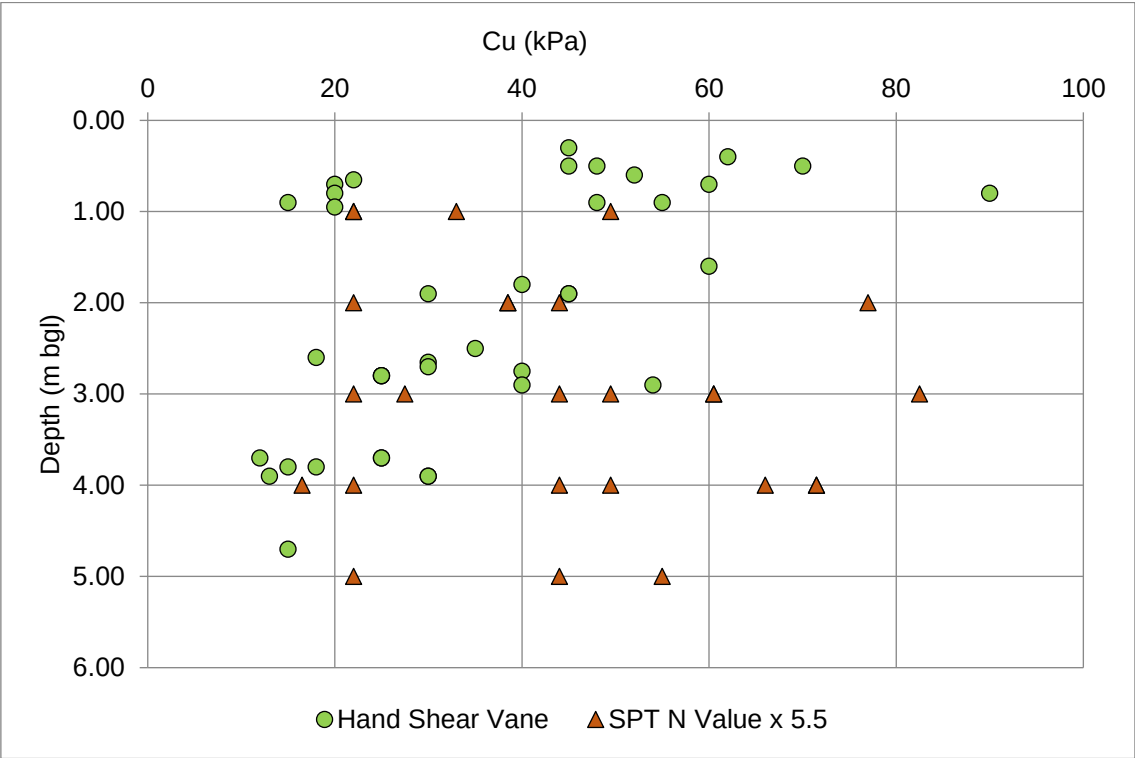


Figure 4 Shear Strength

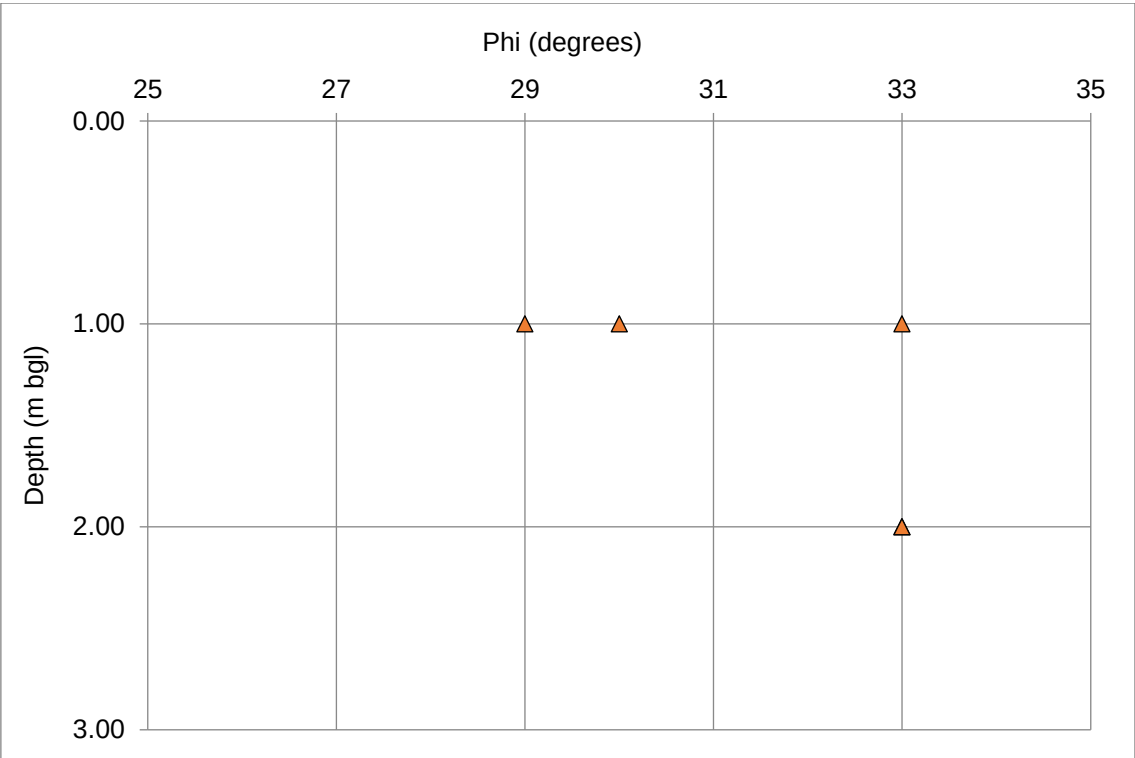


Figure 5 Soil friction angle (phi) derived from SPT N values

8 Geotechnical Assessment

8.1 Proposed Development

The site is being considered for residential development. The development includes four semi-detached bungalows and a two-storey apartment block housing 40no one and two bed independent living apartments. A preliminary proposed development layout plan was provided by Bolton at Home. A copy of this plan is included in Appendix B.

8.2 Summary of Ground Conditions

The investigation identified between 0.50m and 1.80m of Made Ground over a soft silty clay to at least 5m bgl. Locally the upper layer of the clay was recorded as soft to firm. In five locations, WS1, WS2, WS5, WS6 and WS7 the clay layer was interbedded with a layer of loose to medium dense clayey sandy gravel or clayey gravelly sand. This layer was located to between 1.75m and 3.50m bgl.

The Glacial Till and bedrock were not proven however the dynamic probe holes undertaken adjacent to WS1 to WS7, and within the footprint of the proposed buildings, recorded more competent strata (>5 blows per 100mm) from between 5m and 6m bgl.

In the 2021 mining investigation (undertaken by others) recorded drift and completely weathered bedrock were recorded to between 9.50m and 10.90m bgl. Bedrock comprising mudstone / sandstone was recorded from this depth to around 40m bgl. No coal seams or evidence of former mine workings were recorded.

Shallow groundwater was encountered during the intrusive works at depths ranging between 0.6m and 2.50m bgl. Locally around the entrance (WS8 and WS9) of the site groundwater in the wells rose to near ground level (0.1m to 0.12m bgl) within 20mins of completion of the boreholes.

During subsequent monitoring of the standpipes, groundwater was recorded at depths of between 0.9m and 1.32m bgl. It should be noted that further groundwater monitoring is ongoing.

8.3 Foundation Design Principles

The two primary factors controlling the performance of foundations are bearing capacity and settlement. Usually, the settlement tolerances of the structure are considerably less than the settlement that would be expected as the ultimate bearing capacity of the soils is approached. Therefore, it is usually tolerable settlement that dictates the bearing pressure for foundation design. In general, the ultimate bearing capacity is usually divided by a safety factor of 3 for an allowable bearing capacity in order to maintain total settlement within tolerable limits for most structures, which is generally accepted to be 25mm. However, it should be noted that total settlements are usually less than this value as the average actual imposed load will be less than the design load.

8.4 Foundation Design

Based on the ground conditions encountered, the soils are considered to be off too low strength to allow the use of conventional spread foundations for the proposed structures.

A raft foundation may be possible, but the raft would need to have the UDL limited to less than 25kPa to minimise settlement. Where heavier loadings are required alternative foundations such as piles are likely to be required.

The clay soils are shrinkable (low volume change potential) and therefore foundations will need to be deepened and heave precautions adopted within the influence zone of existing, proposed or felled trees, in accordance with NHBC Chapter 4.2.

8.4.1 Piled Foundations

Where the thickness of Made Ground and soft soils are too great for practical or economical construction of strip foundations, piled foundations can offer a suitable alternative solution.

Potential issues that may need to be addressed are:

- The presence of obstructions within the Made Ground. Locations may need to be probed or pre-excavated prior to piling. However, it is noted that no obstructions were recorded during this investigation.

- It is likely that piling contractors will require further investigation by deep boreholes to obtain pile design parameters.
- Piling can result in connection of groundwater bodies and we would recommend early agreement with the Environment Agency to ensure that they are satisfied that works will not have a detrimental impact on water bearing aquifers present at the site.

The advice of a specialist piling contractor should be sought on the suitability and load carrying capacity of their proprietary techniques for use at this site.

Where foundations are within the influence of trees, a suitable compressible material or void former may be required for ring beams and sufficient longitudinal reinforcement incorporated into piles to resist tensile forces resulting from heave. The soils are of low volume change potential.

In order to ensure the safe operation of tracked plant (e.g. piling rigs, cranes etc), it will be necessary to design a suitable working platform. This can only be done in the context of the precise rig to be used and the route it will take to gain access. The data will require specific study for this design case. In some cases further specific shallow investigation may be necessary.

8.5 Floor Slabs

The underlying soils near surface soils were either shrinkable (low volume change potential) or consisted of in excess of 600mm of Made Ground, therefore a suspended floor slab should be recommended with an appropriate underfloor void.

The radon report (see Appendix G) indicates that no radon protection measures are considered necessary for the development.

The ground gas monitoring is still on going and at this stage no details of any ground gas protection measures that may be required can be provided, although the initial results from one round do not indicate any special precautions would be required.

Confirmation of any protection measures should be agreed with the local authority building control and or the NHBC or other warranty provider.

8.6 Buried Structures

Notwithstanding the ground conditions revealed by the intrusive investigations, it is important to note that both foundation and ground floor slab construction could be significantly influenced by pre-existing subsurface construction, associated with the historical development of the site. This could include, for example, foundations and underground services, infilled pits and channels, which will need to be treated / managed as part of the development works.

However, it is understood that the remediation and enabling site works undertaken in 2021 removed the former foundations from the site.

8.7 Concrete Protection

Buried concrete classification is based on guidelines provided in BRE Special Digest 1 (BRE, 2005).

Chemical Analysis was undertaken on five soil samples (2no cohesive Made Ground, 1no natural sand and 2no natural clay) for pH and a total potential sulphate suite (water soluble sulphate, total sulphate and total sulphur).

An assessment for total potential sulphate indicates that the soils are not considered to be pyritic and the design class should be based on soluble sulphates.

The pH values were 7.9 to 9.3 with water soluble sulphate concentrations of 12mg/l to 486mg/l. Therefore, it is recommended that a Design Class of DS1 and AC1 should be assumed for buried concrete in accordance with BRE Special Digest 1 assuming natural ground and mobile groundwater conditions.

For low rise residential on mass concrete foundations, this corresponds to a concrete type of GEN1. It is recommended that the concrete supplier confirm the necessary concrete type based on its intended use and the chemical test results in Appendix F.

8.8 Pavement Design

Equilibrium CBR values for various materials are given in CD 225 – “Design for new pavement foundations” produced by the Highways Agency.

The near surface soils are principally cohesive Made Ground over soft to firm silty clay. A design CBR of value of 3% is recommended.

All Topsoil should be removed and the formation level should be proof rolled to identify any loose or soft spots, which should be removed and replaced with compacted granular fill. The conditions prevailing at the time of construction will affect the CBR of the sub-grade soil and its strength. Research has shown the importance of the equilibrium moisture content of the sub-grade. The relationship between soil suction and the moisture content shows that a soil that becomes wet during construction will retain water and will therefore be weaker under the pavement in the equilibrium condition than a foundation that has remained dry, particularly for soils of low to medium plasticity. Consequently, the formation level will also need to be protected during inclement weather from deterioration; all slopes should be trimmed to falls to shed rain water and the surface sealed to limit infiltration.

8.9 Excavations

Conventional mechanical backhoe excavators should prove suitable for excavation within the superficial deposits.

The soils may be subject to spalling and collapse within excavations and concrete should be poured as soon as possible and temporary support may be required. When dry the clay soils should remain stable in the short term to allow placement of concrete and services. However, during wet weather instability may occur and temporary support may be required. Entry into shallow excavations by personnel should be minimised, and excavation stability should be assessed by suitably qualified and experienced staff and shoring used when required. Entry into deeper excavations should not be permitted unless full support is provided.

Shallow groundwater was encountered during the intrusive works at depths ranging between 0.6m and 2.50m bgl. During subsequent monitoring of the standpipes, groundwater was recorded at depths of between 0.9m and 1.32m bgl.

In addition, surface ponding of water was noted over the northern portion of the site and in the south eastern corner.

Groundwater control measure are likely to be required during construction.

8.10 Soakaway Drainage

The clay soils encountered are likely to possess infiltration rates of less than 1×10^{-6} m/s and therefore efficient soakaway drainage is unlikely to be feasible, furthermore shallow groundwater is present beneath the site.

The Local Authority may still require full scale testing in accordance with BRE 365 (2016) to demonstrate that infiltration rates are too low for soakaway drainage.

9 Contamination Risk Assessment

The primary legislative mechanism for contaminated land management in the UK is Part 2A of the Environmental Protection Act, 1990 (EPA). Part 2A was introduced into the EPA under Section 57 of the Environment Act 1995 to help deal with the substantial legacy of land contamination. Local authorities are the principal regulator for inspection of land under Part 2A. In England, Part 2A is described fully in DEFRA Circular 01/2006, which also contains the statutory guidance (DEFRA, 2006). Part 2A defines contaminated land as:

‘...any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that

- a. significant harm is being caused or there is a significant possibility of such harm being caused; or*
- b. Pollution of controlled waters is being, or is likely to be, caused.’*

In applying the definition of Contaminated Land, Part 2A states that ‘the Local Authority must:

- Identify a ‘Pollution Linkage’. That is, a linkage between a contaminant and a receptor, by means of a pathway(s).
- Determine if the contaminant is causing significant harm to that receptor, or there is a significant possibility of such harm being caused by that contaminant to that receptor.

If any one element of the pollutant linkage is not present then the land should not be identified as ‘contaminated land’.

Part 2A is designed to ‘enable the identification and remediation of land on which contamination is causing unacceptable risks to human health or the wider environment. It does not necessarily include all land where contamination is present, even though such contamination may be relevant in the context of other regimes’. It is not directed to assessing risks in relation to a future use of the land that would require a specific grant of planning permission.

The control of development and land use in the future is the responsibility of the planning system. A fundamental principle of sustainable development is that the condition of land, its use and its development should be protected from potential hazards. The National Planning Policy Framework (NPPF) states that *‘to prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location.’*

Planning policies and decisions should also ensure that the site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation.

NPPF also states that after any required remediation, the land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990.

9.1 Introduction to Human Health Risk Assessment

A generic quantitative risk assessment (GQRA) has been undertaken using the geochemical results for the soil samples retained from the site. The approach to human health risk assessment adopted in this report is consistent with the Environment Agency’s Land Contamination Risk Management (LCRM) guidance and other relevant guidance (including SR3, BS10175:2011:A2-2017 and NPPF).

The laboratory soil data has been compared to relevant and applicable critical concentrations as outlined in the guidance. These criteria can be either Generic Assessment Criteria (GAC) or Site Specific Assessment Criteria (SSAC). For the purpose of this generic quantitative risk assessment, GAC will be used. The GACs been derived from

- LQM/CIEH 'Suitable 4 Use Levels' (S4ULs) where available, or
- DEFRA C4SL Health Criteria Values (March 2014),

The proposed development includes four semi-detached bungalows with private gardens and a two-storey apartment block with associated communal green space.

Therefore, there are two end use scenarios appropriate for the site,

- Scenario 1 (Bungalows): - '**residential with no plant uptake**' end use
- Scenario 2 (Apartment Buildings) - '**residential with plant uptake**' end use

9.2 Soil Assessment

To ascertain a preliminary assessment of the contaminative nature of the near surface materials across the site, twenty two soil samples were retained during the site investigation works and submitted for laboratory analysis for a range of determinants. The calculated Soil Organic Matter (SOM) ranges from 0.35% to 5.69%. Given the large range, where the assessment criteria are reliant on Soil Organic Matter assessment criteria derived for 1% have conservatively been used.

The chemical analysis was undertaken at i2 Analytical Ltd laboratories. The results are included in Appendix F.

9.2.1 Asbestos

All twenty two samples were screen for Asbestos Containing Material (ACM); none was detected.

9.2.2 Metals

Nineteen soil samples were analysed for a metals suite. The results of the chemical analysis for heavy metal concentrations within the soil samples are summarised in Table 5.

Table 5 Summary of Heavy Metals

Determinant	GAC		Concentration Range		No. samples tested	No. samples exceed GAC	
	1	2	Min	Max		1	2
Arsenic	37	79	2.4	39	19	1	0
Boron (w/s)	290	21,000	<0.2	1.3	19	0	0
Cadmium	11	120	<0.2	<0.2	19	0	0
Chromium (total)	910	1,500	12	38	19	0	0
Chromium (VI)	6	7.7	<1.8	<1.8	19	0	0
Copper	2400	12,000	13	65	19	0	0
Lead	200*	630*	11	140	19	0	0
Mercury	11	16	<0.3	1.2	19	0	0

Determinant	GAC		Concentration Range		No. samples tested	No. samples exceed GAC	
	1	2	Min	Max		1	2
Nickel	130	230	14	34	19	0	0
Selenium	250	1100	<1.0	<1.0	19	0	0
Zinc	3700	81000	30	98	19	0	0

Results in mg/kg unless stated otherwise

GACs are LQM GAC unless stated otherwise

*DEFRA C4SL

9.2.3 Polyaromatic Hydrocarbons

Fifteen soil samples were analysed for PAH analysis. The results of the chemical analysis for Polyaromatic Hydrocarbons (PAH US-EPA16) are summarised in Table 6.

Table 6 Summary of Polyaromatic Hydrocarbons

Determinant	GAC		Concentration Range		No. samples tested	No. samples exceed GAC	
	1	2	Min	Max		1	2
Acenaphthene	210	15000	< 0.05	1.30	15	0	0
Acenaphthylene	170	15000	< 0.05	0.11	15	0	0
Anthracene	2400	74000	< 0.05	2.30	15	0	0
Benz(a)anthracene	7.2	29	< 0.05	4.70	15	0	0
Benzo(a)pyrene	2.2	5.7	< 0.05	4.10	15	1	0
Benzo(b)fluoranthene	2.6	7.1	< 0.05	5.10	15	1	0
Benzo(ghi)perylene	320	640	< 0.05	2.60	15	0	0
Benzo(k)fluoranthene	77	190	< 0.05	2.10	15	0	0
Chrysene	15	57	< 0.05	5.10	15	0	0
Dibenz(a,h)anthracene	0.24	0.57	< 0.05	0.67	15	2	1
Fluoranthene	280	3100	< 0.05	12.0	15	0	0
Fluorene	170	9900	< 0.05	1.00	15	0	0
Indeno(1,2,3-cd)pyrene	27	82	< 0.05	2.40	15	0	0
Naphthalene	2.3	4900	< 0.05	0.46	15	0	0
Phenanthrene	95	3100	< 0.05	8.90	15	0	0
Pyrene	620	7400	< 0.05	9.90	15	0	0

Results in mg/kg unless stated otherwise

GACs are LQM S4UL for SOM of 1% unless stated otherwise

9.2.4 Petroleum Hydrocarbons and BTEX

Fifteen soil samples were analysed for total petroleum hydrocarbons (TPH CGW) in an aromatic/aliphatic split and BTEX (benzene, toluene, ethylbenze and xylene), the results of which are summarised in Table 7.

Table 7 Summary of Petroleum Hydrocarbons

Determinant	GAC	Concentration Range		No. samples tested	No. samples exceed GAC
		Min	Max		
EC>5-6 Aliphatic	42	<0.02	<0.02	15	0
EC>6-8 Aliphatic	100	<0.02	<0.02	15	0
EC>8-10 Aliphatic	27	<0.05	<0.05	15	0
EC>10-12 Aliphatic	130	<1.0	2.1	15	0
EC>12-16 Aliphatic	110	<2.0	5.9	15	0
EC>16-35 Aliphatic	65,000	<10	350	15	0
EC>35-44 Aliphatic	65,000	<8.4	470	15	0
EC>5-7 Aromatic	70	<0.01	<0.01	15	0
EC>7-8 Aromatic	130	<0.01	<0.01	15	0
EC>8-10 Aromatic	34	<0.05	<0.05	15	0
EC>10-12 Aromatic	74	<1.0	<1.0	15	0
EC>12-16 Aromatic	140	<2.0	4.5	15	0
EC>16-21 Aromatic	260	<10	39	15	0
EC>21-35 Aromatic	1,100	<10	880	15	0
EC>35-44 Aromatic	1,100	<8.4	960	16	0
Benzene	0.087	<0.05	<0.05	15	0
Toluene	130	<0.05	<0.05	15	0
Ethylbenzene	47	<0.05	<0.05	15	0
m&p-Xylene	56	<0.05	<0.05	15	0
o-Xylene	60	<0.05	<0.05	15	0
MTBE	49**	<0.05	<0.05	15	0

Results in mg/kg unless stated otherwise

GACs are LQM S4UL for SOM of 1% unless stated otherwise

** C:laire 2010

9.3 Human Health Summary

Slightly elevated arsenic was recorded in one Made Ground soil sample. Further assessment is given in Section 9.3.1.

Slightly elevated PAH determinants, Benzo(a)pyrene, Benzo(b)fluoranthene and Dibenzo(a,h)anthracene, were recorded in two soil samples tested at levels which are considered to present a potential risk to Human Health. Further assessment of the PAH concentrations are given in Section 9.3.2.

No other elevated concentrations of contaminants were recorded at levels which are considered to present a risk to Human Health of current or future site users for the proposed end use, or construction workers.

9.3.1 Arsenic

Nineteen soil samples were selected for arsenic testing – 12no samples of the cohesive Made Ground, 5no of the granular Made Ground and 2no samples from the topsoil/subsoil stockpile.

No elevated concentrations were recorded in the material from the stockpile or the cohesive Made Ground. This material is therefore considered suitable for reuse in the proposed development.

One of the five samples of the granular Made Ground recorded a concentration of 39mg/kg. This concentration is slightly above the GAC for residential properties with private gardens (37mg/kg), but below the GAC for shared residential gardens (79mg/kg).

The proposed development is the construction of new bungalows, apartments, car parking. The bungalows will have private gardens and the apartments will have a shared communal garden / green space.

The future hardstanding (will act as barrier, minimising the risk of future users being exposed to the arsenic. Therefore, no remedial works are required where hardstanding is present.

In addition, the risk to future users therefore is only present where private gardens which could have vegetables grown are present. No risk has been identified for communal gardens / public open space.

The elevated sample was from WS3 which is located within the footprint of the apartment block. The arsenic concentration is not a risk for future site users in this area of the site. Therefore, no remedial works are required for the for communal gardens / public open space around the apartment block.

Three soils samples were tested from the area where the bungalows and private gardens are proposed. No elevated arsenic was identified. No remediation is therefore required for the area where private gardens are proposed.

During the development, it is envisaged that site clearance and earthworks will be required to be undertaken. Workers involved in such activities would be at increased risk of exposure. It is envisaged that risks to workers involved in the development of the site can be satisfactorily managed by the implementation of an appropriate health and safety regime in accordance with guidance set out by the Health and Safety Executive.

9.3.2 PAH

Benzo(a)pyrene (BaP), Benzo(b)fluoranthene (BbF) and Dibenzo(a,h)anthracene (DahA) elevated concentrations were recorded in up to two samples.

The laboratory soil data has been compared to relevant and applicable critical concentrations as outlined in the guidance. These criteria can be either Generic Assessment Criteria (GAC) or Site Specific Assessment Criteria (SSAC). For the purpose of this detailed quantitative risk assessment the following hierarchy will be used

- Category 4 Screening Levels (C4SLs)
- LQM/CIEH 'Suitable 4 Use Levels' (S4ULs).

The C4SLs utilise B(a)P as a surrogate marker to assess the risks posed by the PAH. However, this can only be undertaken if the PAH profile falls within known limits. For B(a)P to be used as a surrogate marker it must follow the profile described by the Public Health England document "*Contaminated land information sheet: risk assessment approaches for polycyclic aromatic hydrocarbons (PAHs)*" published in 2017.

Based on this assumption, HBS undertook an assessment of the data for the site with regards to using B(a)P as a surrogate marker for carcinogenic PAH as detailed in HPA guidelines. The primary toxicological study related to Culp et.al, which was based on coal tar mixtures (>80,000mg/kg of total PAHs) fed in food to mice over a two-year carcinogenicity study.

The results from the Made Ground are shown in Figure 6.

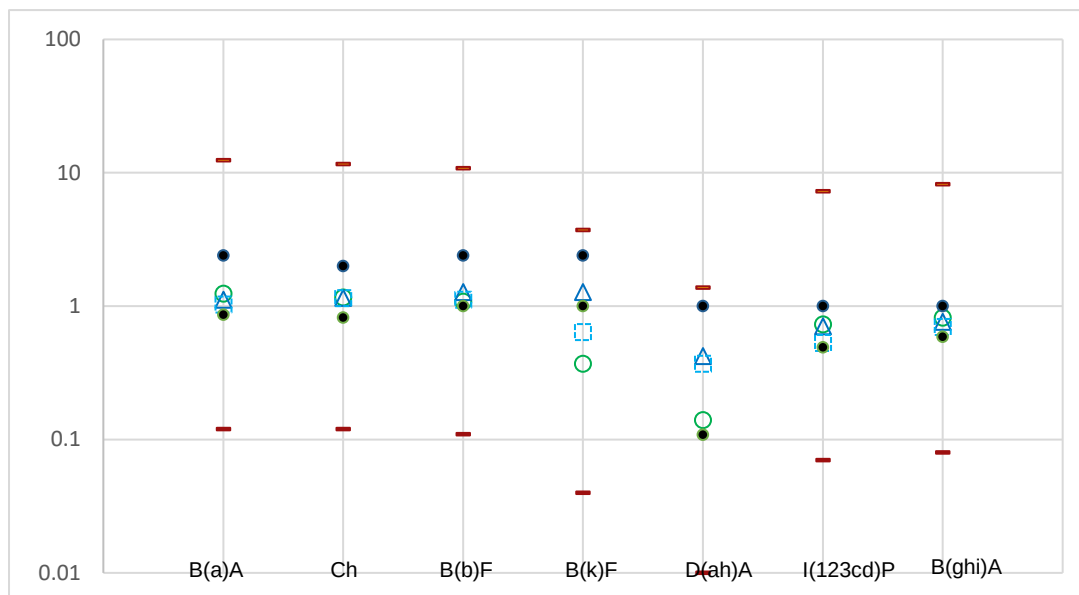


Figure 6 The ratio of PAH to B(a)P in soil for Made Ground.

All the data points that could be used to calculate ratios fall inside the upper or lower limits. Based on this distribution of data it is considered that B(a)P can be used as a surrogate marker for carcinogenic PAHs and the C4SL criteria is suitable for all of the above datasets.

The site is being proposed for the construction of bungalows with private gardens and an apartment building with communal gardens / public open space. Therefore, two scenarios are appropriate and two C4SL for Benzo(a)pyrene.

- Scenario 1 – Bungalows – Residential with uptake - C4SL of 5mg/kg
- Scenario 2 – Apartments – Residential without uptake - C4SL of 10mg/kg

The assessment confirmed that none of the samples were above the Scenario 1 GAC. Therefore, the material is considered suitable for reuse in the proposed development with respect to PAH and no remedial works will be required.

9.4 Controlled Waters

A typical GQRA for controlled waters comprises:

- Comparison of detected concentrations in soil leachate with GAC to assess the potential risk posed to the groundwater receptor. The GAC selected for groundwater are the UK Drinking Water Quality Standards (DWS); and
- Comparison of detected concentrations in soil leachate with GAC to assess the potential risk posed to the surface water receptors. The GAC selected for surface water are the Environmental Quality Standards (EQS). HBS considers that one pathway to surface water receptors is migration within groundwater. Therefore, if the contaminant is below the GAC in groundwater, it is unlikely to be above the GAC at the surface water receptor into which the groundwater may discharge, unless other factors are operating.

For groundwater, if no DWS are available, then EQS have been used as GAC. For surface water, if no EQS are available, then DWS have been used as GAC. World Health Organisation (WHO) guidelines have been used as GAC if neither DWS nor EQS are available.

9.4.1 Leachate Analysis

As the works identified Made Ground at the site, leachate testing of four sample of soil was undertaken for a suite of metals, speciated PAH and speciated TPH.

Comparison of the leachate chemical test data with the selected generic screening criteria was undertaken and only one exceedance was recorded.

Leachate analysis has indicated that the in-situ soils are unlikely to act as a diffuse source of groundwater contamination.

Comparison of the leachate chemical test data with the selected generic screening criteria was undertaken and exceedances are summarised in Table 8 below.

Table 8 Summary of Compounds of Concern Exceeding GAC in Leachate

Determinant	GAC	Source	Concentration
Lead	10	DWS	14 mg/l in WS7 at 0.1m bgl

The majority of the determinants, in the eluate generated from the soil sample subjected to leachate testing, were recorded below the limit of detection and the appropriate GAC with the exception of lead.

Leachate analysis has indicated that soils present have the potential to generate leachate containing concentrations of lead determinants in excess of the UK DWS.

The DWS are designed to be protective of potable water, however the strata underlying the site is considered to be non-productive and there are no source protection zones within 500m and no potable groundwater abstractions within 2km of the site.

It should also be recognised that leachate testing is an aggressive process, consequently the results are likely to provide a conservative estimate of the source potential of the soils present.

Consequently, based on the information available the ground conditions present at the site are unlikely to pose a significant risk to controlled waters.

9.5 Water Pipelines

The current guidance on selection of materials for water supply pipes to be laid in contaminated land is contained in UKWIR Report 10/WM/03/02 (re-issued 2010) which sets out in Table 3.1 of that document threshold values for a selection of organic contaminants that may have a detrimental effect on pipes and fittings. However, the document is for guidance and is not mandatory and has not been adopted universally by all water suppliers.

The site is brownfield and there is a presumption in the guidance that barrier pipe will be required. The investigation and assessment has indicated slightly elevated concentrations of TPH and PAH contaminants within the Made Ground which may have the potential to attack plastics and as such standard pipework may not be suitable for the site. Confirmation should be sought from the water supply company at the earliest opportunity as to their specific requirements.

9.6 Ground Gas Assessment

9.6.1 Radon

The site is in an area where the estimated probability of homes being above the action level of 200Bqm^{-3} is between 1% and 3%. Therefore, no radon protective measures are required in the construction of new buildings or extensions. Confirmation of any protection measures should be agreed with the local authority building control and / or warranty provider.

9.6.2 Landfill Gas

No current or historical landfills are known to exist within 250m of the site. No organic soils, evidence of buried biodegradable materials or other potential sources of ground gas were identified on the site. However, the site lies in an area where coal reserves exist although the mining investigation has not identified any coal or working to 39m bgl.

Consequently, the risks to end users from explosive or asphyxiating gases is considered low.

However, due to the potential risk three round of gas monitoring were commission to confirm this assumption. To date one round of gas monitoring has been completed.

The risks associated with the ground gases methane (CH_4) and carbon dioxide (CO_2) are assessed using BS 8485:2015+A1:2019 (Code of practice for the characterisation and remediation from ground gas in affected developments) and guidelines from CIRIA 665 (Wilson et al 2007) and the NHBC (Boyle and Witherington 2007).

One of the assumptions in using the above guidance is that the worst-case ground gas regime has been identified on the site, for either CH_4 or CO_2 , at the worst-case temporal conditions that the site may be expected to encounter (such as immediately following rapid changes in atmospheric pressure or prolonged rainfall). The idealised frequency of monitoring is suggested in CIRIA 665 Tables 5.5a and 5.5b. These tables are adapted from Wilson and Haines (2005) Table 3 which gives examples of ground conditions with the various gas generation potentials, ranging from inert Made Ground (very low potential) to post 1960s domestic landfill (very high potential).

It is judged from the available evidence that the gas generation potential at the site is very low / low (potential for coal gas, no shallow coal or workings) and the sensitivity of the development is moderate / high (apartments / low rise residential).

The results of the initial round of gas monitoring are presented in Table 9.

Table 9 Gas Monitoring Results - Maximum recorded values

Visit No	1
Pressure (mb)	1007

Max values recorded	WS2	WS3	WS6
Flow rate (l/hr)	3.4	-	< 0.1
BH Pressure (%)	< 0.1	-	< 0.1
LEL (%)	< 0.1	-	< 0.1
Methane (%)	< 0.1	-	< 0.1
GSV (l/hr)	<0.001	-	<0.001
Carbon dioxide (%)	1.5	-	0.4
GSV (l/hr)	<0.0015	-	<0.0004
Oxygen (%)	17.6	-	12.3

At the time of the monitoring visit, surface flooding at the site meant that WS3 was not accessible.

Current UK best practice guidance suggests that the ground gas assessment and characterisation for a site is dealt with separately for different types of development:

- 'Situation A' covers all forms of development (residential and industrial/commercial developments), other than low rise residential development; and
- 'Situation B' is defined as the specific development of low-rise (one to three storeys in height) housing with beam and block floors, vented sub-floor void and gardens.

Based on our understanding of the likely redevelopment of the site, Situation A would be appropriate.

For both Situation A and Situation B a risk based "Gas Screening Value" (GSV) is calculated using the maximum gas concentration (%) x worst case borehole flow rate

(l/h). Where zero values are recorded a conservative “less than minimum” detection value is adopted. For borehole flow rate this is < 0.1l/hr and for gas detection <0.1%.

For Situation A this gives $0.0015 \times 3.4 = <0.0051$ l/hr, which is less than the 0.07 l/hr threshold for “CIRIA Characteristic Situation 1 - very low risk”, which also requires typically methane <1% and/or carbon dioxide <5%. The initial round of gas monitoring would indicate that a very low risk classification may be applicable.

9.6.3 Recommendations

The initial round of gas monitoring would indicate that a “CIRIA Characteristic Situation 1 - very low risk” may be applicable for the site.

However, while the initial results suggest that the site is not being significantly affected ground gas, further gas monitoring has been commissioned and should be undertaken before the ground gas regime is finalised.

10 Site Conceptual Model

Following the generic quantitative risk assessment, a summary of the receptors, sources and potential pollutant linkages identified for the site is presented in the following sections. This Site Conceptual Model is summarised in Table 10.

10.1 Receptors

It is understood that the site will be redeveloped with residential dwellings. Residents, and visitors are assumed therefore to occupy the site full time. Where the bungalows are proposed the residents may be expected to be exposed directly to soils within the site. Where the apartments are proposed residents are less likely to be exposed directly to soils within the site. Construction workers would be directly exposed to soils, however this would only be short term.

- Residents and visitors of the proposed development.
- Construction workers.
- Construction materials (including services).
- Groundwater – Secondary A Aquifer.
- Surface water – Lake c.10m south and River Roch c.115m southeast.
- Flora and fauna.

10.2 Sources

10.2.1 Contaminants

The risk assessment has identified no significantly elevated concentrations of contaminants for the proposed end use.

10.2.2 Landfill gas

No risks from ground gas have been identified to date however gas monitoring is currently ongoing and this assumption will need to be confirmed once the monitoring has been completed.

10.2.3 Radon

No radon protective measures are necessary in the construction of new developments or extensions.

10.3 Pathways

Generic possible pathways between potential sources and receptors are discussed as follows:

10.3.1 Receptor – Residents and Visitors

- Dermal contact with contaminated soil.
- Ingestion of contaminated soil.
- Indoor and outdoor inhalation of dust or vapours.
- Ingestion of produce or soil particles on produce grown on site (Bungalows only).

10.3.2 Receptor – Construction Workers

- Dermal contact with contaminated soil or water.
- Ingestion of contaminated soil or water.
- Outdoor inhalation of dust or vapours.

10.3.3 Receptor – Buildings and services

- Sulphate attack on concretes.
- Hydrocarbon attack on plastics which can result in tainting of potable water carried in supply pipes.

10.3.4 Receptor – Groundwater

- Infiltration and leaching of contaminants in soil into groundwater.
- Migration of contaminated water via drainage system.
- Migration of polluted groundwater to drinking water abstraction.

10.3.5 Receptor – Surface Water

- Run off of contaminants into surface water.
- Migration of contaminated water via drainage system.

10.3.6 Receptor – Flora and Fauna

- Uptake via root system.
- Displacement of oxygen from root systems.
- Harm to ecosystems from contaminated surface water.

Following the generic quantitative risk assessment, a summary of the potential pollutant linkages identified for the site is presented in the Site Conceptual Model in Table 10.

Table 10 Site Conceptual Model

Potential Source and Pollutant	Receptor	Pathway	Potential Pollutant Linkage?	Probability of exposure, consequence and magnitude of risk.
No significant sources of soil or groundwater contamination identified.	Human Health – future residents.	Direct contact - Dermal contact, soil ingestion and dust inhalation.	Unlikely – no significant sources identified.	Probability: Unlikely Consequence: Medium Magnitude: Low Risk
		Indirect Contact - Vapour inhalation.	Unlikely – no (volatile) sources identified.	Probability: Unlikely Consequence: Medium Magnitude: Low Risk
		Hydrocarbon tainting of potable water supply pipes.	Possible – slightly elevated TPH and PAH concentrations in Made Ground.	Probability: Possible Consequence: Medium Magnitude: Low Risk
	Human Health – Construction workers	Direct contact - Dermal contact, soil ingestion and dust inhalation.	Unlikely – increased risk of direct contact with soils during the construction period. However no significant sources identified. Envisaged that any residual risks can be managed through appropriate working practices. If not implemented risk would increase.	Probability: Unlikely Consequence: Medium Magnitude: Low Risk
		Indirect Contact - Vapour inhalation.	Unlikely – no sources identified.	Probability: Unlikely Consequence: Medium Magnitude: Low Risk
	Controlled Waters – groundwater (Secondary A Aquifer)	Leaching and percolation.	Unlikely – no significant sources identified.	Probability: Unlikely Consequence: Low Magnitude: Low Risk

Potential Source and Pollutant	Receptor	Pathway	Potential Pollutant Linkage?	Probability of exposure, consequence and magnitude of risk.
	Controlled Waters – Lake 10m south and River Roch 115m south east.	Groundwater migration & run-off to surface waters carrying entrained sediment or diffuse contamination.	Unlikely – no significant sources identified.	Probability: Unlikely Consequence: Low Magnitude: Low Risk
	Buried structures – Aggressive ground conditions	Direct contact and/or leaching (sulphate, pH).	Unlikely – underlying geology not expected to be aggressive.	Probability: Unlikely Consequence: Medium Magnitude: Low Risk
	Ecology - existing trees and landscaping on site.	Plant uptake.	Unlikely – no significant sources identified.	Probability: Unlikely Consequence: Low Magnitude: Low Risk
Ground gases.	Human Health – future residents.	Permeation through ground and intrusion into buildings and structures.	Unlikely – potential sources identified. Initial round of gas monitoring indicates very low risk. Further monitoring ongoing.	Probability: Unlikely Consequence: High Magnitude: TBC
	Flora	Displacement of oxygen from root systems	Unlikely – no sources identified.	Probability: Unlikely Consequence: Low Magnitude: Low Risk
Radon.	Human Health – future residents.	Permeation through ground floor.	Unlikely – no protection measures required.	Probability: Unlikely Consequence: Medium Magnitude: Low Risk

11 Remedial Requirements

No significant contamination has been identified therefore remedial works for the proposed development are considered unnecessary.

No / limited topsoil / subsoil is present on site therefore topsoil will have to be imported on to the site to create garden / landscaped areas.

11.1 Material Reuse

Based on the GQRA carried out the soil sampled does not pose a potential risk to human receptors and would be suitable for re-use.

The re-use of on-site soils may be undertaken either under the Environmental Permitting Regulations 2007 (EPR), in which case soils other than uncontaminated soils are classed as waste, or under the CL:AIRE Voluntary Code of Practice (CoP) which was published in September 2008, updated 2011, and is now widely accepted as an alternative regime to the EPR.

Under the EPR, material that is contaminated but otherwise suitable for re-use is also classified as waste and its re-use should be in accordance with the Environmental Permitting Regulations 2007 (EPR).

Under the CL:AIRE Voluntary Code of Practice (CoP) materials excavated on-site are not deemed contaminated if suitable for re-use at specified locations or generally within the site. Material that may have been classified as hazardous waste under the EPR may be re-used. The CoP regime requires that a 'Qualified Person' as defined under the CoP reviews the development of the Materials Management Plan, including review of Risk Assessments and Remediation Strategy/Design Statement together with documentation relating to Planning and Regulatory issues, and signs a Declaration which is forwarded to the Environment Agency and which confirms compliance with the CoP.

Based upon the data obtained from the ground investigation there would not be a requirement to take material off-site as long as a suitable Materials Management Plan (MMP) was in place.

12 Recommendations for Further Work

The following further works are recommended:

- Completion and reporting of the scheduled gas monitoring.
- Further investigation deeper boreholes to obtain pile design parameters.
- Discussions with piling contractors regarding their method for emplacing piles.
- Discussions with service providers regarding the materials suitable for pipework etc.
- Discussions with regulatory bodies regarding the conclusions of this report.
- Detailed design of foundations.

13 Limitations and Uncertainties

13.1 General

This report has been prepared by Hamson Barron Smith with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the Client.

The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true representative data with respect to site conditions. The information reported herein is based on the interpretation of data collected during the site investigation, pertaining specifically to the soil samples retained from the identified locations. Should additional information become available that may influence the opinions expressed in this report, Hamson Barron Smith reserves the right to review such information and, if warranted, to alter the opinions accordingly.

The evaluation and conclusions do not preclude the existence of other site conditions and contamination, which could not reasonably have been revealed by the site investigation works undertaken at the time of writing. This report should be used for information purposes only and should not be construed as a comprehensive characterisation of all site conditions or potential contaminants.

It must be noted that the locations of the exploratory holes are, by requirement, usually free from buried services and structures, and therefore are more likely to encounter natural strata at a shallower depth than areas underlain by services and structures.

This report has been prepared solely for the use of the client, and may not be relied upon by other parties without written consent from Hamson Barron Smith.

Hamson Barron Smith disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

13.2 Site Specific

Only one of three scheduled gas monitoring visits have been undertaken to date. The risks from gas cannot therefore be properly assessed at this stage. The gas monitoring

is being undertaken at a minimum of monthly intervals. Furthermore, one well was not accessible due to surface water flooding.

14 General Notes

This report will be prepared for the exclusive use of the client named in the document and copyright will subsist with Hamson Barron Smith Limited. Prior written permission must be obtained to reproduce all or part of the report. It will be prepared on the understanding that you will disclose its contents to parties directly involved in the current investigation, preparation and development of the site. Further copies may be obtained with the client's written permission from Hamson Barron Smith Limited with whom a master copy of the document will be retained.

The report and /or opinion will be prepared for the specific purpose stated in the document and in relation to the nature and extent of proposals made available to us at the time of your enquiry. The recommendations should not be used for other schemes on or adjacent to the site without further reference to Hamson Barron Smith Limited. The assessment of the factual data will be provided to assist the client and his Engineer and/or advisors in the preparation of their designs.

The report will be based on the ground conditions encountered in the exploratory holes together with the results of field and laboratory testing in the context of the proposed development. There may be special conditions, appertaining to the site, however, which may not be revealed by the investigation, and which may not be taken into account in the report.

Methods of construction and/or design other than those proposed by the designers or referred to in the report may require consideration during the evolution of the proposals and further assessment of the geotechnical data would be required to provide discussion and recommendation appropriate to these methods.

The accuracy of the results reported will depend upon the technique of measurement, investigation and test used and these values should not be regarded necessarily as characteristic of the strata as a whole. Where such measurements are critical, the technique of the investigation will need to be reviewed and supplementary investigation undertaken in accordance with the advice of the company where necessary.

Whilst the report may express an opinion on possible configurations of strata between or beyond exploratory holes, or on possible presence of a feature based on either visual, verbal, written, cartographical, photographic or published evidence, this will be for guidance only and no liability can be accepted for its accuracy.

Ground conditions should be monitored during the construction of the works and the recommendations of the report re-evaluated in the light of these data by the supervising geotechnical engineers.

Any comments on groundwater conditions will be based on observations made at the time of the investigation, unless specifically stated otherwise. It should be noted, however, that the observations are subject to the method and speed of the boring, drilling or excavation and that groundwater levels will vary due to seasonal or other effects.

Unless specifically stated, the investigation will not take into account of possible effects of mineral extraction.

The economic viability of the proposals referred to in the report, or of the solutions put forward to any problems encountered, will depend on very many factors in addition to geotechnical considerations hence its evaluation will be outside the scope of the report.

Appendix A

Site plan



Aerial photography supplied by Getmapping PLC. © Copyright Getmapping PLC 2023. All Rights Reserved.

Project: Fletcher Fold

Client: Bolton at Home

Title: Site Plan

Drawing: 23-12-115972 / Plan

Date: 08 Dec 2023

Notes:

Key

**Hamson
Barron
Smith**

Appendix B

Proposed Development Plan



SITE LAYOUT PLAN
1 : 500

NOTES

ACCOMMODATION SUMMARY

TYPE	COUNT
Two bedroom bungalow	4
One bedroom apartment	39
Total	43

All accommodation is designed to meet the Nationally Described Space Standards and Part M4 Category 2: accessible and adaptable

PARKING PROVISION

Table 2 of Bury Councils SPD 11 requires 1.5 parking spaces in an accessible area, which this is, for a 2 bed dwelling. For sheltered housing the requirement is for 1 space per 3 units.

We have indicated 2 spaces per dwelling for the bungalows which are for sale. For the apartments we have indicated 20 spaces for the 39 dwellings to allow for visitor parking.

REFUSE STORAGE PROVISION

Bungalows
4 x 240 litre wheeled bins (general waste, pulvable recycling, mixed recycling and garden waste) to be stored within the garden

Apartments
Storage space for bins will be provided in the kitchens of the apartments. An external refuse store is provided close to the main entrance into which residents will deposit their waste. Those unable to do so will be assisted as part of their care package.

TYPE	REQUIRED*	PROVISION
General waste	4,290 ltr	4 x 1100 ltr
Pulpable recycling	2,145 ltr	2 x 1100 ltr
Mixed recycling	2145 ltr	2 x 1100 ltr
Food waste	390 ltr	2 x 240 ltr

* based on the GD04 Waste Storage and Collection Guidance for New Developments by Manchester City Council. Required provision to be checked and confirmed as part of pre-application discussions.

Notes

The Contractor is to check all dimensions and conditions on site before commencing. Do not scale from this drawing. This drawing remains the copyright of POZZONI Architecture Ltd.

Scale Bars TO BE USED ONLY AS GUIDANCE

1:100 mm 1000 3000 5000
1:200 mm 5000 8000
1:500 M 5 15 25
1:1250 M 10 30 50 70

KEY

- Proposed Tree
- Existing category A tree*
- Existing category B tree*
- Existing category C tree*
- Root protection zones*

* For further information about the existing trees please refer to the Tree Survey by TEP

P06	Six 2 bed apartments changed to 1 bed following housing need feedback. 2 Beds increased to NDSS area. Site adjusted accordingly.	EM	14/03/24
P05	Path alongside building in southern corner reinstated.	EM	29/02/24
P04	Building moved 5m to the right to allow the proposed drainage to sit outside of the tree root protection zones. Car parking adjusted accordingly.	EM	27/02/24
P03	Revised site boundary to site ownership boundary	BAP	08/02/24
P02	Changes to car park and turning head following pre-app Highways feedback	EM	30/01/24
P01	Issued for Pre-App planning advice	EM	19/01/24
Rev	Description	By	Date

Client: ARCON HOUSING ASSOCIATION (BOLTON AT HOME)

Job: FLETCHER FOLD ROAD, BURY

Drawing: **PLANNING - SITE LAYOUT PLAN**

6071_1200 Rev P06

6071-POZ-XX-ZZ-DR-A-1200

Date 19/01/24 Scale 1 : 500 @ A2

EM	2D CoOrd	EM	Approved	JW
Planning	Tender	Construction		
Design	Contract	As Built		

pozzoni

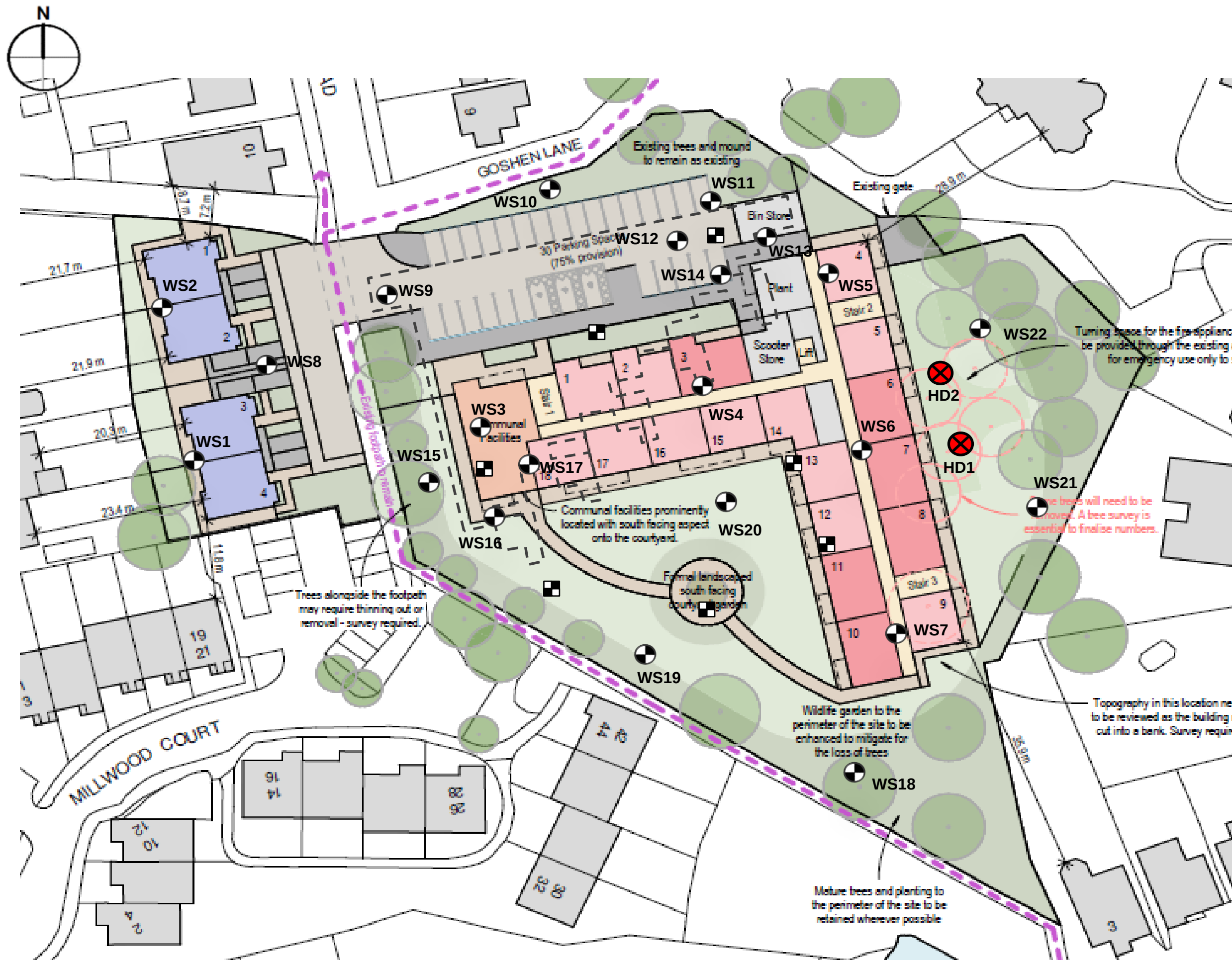
Woodville House
2 Woodville Road
Altrincham
WA14 2FH

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Appendix C

Exploratory Hole Plan

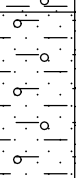
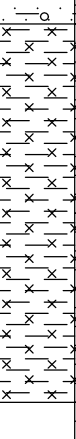


**Hamson
Barron
Smith**

Appendix D

Exploratory Hole Logs

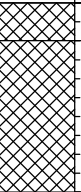
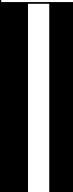
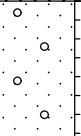
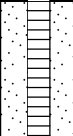
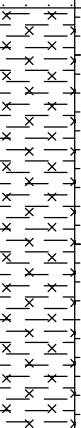
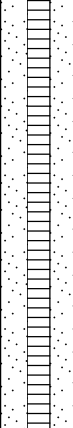
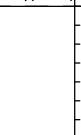
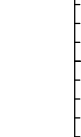
Project: Fletcher Fold				BOREHOLE No.: WS1	
Job No: 23-12-115972	Date Start 04-12-23 End 04-12-23	Ground Level: (m)	Co-Ordinates: () E 380586.0 N 408675.0		
Client: Bolton at Home				Sheet: 1 of 1	

SAMPLES & TESTS			Water	STRATA			Instrument/ Backfill			
Depth	Type	Test Result		Ground Level	Legend	Depth (Thickness)		DESCRIPTION		
0.20 0.30 0.50 0.65 0.70 0.80 0.90 1.00	ES	HV 45 kPa HV 45 kPa HV 22 kPa				0.10 0.30	Made Ground: Brown slightly clayey sandy gravel. Gravel is fine to coarse subangular sandstone.			
						(0.40) 0.70	MADE GROUND: Brown slightly gravelly clay. Gravel is fine to coarse subangular to subrounded sandstone and clinker. Soft to firm brown slightly gravelly CLAY. Gravel is fine to medium subrounded sandstone and coal. [Possible reworked strata]			
	ES B	HV 15 kPa SPT N6				1.00	Soft orangish brown mottled sandy slightly gravelly CLAY. Gravel is fine to medium subrounded sandstone.			
						(1.00) 2.00	Loose light brown slightly clayey gravelly fine SAND / sandy GRAVEL. Gravel is fine to coarse subrounded sandstone.			
						(2.00) 4.00	Soft grey silty CLAY.			
	2.00			SPT N7						
	3.00			SPT N9						
4.00		SPT N9								

Boring Progress and Water Observations						GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	
						Collapsed to 1.4m, hole terminated. Groundwater at 0.78m bgl on completion. Backfilled with arisings. Dynamic Probe DP1 undertaken adjacent.

All dimensions in metres Scale 1:40	Contractor: GeoSpek	Method/ Plant Used: Windowless Sampling	Logged By: CRi
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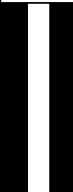
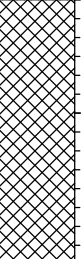
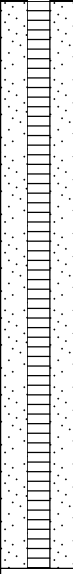
Project: Fletcher Fold				BOREHOLE No.: WS2	
Job No: 23-12-115972	Date Start 04-12-23 End 04-12-23	Ground Level: (m)	Co-Ordinates: () E 380578.0 N 408694.0		
Client: Bolton at Home				Sheet: 1 of 1	

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type	Test Result		Ground Level	Legend	Depth (Thickness)	DESCRIPTION	
0.30	ES					0.20 (0.80)	MADE GROUND: Brown slightly clayey gravel. Gravel is fine to coarse subangular sandstone and brick. Brick cobble. MADE GROUND: Brown slightly clayey sandy gravel. Gravel is fine to coarse subangular sandstone and mudstone; rare brick.	
1.00		SPT N12				1.00 (0.75)	Medium dense brown gravelly fine to coarse SAND. Gravel is fine to coarse subangular to subrounded sandstone. [wet layer]	
1.90 1.90 2.00	D	HV 30 kPa SPT N4				1.75 (2.25)	Soft grey silty CLAY.	
2.80 3.00		HV 25 kPa SPT N8						
3.80 4.00		HV 15 kPa SPT N3				4.00	... Becoming very soft	

Boring Progress and Water Observations						GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	
						Cased to 2m. Groundwater at 0.82m on completion. Gas / groundwater monitoring well installed. Dynamic probe DP2 undertaken adjacent.

All dimensions in metres Scale 1:40	Contractor: GeoSpek	Method/ Plant Used: Windowless Sampling	Logged By: CRi
--	---------------------	--	-------------------

Project: Fletcher Fold				BOREHOLE No.: WS3	
Job No: 23-12-115972	Date Start 04-12-23 End 04-12-23	Ground Level: (m)	Co-Ordinates: () E 380624.0 N 408678.0		
Client: Bolton at Home				Sheet: 1 of 1	

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type	Test Result		Ground Level	Legend	Depth (Thickness)	DESCRIPTION	
0.20	ES	SPT N12				(0.40) 0.40	MADE GROUND: Brown slightly clayey gravel. Gravel is fine to coarse subangular sandstone and brick.	
0.60	ES						MADE GROUND: Gravel in a sandy clay matrix. Gravel is fine to coarse subangular to subrounded sandstone, brick and clinker.	
1.00						(1.40) 1.80		
1.90	D	HV 45 kPa SPT N7					Soft to firm becoming soft grey silty CLAY.	
1.90								
2.00								
2.65		HV 30 kPa						
2.80		HV 25 kPa						
3.00		SPT N4						
3.70		HV 25 kPa				(3.20)		
4.00		SPT N8					4.00 ... Becoming very soft	
4.70		HV 15 kPa						
5.00		SPT N8				5.00		

Boring Progress and Water Observations						GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	
						Cased to 1m. Collapsed to 3.0m on completion. Groundwater at 0.9m on completion. Gas / groundwater monitoring well installed. Dynamic probe DP3 undertaken adjacent.

All dimensions in metres Scale 1:40	Contractor: GeoSpek	Method/ Plant Used: Windowless Sampling	Logged By: CRi
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HBS WS WAKEFIELD 23-12-115972 FLETCHER FOLD(2) GPJ GINT STD AGS 3.1 GDT 4/1/24

Project: Fletcher Fold				BOREHOLE No.: WS4	
Job No: 23-12-115972	Date Start 05-12-23 End 05-12-23	Ground Level: (m)	Co-Ordinates: () E 380639.0 N 408682.0		
Client: Bolton at Home				Sheet: 1 of 1	

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type	Test Result		Ground Level	Legend	Depth (Thickness)	DESCRIPTION	
0.35	ES	SPT N29					MADE GROUND: Brown slightly sandy gravelly clay. Gravel is fine to coarse subangular to subrounded sandstone, brick, concrete and clinker.	
0.75	D					(1.55)		
1.00						1.55		
1.60	ES	HV 60 kPa				(0.45)	Firm brownish grey silty CLAY.	
1.60	D	HV 40 kPa				2.00		
1.80		HV 45 kPa					Soft brownish grey silty CLAY.	
1.80		SPT N14				(1.00)		
1.90								
2.00								
2.50		HV 35 kPa				3.00		
2.70	B	HV 30 kPa					Soft greyish brown silty CLAY.	
2.70		HV 54 kPa						
2.90		SPT N15				(2.00)		
3.00								
3.80		HV 18 kPa						
3.90		HV 30 kPa						
4.00		SPT N12						
5.00		SPT N10				5.00		

Boring Progress and Water Observations						GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	
						Cased to 1m. Collapsed to 2.8m on completion. Groundwater at 1.6m bgl on completion. Backfilled with arisings. Dynamic Probe DP4 undertaken adjacent.

All dimensions in metres Scale 1:40	Contractor: GeoSpek	Method/ Plant Used: Windowless Sampling	Logged By: CRi
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HBS WS WAKEFIELD 23-12-115972 FLETCHER FOLD(2) GPJ GINT STD AGS 3.1 GDT 4/1/24

Project: Fletcher Fold				BOREHOLE No.: WS5	
Job No: 23-12-115972	Date Start 05-12-23 End 05-12-23	Ground Level: (m)	Co-Ordinates: () E 380662.0 N 408694.0		
Client: Bolton at Home				Sheet: 1 of 1	

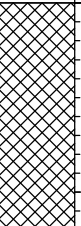
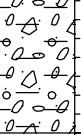
SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type	Test Result		Ground Level	Legend	Depth (Thickness)	DESCRIPTION	
0.10	ES	HV 52 kPa HV 60 kPa SPT N7				(0.40) 0.40	MADE GROUND: Dark brown slightly sandy slightly gravelly clay. Gravel is fine to coarse subangular to subrounded sandstone, brick and concrete.	
0.60	D					(0.45) 0.85	Soft to firm greyish brown mottled brown very sandy SILT/CLAY.	
0.60						1.00	Loose brown gravelly medium to coarse SAND. Gravel is fine to coarse subangular to subrounded sandstone.	
0.70						(0.90) 1.90	Loose brown slightly clayey fine to medium SAND. Many rootlets.	
1.50	ES	SPT N19				(1.60) 3.50	Medium dense brown and greyish brown sandy GRAVEL. Gravel is medium to coarse subrounded mudstone.	
1.70	D					(0.50) 4.00	Soft greyish brown silty CLAY.	
2.00		SPT N11						
3.00								
4.00		SPT N13						

Boring Progress and Water Observations						GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	
						Cased to 1m. Collapsed to 2.0m on completion. Groundwater at 1.5m bgl on completion. Backfilled with arisings. Dynamic Probe DP5 undertaken adjacent.

All dimensions in metres Scale 1:40	Contractor: GeoSpek	Method/ Plant Used: Windowless Sampling	Logged By: CRi
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HBS WS WAKEFIELD 23-12-115972 FLETCHER FOLD(2) GPJ GINT STD AGS 3.1 GDT 4/1/24

Project: Fletcher Fold				BOREHOLE No.: WS6	
Job No: 23-12-115972	Date Start 05-12-23 End 05-12-23	Ground Level: (m)	Co-Ordinates: () E 380667.0 N 408682.0		
Client: Bolton at Home				Sheet: 1 of 1	

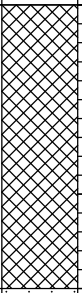
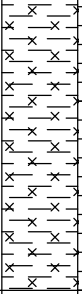
SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type	Test Result		Ground Level	Legend	Depth (Thickness)	DESCRIPTION	
0.30	ES					(1.20)	MADE GROUND: Brown, red and black gravel in a clay matrix. Gravel is fine to coarse subangular to subrounded sandstone, brick, clinker and concrete. Cobbles of mudstone and concrete.	
1.00		SPT N22				1.20		
1.60	B					(0.80)	Medium desne orangish brown clayey sandy Gravel. Gravel is fine to coarse subangular to subrounded sandstone.	
2.00		SPT N8				2.00		
2.60							Soft brownish grey silty CLAY.	
2.60	D					(1.00)		
2.80		HV 18 kPa HV 25 kPa				3.00		
3.00		SPT N5					Very soft to soft greyish brown silty CLAY.	
3.70								
3.90		HV 12 kPa				(2.00)		
4.00		HV 13 kPa SPT N4						
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								
								

Boring Progress and Water Observations						GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	
						Cased to 1m. Collapsed to 3.1m on completion. Groundwater at 2.5m on completion. Gas / groundwater monitoring well installed. Dynamic probe DP6 undertaken adjacent.

All dimensions in metres Scale 1:40	Contractor: GeoSpek	Method/ Plant Used: Windowless Sampling	Logged By: CRi
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HBS WS WAKEFIELD 23-12-115972 FLETCHER FOLD(2) GPJ GINT STD AGS 3.1 GDT 4/1/24

Project: Fletcher Fold				BOREHOLE No.: WS7	
Job No: 23-12-115972	Date Start 06-12-23 End 06-12-23	Ground Level: (m)	Co-Ordinates: () E 380662.0 N 408652.0		
Client: Bolton at Home				Sheet: 1 of 1	

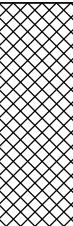
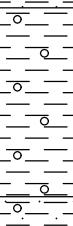
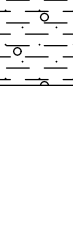
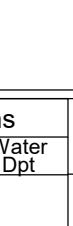
SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type	Test Result		Ground Level	Legend	Depth (Thickness)	DESCRIPTION	
0.10	ES	SPT N7				(1.50)	MADE GROUND: Dark brown slightly sandy gravelly clay. Gravel is fine to coarse subangular to subrounded sandstone, brick and clinker.	
0.80	ES					1.50		
1.00								
1.80	B	SPT N19			(0.50)	Medium dense orangish brown clayey gravelly fine SAND. Gravel is fine to coarse subrounded sandstone. Sandstone cobbles.		
2.00					(0.40)	Medium dense orangish brown sandy GRAVEL. Gravel is fine to coarse subrounded sandstone.		
2.70	D				2.40			
2.75		HV 40 kPa HV 40 kPa SPT N11			(1.60)	Soft greyish brown silty CLAY.		
2.90					4.00			
3.00								
3.70		HV 25 kPa HV 30 kPa SPT N13						
3.90								
4.00								

Boring Progress and Water Observations						GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	
						Cased to 1m. Collapsed to 2.1m on completion. Groundwater at 2.0m bgl on completion. Backfilled with arisings. Dynamic Probe DP7 undertaken adjacent.

All dimensions in metres Scale 1:40	Contractor: GeoSpek	Method/ Plant Used: Windowless Sampling	Logged By: CRi
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HBS WS WAKEFIELD 23-12-115972 FLETCHER FOLD(2) GPJ GINT STD AGS 3.1 GDT 4/1/24

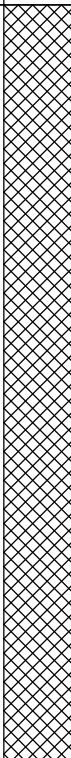
Project: Fletcher Fold				BOREHOLE No.: WS8	
Job No: 23-12-115972	Date Start 04-12-23 End 04-12-23	Ground Level: (m)	Co-Ordinates: () E 380596.0 N 408683.0		
Client: Bolton at Home				Sheet: 1 of 1	

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type	Test Result		Ground Level	Legend	Depth (Thickness)	DESCRIPTION	
0.10	ES					(0.30)	MADE GROUND: Dark brown gravelly clay. Gravel is fine to coarse subangular to subrounded sandstone, brick, concrete and tarmac.	
0.40		HV 62 kPa				(0.30)	Firm dark grey slightly sandy CLAY.	
0.50		HV 48 kPa				0.60		
0.70		HV 20 kPa				(0.25)	Soft dark brown slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded sandstone.	
0.80		HV 20 kPa				0.85		
0.90		HV 48 kPa				(0.15)	Soft to firm grey mottled orangish brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded siltstone and sandstone.	
0.95	D					1.00		
1.00		SPT N4						

Boring Progress and Water Observations						GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	
						Groundwater at 0.1m on completion. Backfilled with arisings.

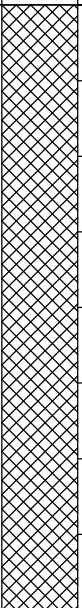
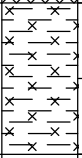
All dimensions in metres Scale 1:10	Contractor: GeoSpek	Method/ Plant Used: Windowless Sampling	Logged By: CRi
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HBS WS WAKEFIELD 23-12-115972 FLETCHER FOLD(2).GPJ GINT STD AGS.3.1.GDT 4/1/24

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type	Test Result		Ground Level	Legend	Depth (Thickness)	DESCRIPTION	
0.50 0.50	ES	HV 70 kPa				(1.00)	MADE GROUND: Dark brown slightly sandy gravelly clay. Gravel is fine to coarse subangular to subrounded concrete, brick, sandstone, tarmac and mudstone. Cobble of sandstone, concrete and mudstone. 0.80 ... Becoming very gravelly.	
1.00		SPT N10						

All dimensions in metres Scale 1:10	Contractor: GeoSpek	Method/ Plant Used: Windowless Sampling	Logged By: CRi
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Project: Fletcher Fold				BOREHOLE No.: WS10	
Job No: 23-12-115972	Date Start 04-12-23 End 04-12-23	Ground Level: (m)	Co-Ordinates: () E 380626.0 N 408708.0		
Client: Bolton at Home				Sheet: 1 of 1	

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type	Test Result		Ground Level	Legend	Depth (Thickness)	DESCRIPTION	
0.20	ES					(0.80)	MADE GROUND: Brown slightly clayey gravelly sand. Gravel is fine to coarse subangular to subrounded sandstone, mudstone and brick. Cobbles of sandstone and mudstone.	
0.80	D	HV 90 kPa				0.80	Soft to firm brownish grey CLAY.	
0.85						(0.20)	0.90 ... becoming sandy and slightly gravelly.	
0.95		HV 20 kPa				1.00		
1.00		SPT N4						

Boring Progress and Water Observations						GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	
						Wet at base (1m bgl) of hole on completion. Backfilled with arisings.

All dimensions in metres Scale 1:10	Contractor: GeoSpek	Method/ Plant Used: Windowless Sampling	Logged By: CRi
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HBS WS WAKEFIELD 23-12-115972 FLETCHER FOLD(2).GPJ GINT STD AGS.3.1.GDT 4/1/24

Project: Fletcher Fold				BOREHOLE No.: WS11	
Job No: 23-12-115972	Date Start 04-12-23 End 04-12-23	Ground Level: (m)	Co-Ordinates: () E 380646.0 N 408706.0		
Client: Bolton at Home				Sheet: 1 of 1	

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type	Test Result		Ground Level	Legend	Depth (Thickness)	DESCRIPTION	
0.60	ES					(1.00)	MADE GROUND: Brown clayey sandy gravel / sandy gravelly clay. Gravel is fine to coarse subangular to subrounded sandstone, brick and tarmac.	
1.00		SPT N9				1.00		

Boring Progress and Water Observations						GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	
						Groundwater at 0.6m bgl on completion. Backfilled with arisings.

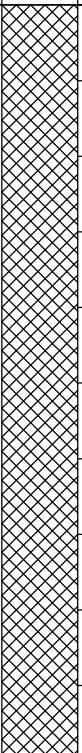
All dimensions in metres Scale 1:10	Contractor: GeoSpek	Method/ Plant Used: Windowless Sampling	Logged By: CRi
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HBS WS WAKEFIELD 23-12-115972 FLETCHER FOLD(2).GPJ GINT STD AGS.3.1.GDT 4/1/24

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type	Test Result		Ground Level	Legend	Depth (Thickness)	DESCRIPTION	
0.60	ES	SPT N12				(0.60)	MADE GROUND: Brown slightly clayey sandy gravel. Gravel is fine to coarse subangular to subrounded sandstone, brick, concrete and mudstone; occasional clinker.	
						(0.40)	MADE GROUND: Brown slightly sandy gravelly clay. Gravel is fine to coarse subangular to subrounded sandstone, brick and concrete. Cobbles of sandstone.	
1.00								

All dimensions in metres Scale 1:10	Contractor: GeoSpek	Method/ Plant Used: Windowless Sampling	Logged By: CRi
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Project: Fletcher Fold				BOREHOLE No.: WS13			
Job No: 23-12-115972		Date Start 04-12-23 End 04-12-23				Ground Level: (m)	
Client: Bolton at Home				Sheet: 1 of 1			

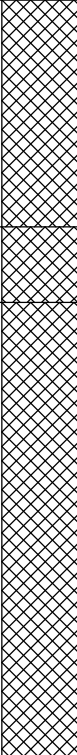
SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type	Test Result		Ground Level	Legend	Depth (Thickness)	DESCRIPTION	
0.65	ES					(1.00)	MADE GROUND: Brown slightly sandy gravelly clay. Gravel is fine to coarse subangular to subrounded sandstone, brick and concrete. Many cobbles of sandstone and concrete.	
1.00		SPT N11				1.00		

Boring Progress and Water Observations						GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	
						Groundwater at 0.85m bgl on completion. Backfilled with arisings.

All dimensions in metres Scale 1:10	Contractor: GeoSpek	Method/ Plant Used: Windowless Sampling	Logged By: CRi
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HBS WS WAKEFIELD 23-12-115972 FLETCHER FOLD(2).GPJ GINT STD AGS.3.1.GDT 4/1/24

Project: Fletcher Fold				BOREHOLE No.: WS14			
Job No: 23-12-115972		Date Start 04-12-23 End 04-12-23				Ground Level: (m)	
Client: Bolton at Home				Sheet: 1 of 1			

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type	Test Result		Ground Level	Legend	Depth (Thickness)	DESCRIPTION	
0.70	ES	SPT N23				(0.30) 0.30	MADE GROUND: Dark brown clayey sandy gravel. Gravel is fine to coarse subangular to subrounded brick.	
						(0.10) 0.40	MADE GROUND: Sandstone cobble.	
						(0.60) 1.00	MADE GROUND: Brown very gravelly clay. Gravel is fine to coarse subangular to subrounded sandstone and brick.	
1.00								

Boring Progress and Water Observations						GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	
						Groundwater at 0.6m bgl on completion. Backfilled with arisings.

All dimensions in metres Scale 1:10	Contractor: GeoSpek	Method/ Plant Used: Windowless Sampling	Logged By: CRi
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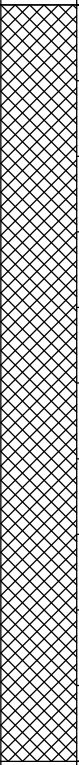
HBS WS WAKEFIELD 23-12-115972 FLETCHER FOLD(2).GPJ GINT STD AGS.3.1.GDT 4/1/24

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type	Test Result		Ground Level	Legend	Depth (Thickness)	DESCRIPTION	
0.50	ES	SPT N10				(0.30) 0.30	MADE GROUND: Brown clayey slightly gravelly fine to medium sand / sandy gravelly clay. Gravel is fine to coarse subangular to subrounded sandstone.	
						(0.40) 0.70	MADE GROUND: Brownish grey sandy gravelly clay. Gravel is fine to coarse subangular to subrounded sandstone, brick and clinker.	
						(0.30) 1.00	MADE GROUND: Brown sandy gravelly clay. Gravel is fine to coarse subangular to subrounded sandstone and brick.	
1.00								

All dimensions in metres Scale 1:10	Contractor: GeoSpek	Method/ Plant Used: Windowless Sampling	Logged By: CRi
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HBS WS WAKEFIELD 23-12-115972 FLETCHER FOLD(2).GPJ GINT STD AGS3 1.GDT 4/1/24

Project: Fletcher Fold				BOREHOLE No.: WS16	
Job No: 23-12-115972		Date Start 04-12-23 End 04-12-23	Ground Level: (m)		
Client: Bolton at Home				Sheet: 1 of 1	

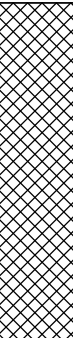
SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type	Test Result		Ground Level	Legend	Depth (Thickness)	DESCRIPTION	
0.50	ES					(1.00)	MADE GROUND: Brown clayey slightly gravelly fine sand / sandy gravelly clay. Gravel is fine to coarse subangular to subrounded sandstone, brick, concrete, clinker and coal.	
1.00		SPT N11				1.00		

Boring Progress and Water Observations						GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	
						Groundwater at 0.7m bgl on completion. Backfilled with arisings.

All dimensions in metres Scale 1:10	Contractor: GeoSpek	Method/ Plant Used: Windowless Sampling	Logged By: CRi
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HBS WS WAKEFIELD 23-12-115972 FLETCHER FOLD(2).GPJ GINT STD AGS.3.1.GDT 4/1/24

Project: Fletcher Fold				BOREHOLE No.: WS17	
Job No: 23-12-115972	Date Start 04-12-23 End 04-12-23	Ground Level: (m)	Co-Ordinates: () E 380629.0 N 408673.0		
Client: Bolton at Home				Sheet: 1 of 1	

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type	Test Result		Ground Level	Legend	Depth (Thickness)	DESCRIPTION	
0.60	ES	HV 55 kPa SPT N9				(0.45)	MADE GROUND: Brown clayey slightly gravelly fine sand / sandy clay. Gravel is fine to coarse subangular to subrounded sandstone and brick.	
						0.45 (0.40)	MADE GROUND: Gravel in a sandy clay matrix. Gravel is fine to coarse subangular brick, clinker, concrete and sandstone.	
						0.85 (0.15)	Soft to firm grey CLAY	
0.90 0.90 1.00	D					1.00		

Boring Progress and Water Observations						GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	
						Dry on completion. Backfilled with arisings.

All dimensions in metres Scale 1:10	Contractor: GeoSpek	Method/ Plant Used: Windowless Sampling	Logged By: CRi
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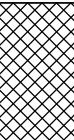
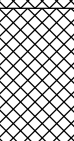
HBS WS WAKEFIELD 23-12-115972 FLETCHER FOLD(2).GPJ GINT STD AGS.3.1.GDT 4/1/24

Project: Fletcher Fold				BOREHOLE No.: WS18
Job No: 23-12-115972	Date Start 06-12-23 End 06-12-23	Ground Level: (m)	Co-Ordinates: () E 380657.0 N 408641.0	
Client: Bolton at Home				Sheet: 1 of 1

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Boring Progress and Water Observations						GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	
						Hand dug due to rig break down. Backfilled with arisings.

Project: Fletcher Fold				BOREHOLE No.: WS19
Job No: 23-12-115972	Date Start 06-12-23 End 06-12-23	Ground Level: (m)	Co-Ordinates: () E 380641.0 N 408652.0	
Client: Bolton at Home				
				Sheet: 1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type	Test Result		Ground Level	Legend	Depth (Thickness)	DESCRIPTION	
0.10	ES					(0.20) 0.20	MADE GROUND: Dark brown gravelly clay. Gravel is fine to coarse subangular sandstone, mudstone, brick, clinker and wood.	
							(0.30) 0.50	

Boring Progress and Water Observations						GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	
						Hand dug due to rig break down. Backfilled with arisings.

All dimensions in metres Scale 1:10	Contractor: GeoSpek	Method/ Plant Used: Hand Dug	Logged By: CRi
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HBS WS WAKEFIELD 23-12-115972 FLETCHER FOLD(2).GPJ GINT STD AGS3 1.GDT 4/1/24

Project: Fletcher Fold				BOREHOLE No.: WS20
Job No: 23-12-115972	Date Start 06-12-23 End 06-12-23	Ground Level: (m)	Co-Ordinates: () E 380642.0 N 408671.0	
Client: Bolton at Home				Sheet: 1 of 1

[illegible]

Boring Progress and Water Observations						GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	
						Hand dug due to rig break down. Backfilled with arisings.

Project: Fletcher Fold				BOREHOLE No.: WS21
Job No: 23-12-115972	Date Start 06-12-23 End 06-12-23	Ground Level: (m)	Co-Ordinates: () E 380675.0 N 408669.0	
Client: Bolton at Home				
				Sheet: 1 of 1

[illegible]

Boring Progress and Water Observations						GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	
						Hand dug due to rig break down. Backfilled with arisings.

Project: Fletcher Fold				BOREHOLE No.: WS22
Job No: 23-12-115972	Date Start 06-12-23 End 06-12-23	Ground Level: (m)	Co-Ordinates: () E 380682.0 N 408685.0	
Client: Bolton at Home				
				Sheet: 1 of 1

[illegible]

Boring Progress and Water Observations						GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	
						Hand dug due to rig break down. Backfilled with arisings.

All dimensions in metres Scale 1:10	Contractor: GeoSpek	Method/ Plant Used: Hand Dug	Logged By: CRi
--	---------------------	---------------------------------	-------------------

HBS WS WAKEFIELD 23-12-115972 FLETCHER FOLD(2).GPJ GINT STD AGS3 1.GDT 4/1/24

HBS
Geotechnical

DYNAMIC PROBE LOG

Evolution House
Springwell Road
Leeds
LS12 1AW

Project: Fletcher Fold				PROBE No DP1
Job No: 23-12-115972	Date: 04-12-23 04-12-23	Ground Level (m)	Co-Ordinates ()	
Client: Bolton at Home				Sheet 1 of 1

Depth (m)	Readings (blows/100mm)	Diagram (N100 Values)						Torque (Nm)	Remarks
		5	10	15	20	25	30		
1	2 1 1 0 0								
	0 0 0 1 1								
	2 1 1 1 3								
	2 1 0 0 1								
2	1 1 2 2 1								
	2 3 2 3 3								
3	3 3 3 4 4								
	3 3 5 4 4								
4	4 4 4 4 4								
	4 4 5 5 5								
5	6 5 6 5 6								
	5 6 6 6 6								
6	6 6 7 7 7								
	8 8 9 10 9								
7									

Hammer Wt (kg)	63.5	GENERAL REMARKS
Hammer Drop (mm)	750	
Cone Dia (mm)	50.5	
Cone Type	DPSH	
Damper		

All dimensions in metres Scale 1:50	Contractor: GeoSpek	Method/ Plant Used: Windowless Sampling	Logged By:
--	---------------------	--	------------

HBS DP WAKEFIELD 23-12-115972 FLETCHER FOLD.GPJ GINT STD.AGS 3 1.GDT 8/12/23

HBS
Geotechnical

DYNAMIC PROBE LOG

Evolution House
Springwell Road
Leeds
LS12 1AW

Project: Fletcher Fold				PROBE No DP2
Job No: 23-12-115972	Date: 04-12-23 04-12-23	Ground Level (m)	Co-Ordinates ()	
Client: Bolton at Home				Sheet 1 of 1

Depth (m)	Readings (blows/100mm)	Diagram (N100 Values)						Torque (Nm)	Remarks
		5	10	15	20	25	30		
1	0								
	1								
	2								
	3								
	4								
	5								
2	6								
	7								
	8								
	9								
	10								
	11								
3	12								
	13								
	14								
	15								
	16								
	17								
4	18								
	19								
	20								
	21								
	22								
	23								
5	24								
	25								
	26								
	27								
	28								
	29								
6	30								
	31								
	32								
	33								
	34								
	35								
7	36								
	37								
	38								
	39								
	40								
	41								

Hammer Wt (kg)	63.5	GENERAL REMARKS
Hammer Drop (mm)	750	
Cone Dia (mm)	50.5	
Cone Type	DPSH	
Damper		

All dimensions in metres Scale 1:50	Contractor: GeoSpek	Method/ Plant Used: Windowless Sampling	Logged By:
--	---------------------	--	------------

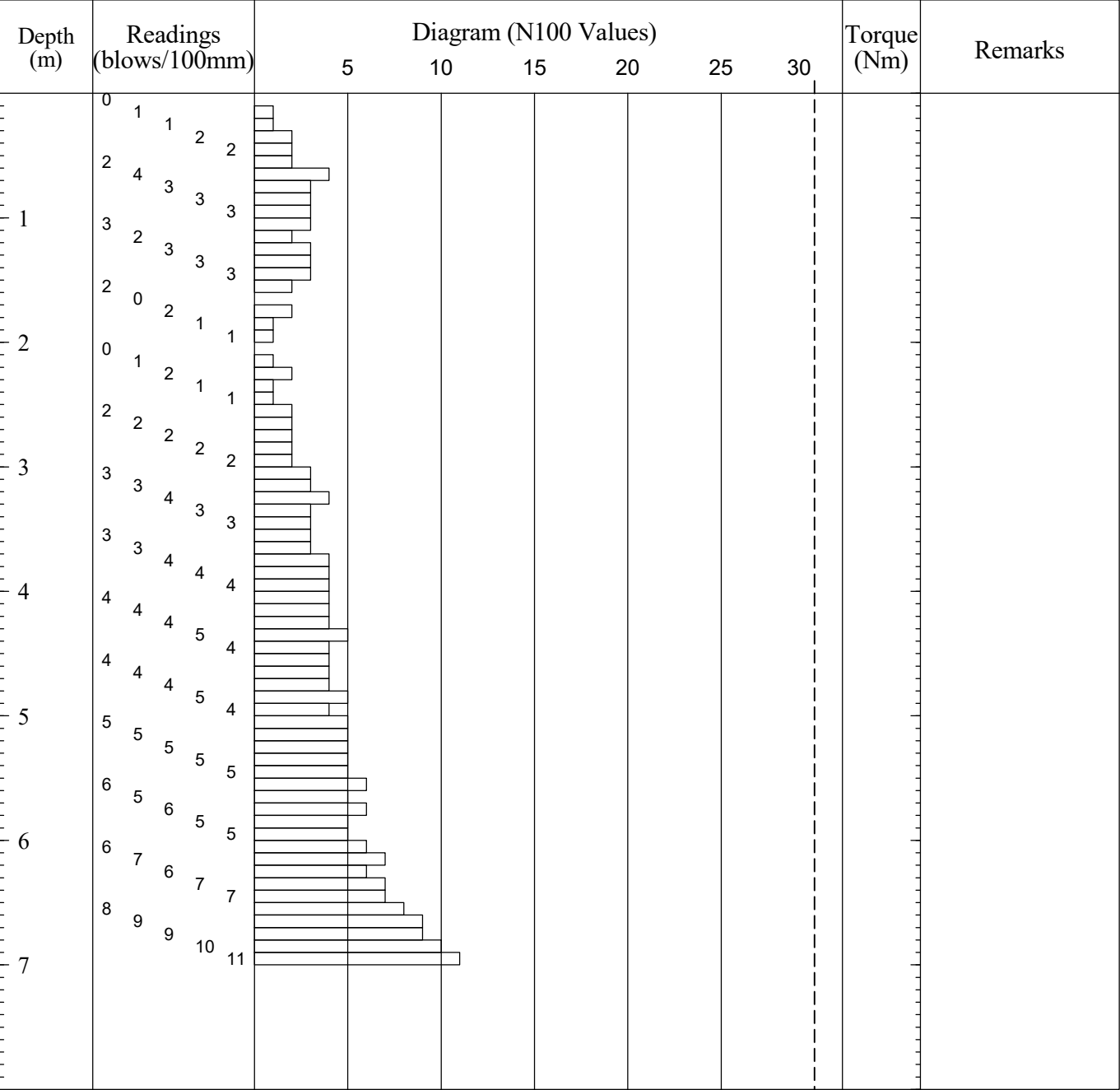
HBS DP WAKEFIELD 23-12-115972 FLETCHER FOLD.GPJ GINT STD.AGS 3 1.GDT 8/12/23

HBS
Geotechnical

DYNAMIC PROBE LOG

Evolution House
Springwell Road
Leeds
LS12 1AW

Project: Fletcher Fold				PROBE No DP3
Job No: 23-12-115972	Date: 04-12-23 04-12-23	Ground Level (m)	Co-Ordinates ()	
Client: Bolton at Home				Sheet 1 of 1



Hammer Wt (kg)	63.5	GENERAL REMARKS
Hammer Drop (mm)	750	
Cone Dia (mm)	50.5	
Cone Type	DPSH	
Damper		

All dimensions in metres Scale 1:50	Contractor: GeoSpek	Method/ Plant Used: Windowless Sampling	Logged By:
--	---------------------	--	------------

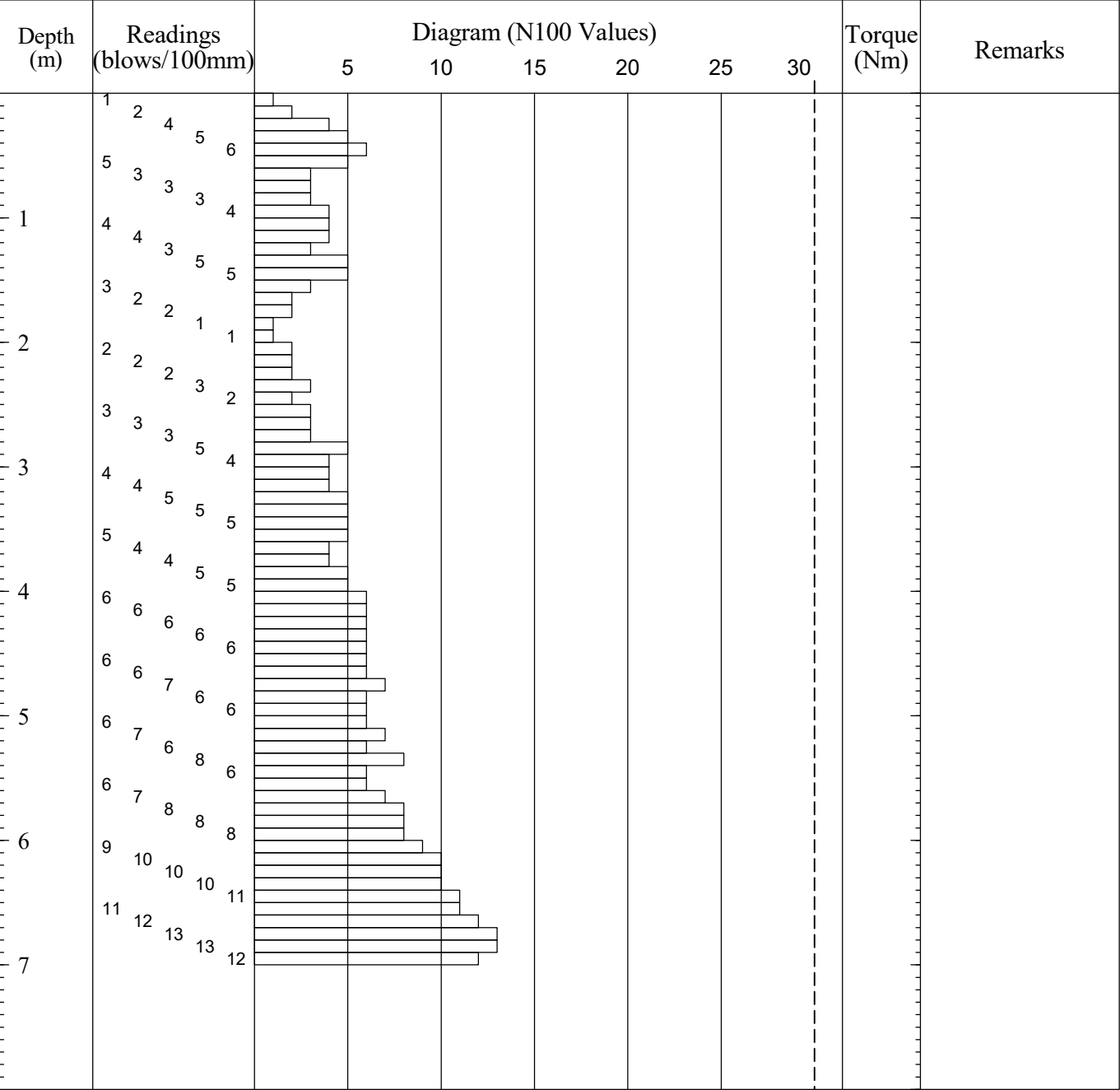
HBS DP WAKEFIELD 23-12-115972 FLETCHER FOLD.GPJ GINT STD.AGS 3 1.GDT 8/12/23

HBS
Geotechnical

DYNAMIC PROBE LOG

Evolution House
Springwell Road
Leeds
LS12 1AW

Project: Fletcher Fold				PROBE No DP4
Job No: 23-12-115972	Date: 04-12-23 04-12-23	Ground Level (m)	Co-Ordinates ()	
Client: Bolton at Home				Sheet 1 of 1



Hammer Wt (kg)	63.5	GENERAL REMARKS
Hammer Drop (mm)	750	
Cone Dia (mm)	50.5	
Cone Type	DPSH	
Damper		

All dimensions in metres Scale 1:50	Contractor: GeoSpek	Method/ Plant Used: Windowless Sampling	Logged By:
--	---------------------	--	------------

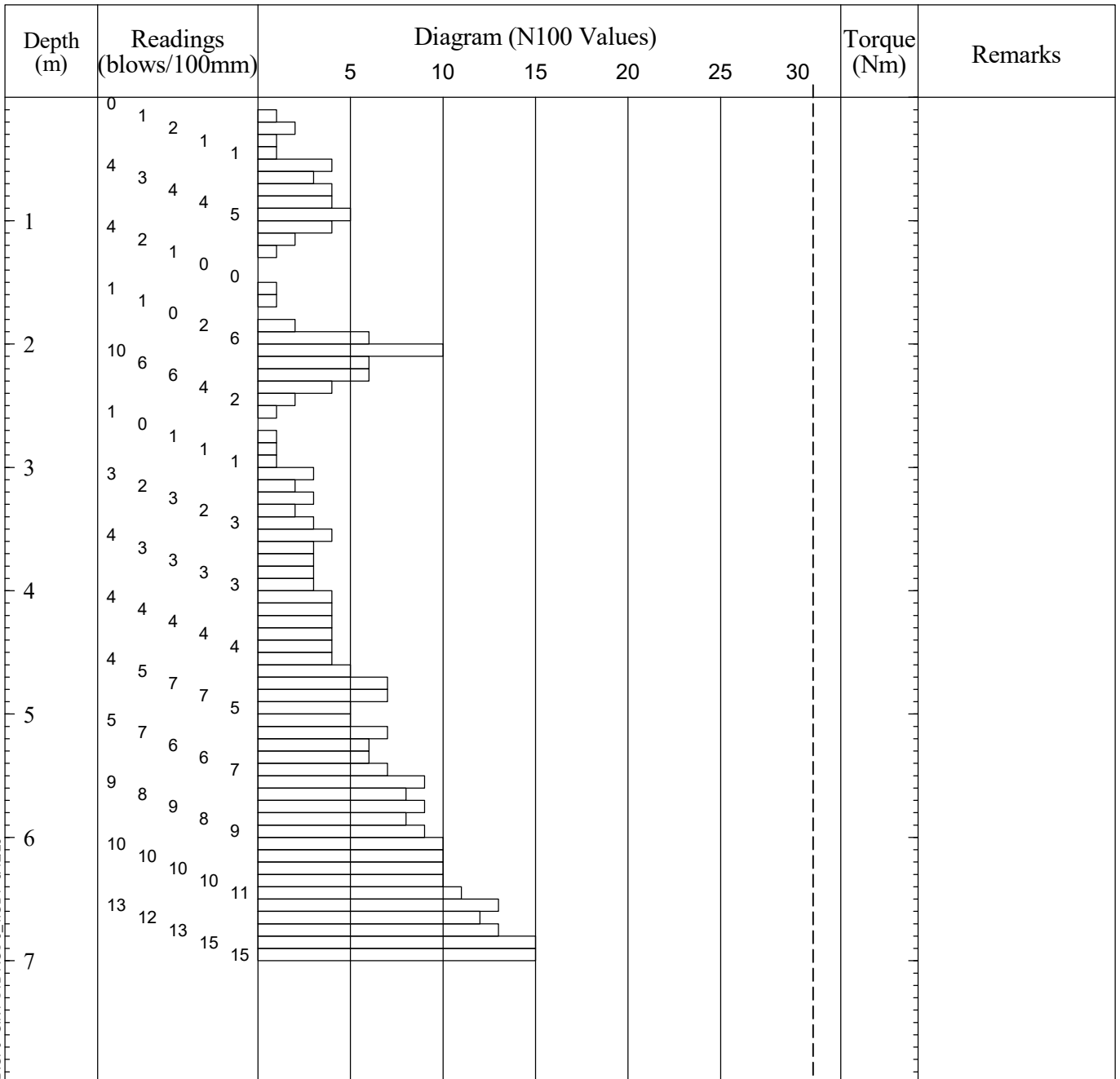
HBS DP WAKEFIELD 23-12-115972 FLETCHER FOLD.GPJ GINT STD.AGS 3 1.GDT 8/12/23

HBS Geotechnical

DYNAMIC PROBE LOG

Evolution House
Springwell Road
Leeds
LS12 1AW

Project: Fletcher Fold				PROBE No DP5
Job No: 23-12-115972	Date: 04-12-23 04-12-23	Ground Level (m)	Co-Ordinates ()	
Client: Bolton at Home				Sheet 1 of 1



Hammer Wt (kg)	63.5	GENERAL REMARKS
Hammer Drop (mm)	750	
Cone Dia (mm)	50.5	
Cone Type	DPSH	
Damper		

All dimensions in metres Scale 1:50	Contractor: GeoSpek	Method/ Plant Used: Windowless Sampling	Logged By:
--	---------------------	--	------------

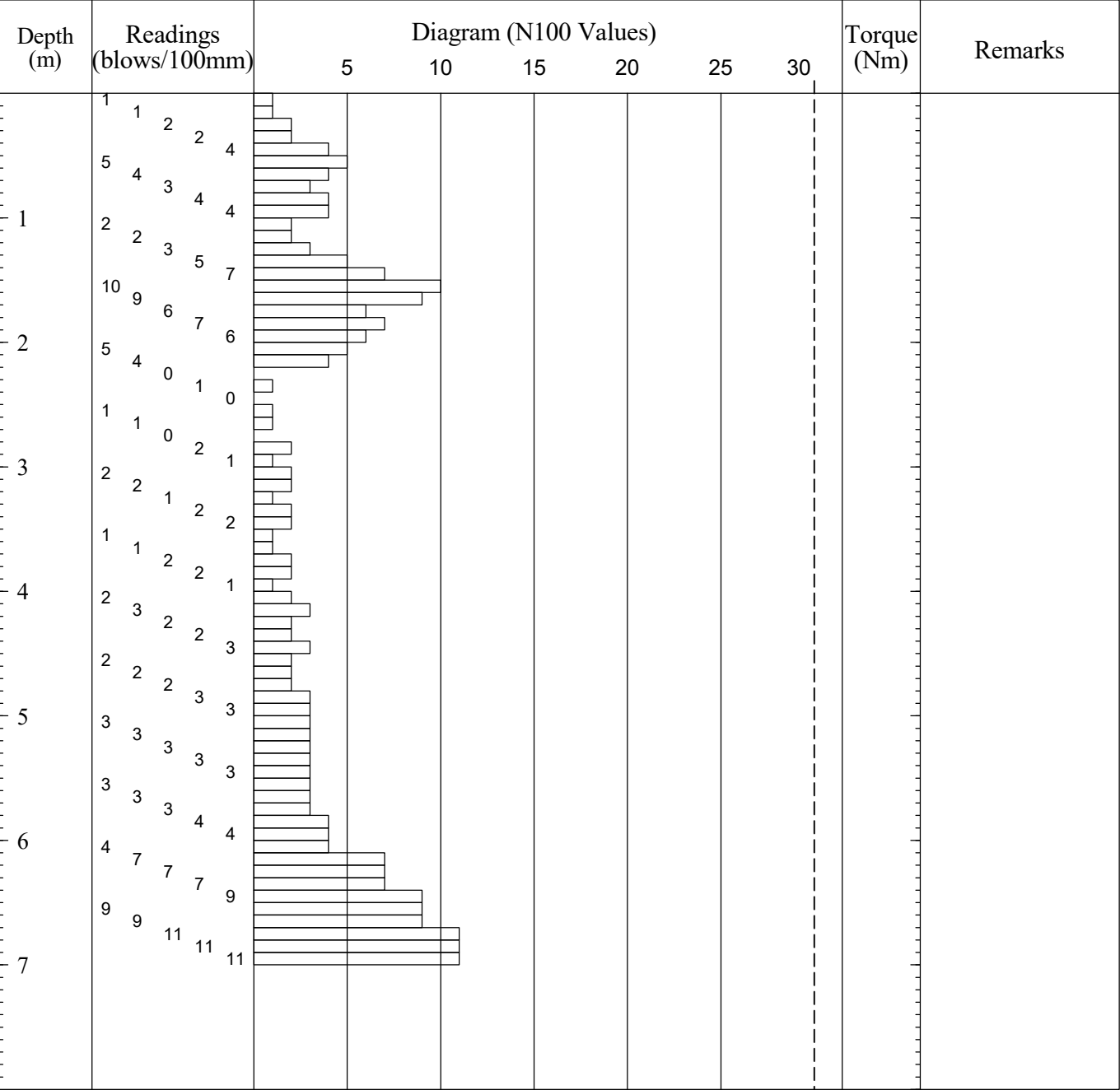
HBS DP WAKEFIELD 23-12-115972 FLETCHER FOLD.GPJ GINT STD.AGS 3 1.GDT 8/12/23

HBS Geotechnical

DYNAMIC PROBE LOG

Evolution House
Springwell Road
Leeds
LS12 1AW

Project: Fletcher Fold				PROBE No DP6
Job No: 23-12-115972	Date: 05-12-23 05-12-23	Ground Level (m)	Co-Ordinates ()	
Client: Bolton at Home				Sheet 1 of 1



Hammer Wt (kg)	63.5	GENERAL REMARKS
Hammer Drop (mm)	750	
Cone Dia (mm)	50.5	
Cone Type	DPSH	
Damper		

All dimensions in metres Scale 1:50	Contractor: GeoSpek	Method/ Plant Used: Windowless Sampling	Logged By:
--	---------------------	--	------------

HBS DP WAKEFIELD 23-12-115972 FLETCHER FOLD.GPJ GINT STD.AGS 3 1.GDT 8/12/23

HBS Geotechnical

DYNAMIC PROBE LOG

Evolution House
Springwell Road
Leeds
LS12 1AW

Project: Fletcher Fold				PROBE No DP7
Job No: 23-12-115972	Date: 06-12-23 06-12-23	Ground Level (m)	Co-Ordinates ()	
Client: Bolton at Home				Sheet 1 of 1

Depth (m)	Readings (blows/100mm)	Diagram (N100 Values)						Torque (Nm)	Remarks
		5	10	15	20	25	30		
1	1								
	2								
	2								
	2								
	2								
	1								
	2								
	1								
	1								
	1								
2	1								
	1								
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	3								
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	74								
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3	5								
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Hammer Wt (kg)	63.5	GENERAL REMARKS
Hammer Drop (mm)	750	
Cone Dia (mm)	50.5	
Cone Type	DPSH	
Damper		

All dimensions in metres Scale 1:50	Contractor: GeoSpek	Method/ Plant Used: Windowless Sampling	Logged By:
--	---------------------	--	------------

HBS DP WAKEFIELD 23-12-115972 FLETCHER FOLD.GPJ GINT STD.AGS 3 1.GDT 8/12/23

Project: Fletcher Fold				BOREHOLE No.: HD1
Job No: 23-12-115972	Date Start 06-12-23 End 06-12-23	Ground Level: (m)	Co-Ordinates: ()	
Client: Bolton at Home				Sheet: 1 of 1

[illegible]

Boring Progress and Water Observations						GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	
						Hand dug pit in on site stockpile. Backfilled with arisings.

All dimensions in metres Scale 1:10	Contractor: GeoSpek	Method/ Plant Used: Hand Dug	Logged By: CRi
--	---------------------	---------------------------------	-------------------

HBS WS WAKEFIELD 23-12-115972 FLETCHER FOLD(2).GPJ GINT STD AGS3_1.GDT 4/1/24

Project: Fletcher Fold				BOREHOLE No.: HD2
Job No: 23-12-115972	Date Start 06-12-23 End 06-12-23	Ground Level: (m)	Co-Ordinates: ()	
Client: Bolton at Home				Sheet: 1 of 1

[illegible]

Boring Progress and Water Observations						GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	
						Hand dug pit in on site stockpile. Backfilled with arisings.

All dimensions in metres Scale 1:10	Contractor: GeoSpek	Method/ Plant Used: Hand Dug	Logged By: CRi
--	---------------------	---------------------------------	-------------------

Appendix E

Geotechnical Test Certificates



TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

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

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



Environmental Science

4041

Client: Hamson Barron Smith Ltd
Client Address: Navigation Warehouse, 2nd Floor Waterfront,
Navigation Walk, Wakefield,
WF1 5RH
Contact: Catherine Riley
Site Address: Fletcher Fold

Client Reference: 23-12-115972
Job Number: 23-100080-1
Date Sampled: 04/12/2023
Date Received: 07/12/2023
Date Tested: 18/12/2023
Sampled By: Client - C.Riley

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

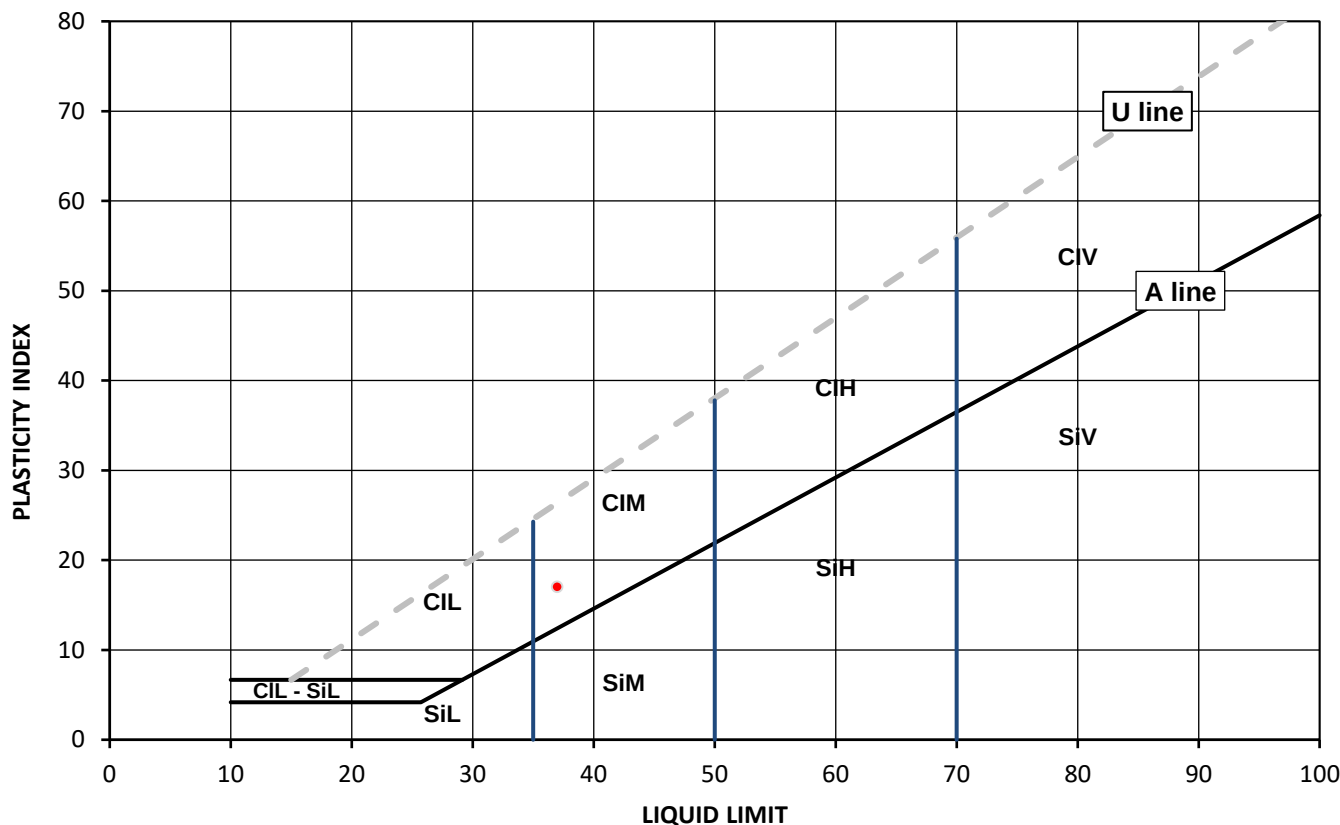
Test Results:

Laboratory Reference: 100370
Hole No.: WS8
Sample Reference: D1
Sample Description: Brownish grey slightly gravelly sandy CLAY

Depth Top [m]: 0.95
Depth Base [m]: Not Given
Sample Type: D

Sample Preparation: Tested after washing to remove >425 µm

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
27	37	20	17	82



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

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

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

Remarks:

Signed:

Katarzyna Koziel

Katarzyna Koziel
Senior Reporting Specialist
for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

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

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



Environmental Science

4041

Client: Hamson Barron Smith Ltd
Client Address: Navigation Warehouse, 2nd Floor Waterfront,
Navigation Walk, Wakefield,
WF1 5RH
Contact: Catherine Riley
Site Address: Fletcher Fold

Client Reference: 23-12-115972
Job Number: 23-100080-1
Date Sampled: 04/12/2023
Date Received: 07/12/2023
Date Tested: 18/12/2023
Sampled By: Client - C.Riley

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

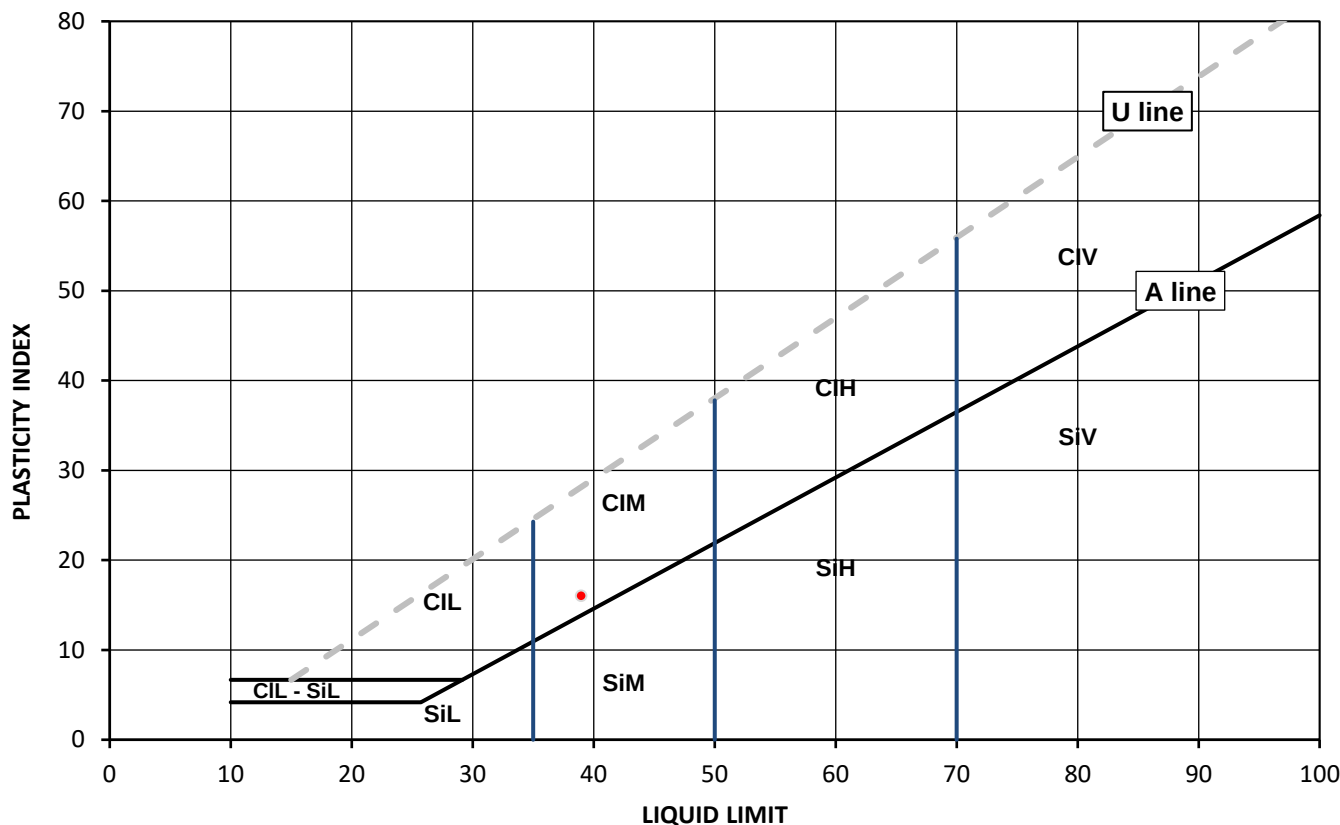
Test Results:

Laboratory Reference: 100372
Hole No.: WS3
Sample Reference: D5
Sample Description: Brownish grey sandy slightly silty CLAY

Depth Top [m]: 1.90
Depth Base [m]: Not Given
Sample Type: D

Sample Preparation: Tested in natural condition

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
26	39	23	16	100



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

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

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

Remarks:

Signed:

Katarzyna Koziel

Katarzyna Koziel
Senior Reporting Specialist
for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

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

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



Environmental Science

4041

Client: Hamson Barron Smith Ltd
Client Address: Navigation Warehouse, 2nd Floor Waterfront,
Navigation Walk, Wakefield,
WF1 5RH
Contact: Catherine Riley
Site Address: Fletcher Fold

Client Reference: 23-12-115972
Job Number: 23-100080-1
Date Sampled: 05/12/2023
Date Received: 07/12/2023
Date Tested: 18/12/2023
Sampled By: Client - C.Riley

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

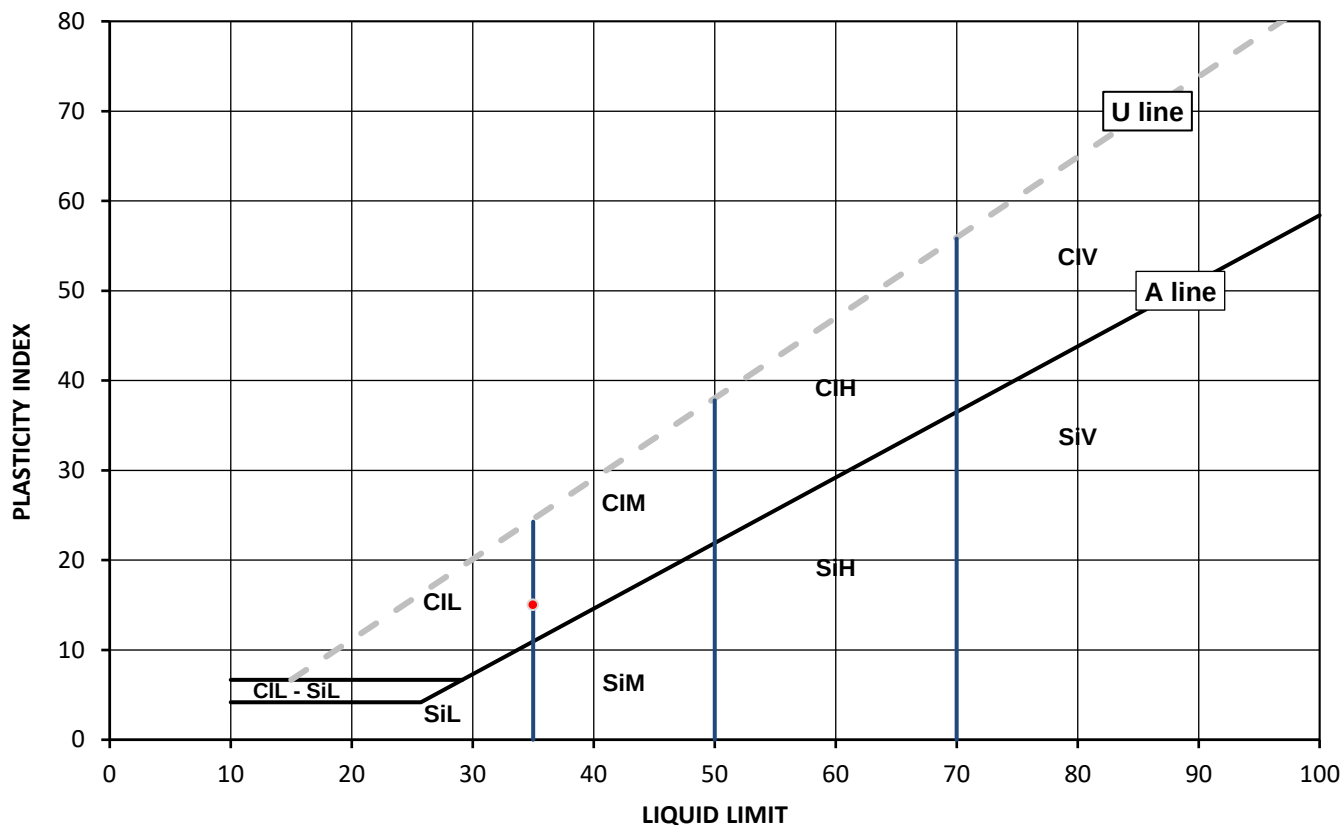
Test Results:

Laboratory Reference: 100373
Hole No.: WS4
Sample Reference: D6
Sample Description: Brownish grey gravelly sandy CLAY

Depth Top [m]: 0.75
Depth Base [m]: Not Given
Sample Type: D

Sample Preparation: Tested after washing to remove >425 µm

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
15	35	20	15	48



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

	Plasticity	Liquid Limit
Cl	Clay	below 35
Si	Silt	35 to 50
		50 to 70
		exceeding 70
		append to classification for organic material (eg CIHO)

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

Remarks:

Signed:

Katarzyna Koziel

Katarzyna Koziel
Senior Reporting Specialist
for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

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

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



Environmental Science

4041

Client: Hamson Barron Smith Ltd
Client Address: Navigation Warehouse, 2nd Floor Waterfront,
Navigation Walk, Wakefield,
WF1 5RH
Contact: Catherine Riley
Site Address: Fletcher Fold

Client Reference: 23-12-115972
Job Number: 23-100080-1
Date Sampled: 05/12/2023
Date Received: 07/12/2023
Date Tested: 18/12/2023
Sampled By: Client - C.Riley

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

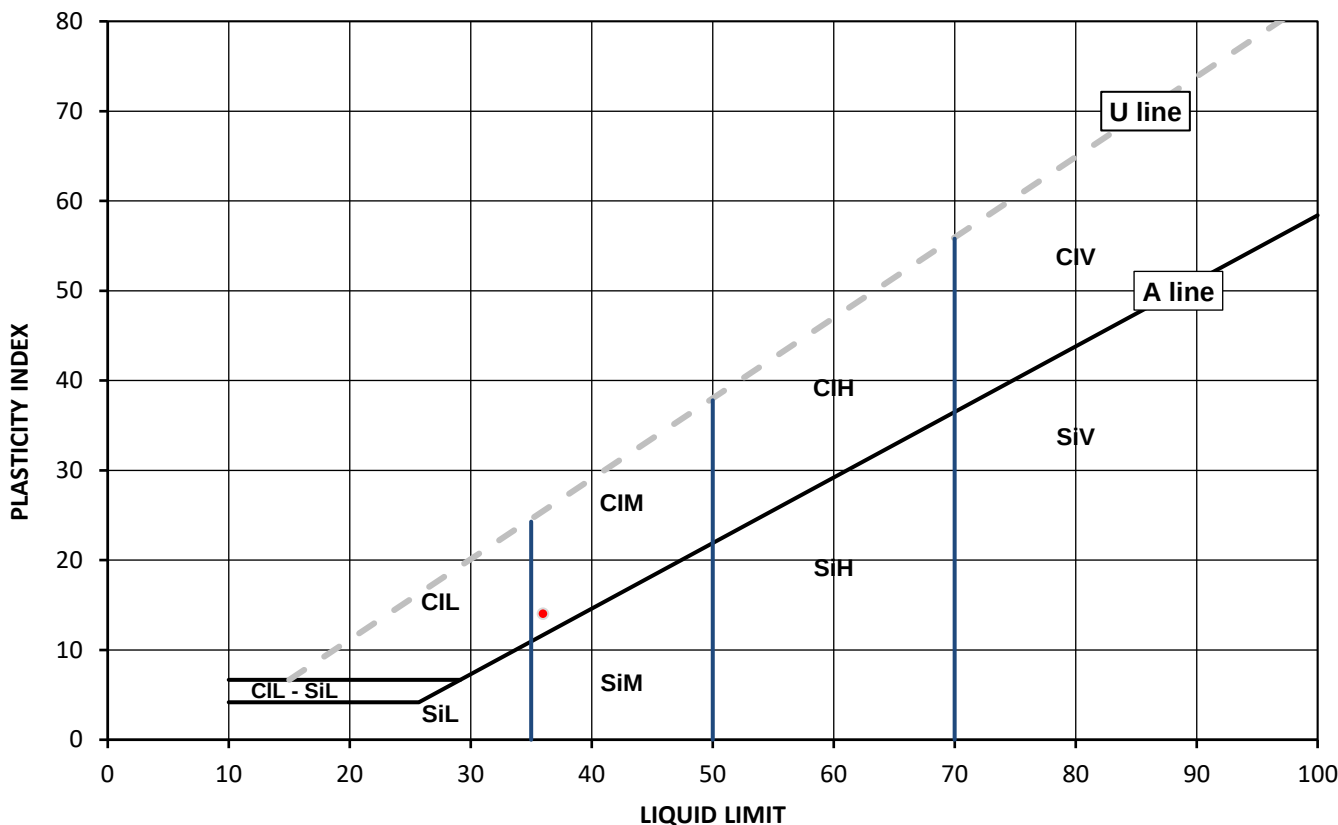
Test Results:

Laboratory Reference: 100374
Hole No.: WS4
Sample Reference: D7
Sample Description: Brownish grey sandy slightly silty CLAY

Depth Top [m]: 1.80
Depth Base [m]: Not Given
Sample Type: D

Sample Preparation: Tested in natural condition

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
25	36	22	14	100



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

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

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

Remarks:

Signed:

Katarzyna Koziel

Katarzyna Koziel
Senior Reporting Specialist
for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

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

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



Environmental Science

4041

Client: Hamson Barron Smith Ltd
Client Address: Navigation Warehouse, 2nd Floor Waterfront,
Navigation Walk, Wakefield,
WF1 5RH
Contact: Catherine Riley
Site Address: Fletcher Fold

Client Reference: 23-12-115972
Job Number: 23-100080-1
Date Sampled: 05/12/2023
Date Received: 07/12/2023
Date Tested: 18/12/2023
Sampled By: Client - C.Riley

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

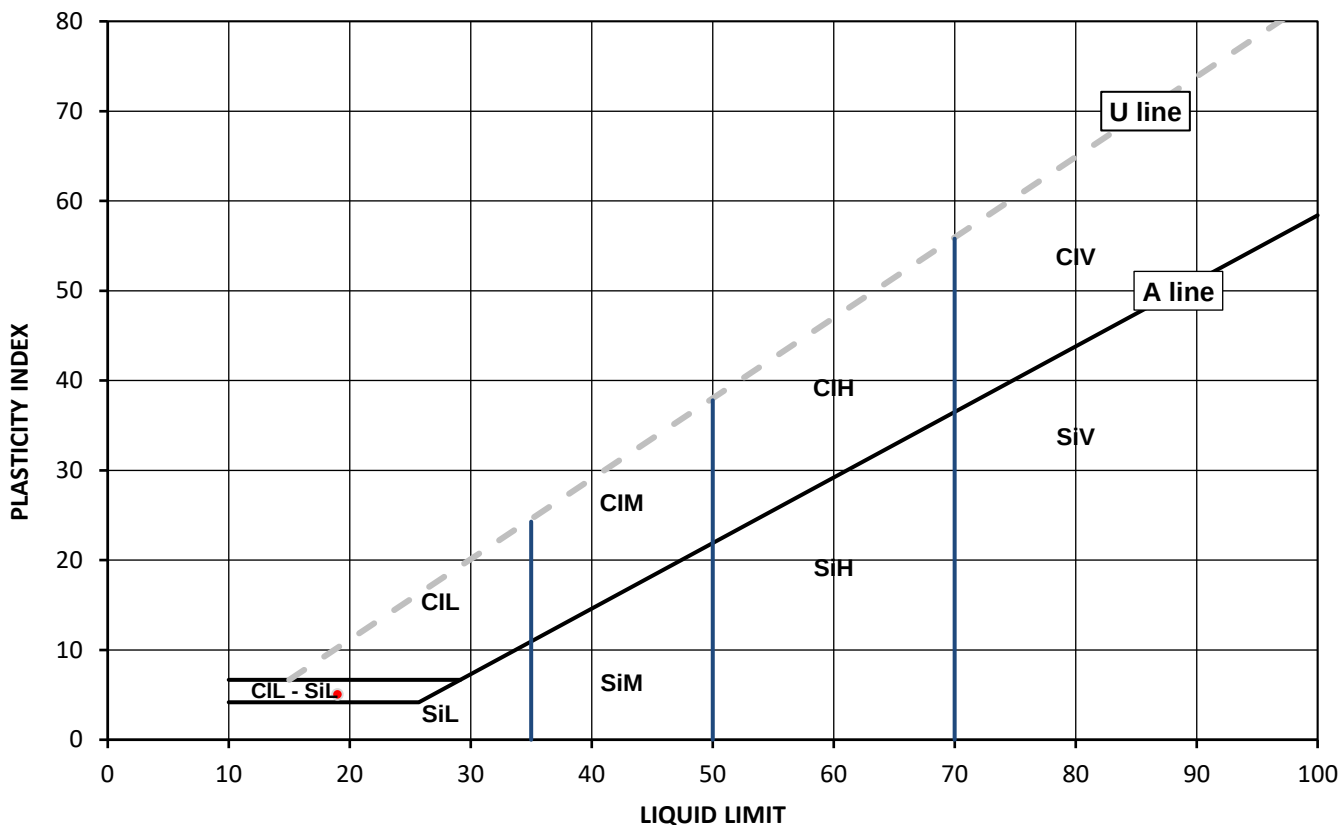
Test Results:

Laboratory Reference: 100376
Hole No.: WS5
Sample Reference: D9
Sample Description: Brownish grey very sandy SILT and CLAY

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

Sample Preparation: Tested in natural condition

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
14	19	14	5	100



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

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

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

Remarks:

Signed:

Katarzyna Koziel

Katarzyna Koziel
Senior Reporting Specialist
for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

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

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



Environmental Science

4041

Client: Hamson Barron Smith Ltd
Client Address: Navigation Warehouse, 2nd Floor Waterfront,
Navigation Walk, Wakefield,
WF1 5RH
Contact: Catherine Riley
Site Address: Fletcher Fold

Client Reference: 23-12-115972
Job Number: 23-100080-1
Date Sampled: 05/12/2023
Date Received: 07/12/2023
Date Tested: 18/12/2023
Sampled By: Client - C.Riley

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

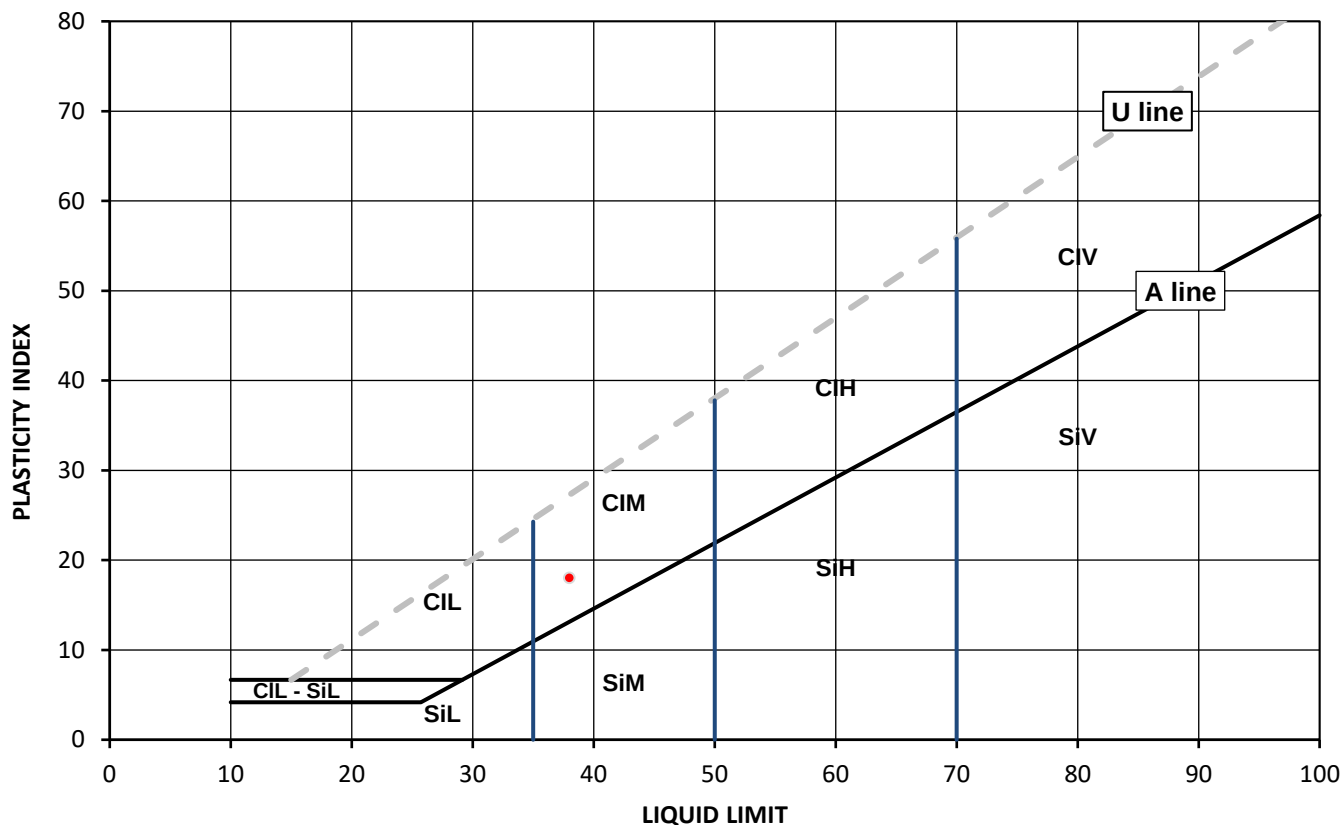
Test Results:

Laboratory Reference: 100379
Hole No.: WS7
Sample Reference: D12
Sample Description: Brownish grey sandy CLAY

Depth Top [m]: 2.70
Depth Base [m]: Not Given
Sample Type: D

Sample Preparation: Tested in natural condition

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
29	38	20	18	100



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

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

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

Remarks:

Signed:

Katarzyna Koziel

Katarzyna Koziel
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for and on behalf of i2 Analytical Ltd

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SUMMARY REPORT

SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with:

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



Environmental Science

4041

Client: Hamson Barron Smith Ltd
Client Address: Navigation Warehouse, 2nd Floor Waterfront,
Navigation Walk,
Wakefield, WF1 5RH

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

Client Reference: 23-12-115972

Job Number: 23-100080-1

Date Sampled: 04/12 - 05/12/2023

Date Received: 07/12/2023

Date Tested: 18/12/2023

Sampled By: Client - C.Riley

Contact: Catherine Riley

Site Address: Fletcher Fold

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

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	Water Content BS 1377-2 [W] %	Water Content BS EN ISO 17892-1 [W] %	Atterberg				Density			Total Porosity# %		
		Reference	Depth Top	Depth Base	Type					% Passing 425um	WL	Wp	Ip	bulk	dry	PD			
			m	m															
100370	WS8	D1	0.95	Not Given	D	Brownish grey slightly gravelly sandy CLAY	Atterberg 1 Point	27		82	37	20	17						
100371	WS1	B1	0.80	1.00	B	Brownish grey sandy CLAY		32											
100372	WS3	D5	1.90	Not Given	D	Brownish grey sandy slightly silty CLAY	Atterberg 1 Point	26		100	39	23	16						
100373	WS4	D6	0.75	Not Given	D	Brownish grey gravelly sandy CLAY	Atterberg 1 Point	15		48	35	20	15						
100374	WS4	D7	1.80	Not Given	D	Brownish grey sandy slightly silty CLAY	Atterberg 1 Point	25		100	36	22	14						
100375	WS4	B2	2.70	2.90	B	Brownish grey CLAY		25											
100376	WS5	D9	0.60	Not Given	D	Brownish grey very sandy SILT and CLAY	Atterberg 1 Point	14		100	19	14	5						
100377	WS6	B3	1.60	1.80	B	Yellowish brown sandy GRAVEL		8.9											
100378	WS7	B4	1.80	2.00	B	Brownish grey GRAVEL		9.6											
100379	WS7	D12	2.70	Not Given	D	Brownish grey sandy CLAY	Atterberg 1 Point	29		100	38	20	18						

Note: # Non accredited; NP - Non plastic

Comments:

Signed:

Katarzyna Koziel

Katarzyna Koziel
Senior Reporting Specialist
for and on behalf of i2 Analytical Ltd

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SUMMARY REPORT

DETERMINATION OF WATER CONTENT

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

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



Environmental Science

4041

Client: Hamson Barron Smith Ltd
Client Address: Navigation Warehouse, 2nd Floor Waterfront,
Navigation Walk,
Wakefield, WF1 5RH

Contact: Catherine Riley
Site Address: Fletcher Fold

Client Reference: 23-12-115972
Job Number: 23-100080-1
Date Sampled: 04/12 - 05/12/2023
Date Received: 07/12/2023
Date Tested: 18/12/2023
Sampled By: Client - C.Riley

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

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	WC %	Sample preparation / Oven temperature at the time of testing			
		Reference	Depth Top m	Depth Base m	Type							
100370	WS8	D1	0.95	Not Given	D	Brownish grey slightly gravelly sandy CLAY		27	Sample was quartered, oven dried at 107.9 °C			
100371	WS1	B1	0.80	1.00	B	Brownish grey sandy CLAY		32	Sample was quartered, oven dried at 108.8 °C			
100372	WS3	D5	1.90	Not Given	D	Brownish grey sandy slightly silty CLAY		26	Sample was quartered, oven dried at 107.9 °C			
100373	WS4	D6	0.75	Not Given	D	Brownish grey gravelly sandy CLAY		15	Sample was quartered, oven dried at 107.9 °C			
100374	WS4	D7	1.80	Not Given	D	Brownish grey sandy slightly silty CLAY		25	Sample was quartered, oven dried at 107.9 °C			
100375	WS4	B2	2.70	2.90	B	Brownish grey CLAY		25	Sample was quartered, oven dried at 108.8 °C			
100376	WS5	D9	0.60	Not Given	D	Brownish grey very sandy SILT and CLAY		14	Sample was quartered, oven dried at 107.9 °C			
100377	WS6	B3	1.60	1.80	B	Yellowish brown sandy GRAVEL		8.9	Sample was quartered, oven dried at 108.8 °C			
100378	WS7	B4	1.80	2.00	B	Brownish grey GRAVEL		9.6	Sample was quartered, oven dried at 108.8 °C			
100379	WS7	D12	2.70	Not Given	D	Brownish grey sandy CLAY		29	Sample was quartered, oven dried at 107.9 °C			

Comments:

Signed:

Katarzyna Koziel

Katarzyna Koziel
Senior Reporting Specialist
for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

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



Environmental Science

Client: Hamson Barron Smith Ltd
Client Address: Navigation Warehouse, 2nd Floor Waterfront,
Navigation Walk, Wakefield,
WF1 5RH
Contact: Catherine Riley
Site Address: Fletcher Fold

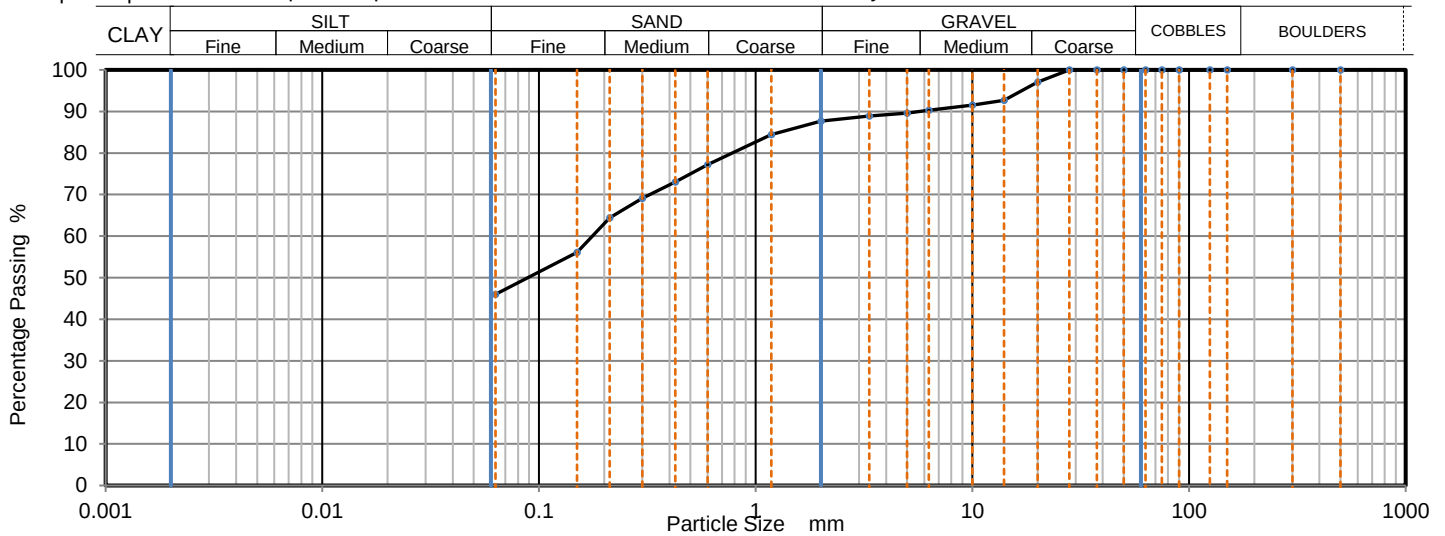
Client Reference: 23-12-115972
Job Number: 23-100080-1
Date Sampled: 04/12/2023
Date Received: 07/12/2023
Date Tested: 18/12/2023
Sampled By: Client - C.Riley

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

Test Results:

Laboratory Reference: 100371
Hole No.: WS1
Sample Reference: B1
Sample Description: Brownish grey sandy CLAY
Sample Preparation: Sample was quartered, oven dried at 108.8 °C and broken down by hand.

Depth Top [m]: 0.80
Depth Base [m]: 1.00
Sample Type: B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	97		
14	93		
10	92		
6.3	90		
5	90		
3.35	89		
2	88		
1.18	84		
0.6	77		
0.425	73		
0.3	69		
0.212	64		
0.15	56		
0.063	47		

Sample Proportions	% dry mass
Very coarse	0
Gravel	12
Sand	41
Fines <0.063mm	46

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	> 2.8
Curvature Coefficient	

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed:

Katarzyna Koziel

Katarzyna Koziel
Senior Reporting Specialist
for and on behalf of i2 Analytical Ltd

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



Environmental Science

Client: Hamson Barron Smith Ltd
Client Address: Navigation Warehouse, 2nd Floor Waterfront,
Navigation Walk, Wakefield,
WF1 5RH
Contact: Catherine Riley
Site Address: Fletcher Fold

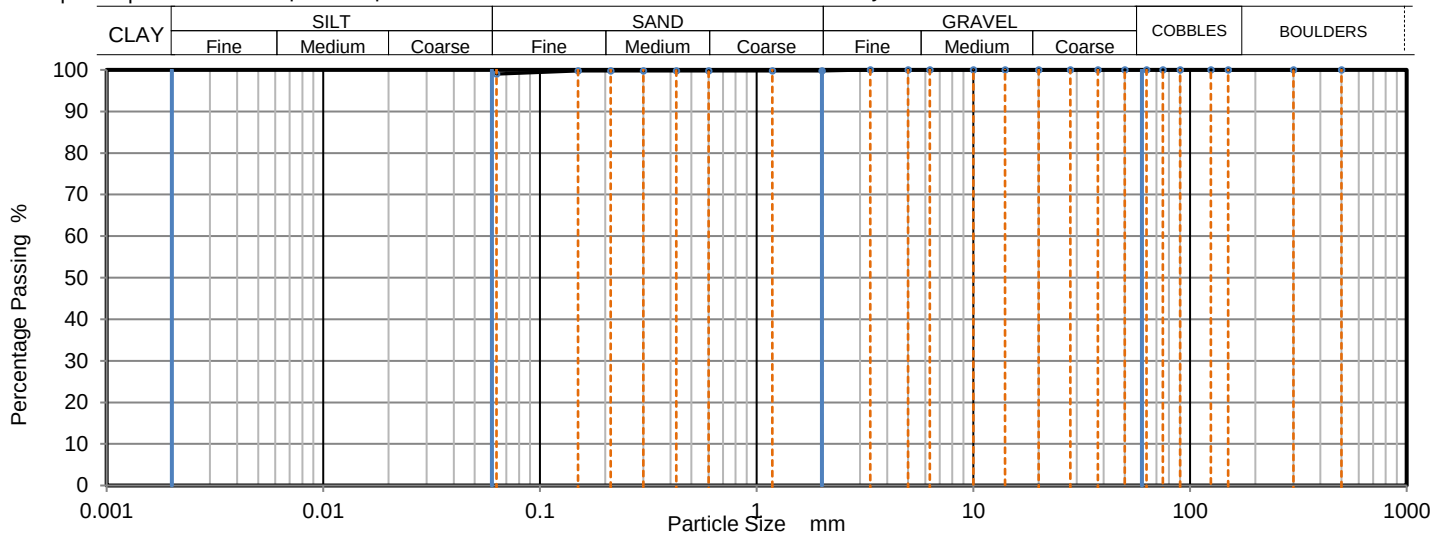
Client Reference: 23-12-115972
Job Number: 23-100080-1
Date Sampled: 05/12/2023
Date Received: 07/12/2023
Date Tested: 18/12/2023
Sampled By: Client - C.Riley

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

Test Results:

Laboratory Reference: 100375
Hole No.: WS4
Sample Reference: B2
Sample Description: Brownish grey CLAY
Sample Preparation: Sample was quartered, oven dried at 108.8 °C and broken down by hand.

Depth Top [m]: 2.70
Depth Base [m]: 2.90
Sample Type: B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
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	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	100		
0.212	100		
0.15	100		
0.063	100		

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	0
Fines <0.063mm	100

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	N/A
Curvature Coefficient	

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed:

Katarzyna Koziel

Katarzyna Koziel
Senior Reporting Specialist
for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

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



Environmental Science

4041

Client: Hamson Barron Smith Ltd
Client Address: Navigation Warehouse, 2nd Floor Waterfront,
Navigation Walk, Wakefield,
WF1 5RH
Contact: Catherine Riley
Site Address: Fletcher Fold

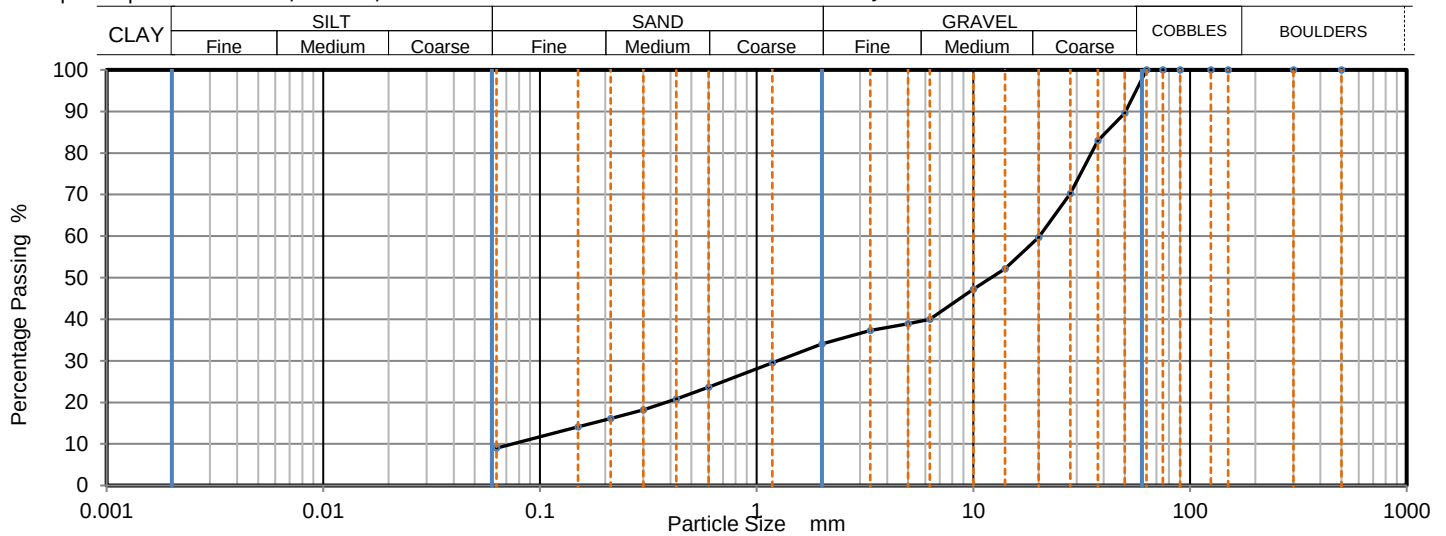
Client Reference: 23-12-115972
Job Number: 23-100080-1
Date Sampled: 05/12/2023
Date Received: 07/12/2023
Date Tested: 18/12/2023
Sampled By: Client - C.Riley

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

Test Results:

Laboratory Reference: 100377
Hole No.: WS6
Sample Reference: B3
Sample Description: Yellowish brown sandy GRAVEL
Sample Preparation: Sample was quartered, oven dried at 108.8 °C and broken down by hand.

Depth Top [m]: 1.60
Depth Base [m]: 1.80
Sample Type: B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	90		
37.5	83		
28	70		
20	60		
14	52		
10	47		
6.3	40		
5	39		
3.35	37		
2	34		
1.18	30		
0.6	24		
0.425	21		
0.3	18		
0.212	16		
0.15	14		
0.063	10		

Sample Proportions	% dry mass
Very coarse	0
Gravel	66
Sand	24
Fines <0.063mm	10

Grading Analysis	
D100	mm 63
D60	mm 20.2
D30	mm 1.25
D10	mm 0.0675
Uniformity Coefficient	300
Curvature Coefficient	1.2

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks: The material submitted - fails to meet the minimum mass requirements as stated in BS1377 Part 2 Table 3

Signed:

Katarzyna Koziel

Katarzyna Koziel
Senior Reporting Specialist
for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

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



Environmental Science

Client: Hamson Barron Smith Ltd
Client Address: Navigation Warehouse, 2nd Floor Waterfront,
Navigation Walk, Wakefield,
WF1 5RH
Contact: Catherine Riley
Site Address: Fletcher Fold

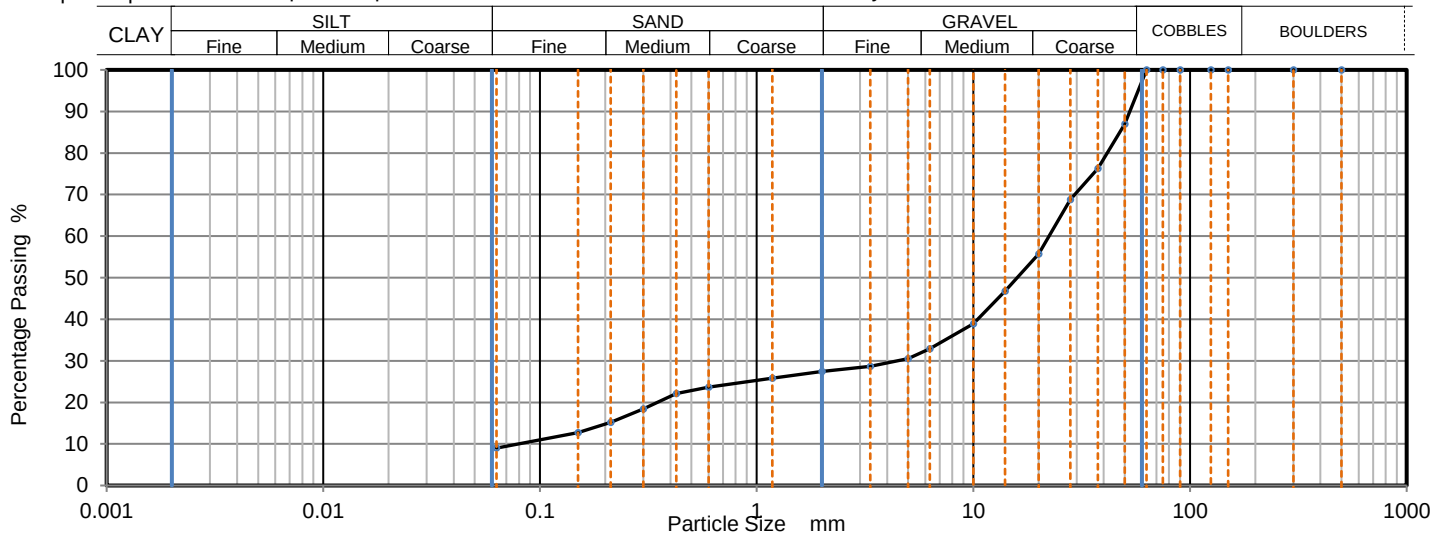
Client Reference: 23-12-115972
Job Number: 23-100080-1
Date Sampled: 05/12/2023
Date Received: 07/12/2023
Date Tested: 18/12/2023
Sampled By: Client - C.Riley

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

Test Results:

Laboratory Reference: 100378
Hole No.: WS7
Sample Reference: B4
Sample Description: Brownish grey GRAVEL
Sample Preparation: Sample was quartered, oven dried at 108.8 °C and broken down by hand.

Depth Top [m]: 1.80
Depth Base [m]: 2.00
Sample Type: B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	87		
37.5	76		
28	69		
20	56		
14	47		
10	39		
6.3	33		
5	31		
3.35	29		
2	27		
1.18	26		
0.6	24		
0.425	22		
0.3	18		
0.212	15		
0.15	13		
0.063	9		

Sample Proportions	% dry mass
Very coarse	0
Gravel	73
Sand	18
Fines <0.063mm	9

Grading Analysis	
D100	63
D60	22.4
D30	4.45
D10	0.0786
Uniformity Coefficient	280
Curvature Coefficient	11

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks: The material submitted - fails to meet the minimum mass requirements as stated in BS1377 Part 2 Table 3

Signed:

Katarzyna Koziel

Katarzyna Koziel
Senior Reporting Specialist
for and on behalf of i2 Analytical Ltd

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Appendix F

Chemical Test Certificates

Hamson Barron Smith Ltd
Navigation Warehouse
2nd Floor Waterfront
Navigation Walk
Wakefield
WF1 5RH

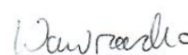
i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

e: Catherine.Riley@norsegroup.co.uk

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 23-100077

Project / Site name:	Fletcher Fold	Samples received on:	07/12/2023
Your job number:	23 12 115972	Samples instructed on/ Analysis started on:	08/12/2023
Your order number:	PO23006231	Analysis completed by:	18/12/2023
Report Issue Number:	1	Report issued on:	18/12/2023
Samples Analysed:	27 soil samples		



Signed:

Joanna Wawrzeczko
Senior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

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

Analytical Report Number: 23-100077

Project / Site name: Fletcher Fold

Your Order No: PO23006231

Lab Sample Number	100341	100342	100343	100344	100345
Sample Reference	WS8 ES1	WS9 ES2	WS1 ES3	WS1 ES4	WS10 ES5
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.10	0.50	0.20	0.70	0.20
Date Sampled	04/12/2023	04/12/2023	04/12/2023	04/12/2023	04/12/2023
Time Taken	0938	1004	1024	1027	1059
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Stone Content	%	0.1	NONE	74	36	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	9.4	10	21	21	12
Total mass of sample received	kg	0.1	NONE	0.9	0.8	0.8	0.5	0.9

Asbestos

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

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	9.3	11.3	7.6	7.9	8.1
Total Sulphate as SO4	%	0.005	MCERTS	-	-	-	0.028	-
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	-	-	33	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	-	16.6	-
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	-	-	1.3	-
Total Sulphur	mg/kg	50	MCERTS	-	-	-	88	-
Total Sulphur	%	0.005	MCERTS	-	-	-	0.009	-
Ammonium as NH4 (10:1 leachate equivalent)	mg/l	0.05	MCERTS	-	-	-	< 0.05	-
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	3	0.6	1.9	-	0.6
Water Soluble Nitrate (2:1) as NO3	mg/kg	2	NONE	-	-	-	< 2.0	-
Water Soluble Nitrate (2:1) as NO3 (leachate equivalent)	mg/l	5	NONE	-	-	-	< 5.0	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.12	0.53	< 0.05	-	0.15
Anthracene	mg/kg	0.05	MCERTS	< 0.05	0.06	< 0.05	-	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.1	0.67	< 0.05	-	0.24
Pyrene	mg/kg	0.05	MCERTS	0.17	0.6	< 0.05	-	0.22
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.47	< 0.05	-	0.12
Chrysene	mg/kg	0.05	MCERTS	< 0.05	0.5	< 0.05	-	0.1
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	0.59	< 0.05	-	0.12
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	0.29	< 0.05	-	0.08
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.42	< 0.05	-	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.26	< 0.05	-	< 0.05
Dibenzo(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	0.32	< 0.05	-	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	< 0.80	4.71	< 0.80	-	1.03
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Analytical Report Number: 23-100077

Project / Site name: Fletcher Fold

Your Order No: PO23006231

Lab Sample Number	100341	100342	100343	100344	100345
Sample Reference	WS8 ES1	WS9 ES2	WS1 ES3	WS1 ES4	WS10 ES5
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.10	0.50	0.20	0.70	0.20
Date Sampled	04/12/2023	04/12/2023	04/12/2023	04/12/2023	04/12/2023
Time Taken	0938	1004	1024	1027	1059
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	3.5	6.1	13	-	6.8
Boron (water soluble)	mg/kg	0.2	MCERTS	0.2	1.3	0.7	-	< 0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	-	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8	-	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	15	16	15	-	18
Copper (aqua regia extractable)	mg/kg	1	MCERTS	17	15	24	-	18
Lead (aqua regia extractable)	mg/kg	1	MCERTS	19	45	69	-	15
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	-	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	20	19	19	-	22
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	38	58	65	-	59

Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	-	-	< 2.5	-
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Petroleum Hydrocarbons

TPHCWG - Aliphatic >C5 - C6 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020	-	< 0.020
TPHCWG - Aliphatic >C6 - C8 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020	-	< 0.020
TPHCWG - Aliphatic >C8 - C10 HS_1D_AL	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050	-	< 0.050
TPHCWG - Aliphatic >C10 - C12 EH_CU_1D_AL_#1_#2	mg/kg	1	MCERTS	2.1	< 1.0	< 1.0	-	< 1.0
TPHCWG - Aliphatic >C12 - C16 EH_CU_1D_AL_#1_#2	mg/kg	2	MCERTS	5.9	< 2.0	< 2.0	-	< 2.0
TPHCWG - Aliphatic >C16 - C21 EH_CU_1D_AL_#1_#2	mg/kg	8	MCERTS	21	< 8.0	< 8.0	-	< 8.0
TPHCWG - Aliphatic >C16 - C35 EH_CU_1D_AL_#1_#2	mg/kg	10	MCERTS	350	< 10	< 10	-	< 10
TPHCWG - Aliphatic >C21 - C35 EH_CU_1D_AL_#1_#2	mg/kg	8	MCERTS	330	< 8.0	< 8.0	-	< 8.0
TPHCWG - Aliphatic >C35 - C44 EH_CU_1D_AL_#1_#2	mg/kg	8.4	NONE	470	< 8.4	< 8.4	-	11
TPHCWG - Aliphatic >C5 - C35 EH_CU+HS_1D_AL_#1_#2	mg/kg	10	NONE	360	< 10	< 10	-	< 10
TPHCWG - Aliphatic >C5 - C44 EH_CU+HS_1D_AL_#1_#2	mg/kg	10	NONE	830	< 10	< 10	-	11

TPHCWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010	-	< 0.010
TPHCWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010	-	< 0.010
TPHCWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050	-	< 0.050
TPHCWG - Aromatic >EC10 - EC12 EH_CU_1D_AR_#1_#2	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	< 1.0
TPHCWG - Aromatic >EC12 - EC16 EH_CU_1D_AR_#1_#2	mg/kg	2	MCERTS	4.5	< 2.0	< 2.0	-	< 2.0
TPHCWG - Aromatic >EC16 - EC21 EH_CU_1D_AR_#1_#2	mg/kg	10	MCERTS	39	< 10	< 10	-	< 10
TPHCWG - Aromatic >EC21 - EC35 EH_CU_1D_AR_#1_#2	mg/kg	10	MCERTS	880	< 10	< 10	-	< 10
TPHCWG - Aromatic >EC35 - EC44 EH_CU_1D_AR_#1_#2	mg/kg	8.4	NONE	960	< 8.4	< 8.4	-	< 8.4
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_1D_AR_#1_#2	mg/kg	10	NONE	920	< 10	< 10	-	< 10
TPHCWG - Aromatic >EC5 - EC44 EH_CU+HS_1D_AR_#1_#2	mg/kg	10	NONE	1900	< 10	< 10	-	< 10

VOCs

MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	-	< 5.0
Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	< 5.0
o-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	-	< 5.0

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 23-100077

Project / Site name: Fletcher Fold

Your Order No: PO23006231

Lab Sample Number	100346	100347	100348	100349	100350
Sample Reference	WS11 ES6	WS12ES7	WS13 ES8	WS14 ES9	WS2 ES10
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.60	0.60	0.65	0.70	0.30
Date Sampled	04/12/2023	04/12/2023	04/12/2023	04/12/2023	04/12/2023
Time Taken	1129	1140	1152	1204	1332
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Stone Content	%	0.1	NONE	41	40	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	8.6	9.1	12	11	12
Total mass of sample received	kg	0.1	NONE	1	1.1	1.1	1	0.6

Asbestos

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

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	8.8	7.6	7.8	9.7	8.2
Total Sulphate as SO4	%	0.005	MCERTS	-	-	-	-	-
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	-	-	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	-	-	-
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	-	-	-	-
Total Sulphur	mg/kg	50	MCERTS	-	-	-	-	-
Total Sulphur	%	0.005	MCERTS	-	-	-	-	-
Ammonium as NH4 (10:1 leachate equivalent)	mg/l	0.05	MCERTS	-	-	-	-	-
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	-	-	-	-	0.2
Water Soluble Nitrate (2:1) as NO3	mg/kg	2	NONE	-	-	-	-	-
Water Soluble Nitrate (2:1) as NO3 (leachate equivalent)	mg/l	5	NONE	-	-	-	-	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	-	-	-	-	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	-	-	-	-	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	-	-	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	-	-	-	-	< 0.05
Fluorene	mg/kg	0.05	MCERTS	-	-	-	-	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	-	-	-	-	< 0.05
Anthracene	mg/kg	0.05	MCERTS	-	-	-	-	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	< 0.05
Pyrene	mg/kg	0.05	MCERTS	-	-	-	-	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	-	-	< 0.05
Chrysene	mg/kg	0.05	MCERTS	-	-	-	-	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	-	-	-	-	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	-	-	-	-	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	-	-	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	-	-	< 0.05
Dibenzo(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	-	-	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	-	-	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	-	-	-	-	< 0.80
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Analytical Report Number: 23-100077

Project / Site name: Fletcher Fold

Your Order No: PO23006231

Lab Sample Number	100346	100347	100348	100349	100350
Sample Reference	WS11 ES6	WS12ES7	WS13 ES8	WS14 ES9	WS2 ES10
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.60	0.60	0.65	0.70	0.30
Date Sampled	04/12/2023	04/12/2023	04/12/2023	04/12/2023	04/12/2023
Time Taken	1129	1140	1152	1204	1332
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	5.6	13	12	4.4	2.4
Boron (water soluble)	mg/kg	0.2	MCERTS	0.3	0.2	0.3	0.4	< 0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	18	32	38	15	19
Copper (aqua regia extractable)	mg/kg	1	MCERTS	14	16	24	13	14
Lead (aqua regia extractable)	mg/kg	1	MCERTS	18	18	15	14	11
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	17	21	34	15	14
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	50	55	68	47	30

Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	-	-	-	-
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Petroleum Hydrocarbons

TPHCWG - Aliphatic >C5 - C6 HS_1D_AL	mg/kg	0.02	NONE	-	-	-	-	< 0.020
TPHCWG - Aliphatic >C6 - C8 HS_1D_AL	mg/kg	0.02	NONE	-	-	-	-	< 0.020
TPHCWG - Aliphatic >C8 - C10 HS_1D_AL	mg/kg	0.05	NONE	-	-	-	-	< 0.050
TPHCWG - Aliphatic >C10 - C12 EH_CU_1D_AL_#1_#2	mg/kg	1	MCERTS	-	-	-	-	< 1.0
TPHCWG - Aliphatic >C12 - C16 EH_CU_1D_AL_#1_#2	mg/kg	2	MCERTS	-	-	-	-	< 2.0
TPHCWG - Aliphatic >C16 - C21 EH_CU_1D_AL_#1_#2	mg/kg	8	MCERTS	-	-	-	-	< 8.0
TPHCWG - Aliphatic >C16 - C35 EH_CU_1D_AL_#1_#2	mg/kg	10	MCERTS	-	-	-	-	< 10
TPHCWG - Aliphatic >C21 - C35 EH_CU_1D_AL_#1_#2	mg/kg	8	MCERTS	-	-	-	-	< 8.0
TPHCWG - Aliphatic >C35 - C44 EH_CU_1D_AL_#1_#2	mg/kg	8.4	NONE	-	-	-	-	< 8.4
TPHCWG - Aliphatic >C5 - C35 EH_CU+HS_1D_AL_#1_#2	mg/kg	10	NONE	-	-	-	-	< 10
TPHCWG - Aliphatic >C5 - C44 EH_CU+HS_1D_AL_#1_#2	mg/kg	10	NONE	-	-	-	-	< 10

TPHCWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.01	NONE	-	-	-	-	< 0.010
TPHCWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	NONE	-	-	-	-	< 0.010
TPHCWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.05	NONE	-	-	-	-	< 0.050
TPHCWG - Aromatic >EC10 - EC12 EH_CU_1D_AR_#1_#2	mg/kg	1	MCERTS	-	-	-	-	< 1.0
TPHCWG - Aromatic >EC12 - EC16 EH_CU_1D_AR_#1_#2	mg/kg	2	MCERTS	-	-	-	-	< 2.0
TPHCWG - Aromatic >EC16 - EC21 EH_CU_1D_AR_#1_#2	mg/kg	10	MCERTS	-	-	-	-	< 10
TPHCWG - Aromatic >EC21 - EC35 EH_CU_1D_AR_#1_#2	mg/kg	10	MCERTS	-	-	-	-	< 10
TPHCWG - Aromatic >EC35 - EC44 EH_CU_1D_AR_#1_#2	mg/kg	8.4	NONE	-	-	-	-	< 8.4
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_1D_AR_#1_#2	mg/kg	10	NONE	-	-	-	-	< 10
TPHCWG - Aromatic >EC5 - EC44 EH_CU+HS_1D_AR_#1_#2	mg/kg	10	NONE	-	-	-	-	< 10

VOCs

MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	-	-	-	-	< 5.0
Benzene	µg/kg	5	MCERTS	-	-	-	-	< 5.0
Toluene	µg/kg	5	MCERTS	-	-	-	-	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	-	-	-	-	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	-	-	-	-	< 5.0
o-Xylene	µg/kg	5	MCERTS	-	-	-	-	< 5.0

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 23-100077
Project / Site name: Fletcher Fold
Your Order No: PO23006231

Lab Sample Number	100351	100352	100353	100354	100355
Sample Reference	WS15 ES11	WS16 ES12	WS17 ES13	WS3 ES14	WS3 ES15
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.50	0.50	0.60	0.20	0.60
Date Sampled	04/12/2023	04/12/2023	04/12/2023	04/12/2023	04/12/2023
Time Taken	1349	1404	1415	1431	1434
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Stone Content	%	0.1	NONE	-	-	-	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	-	-	-	13	13
Total mass of sample received	kg	0.1	NONE	-	-	-	0.8	1.1

Asbestos

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

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	-	-	-	10.8	9.3
Total Sulphate as SO4	%	0.005	MCERTS	-	-	-	-	0.165
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	-	-	-	970
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	-	-	486
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	-	-	-	6
Total Sulphur	mg/kg	50	MCERTS	-	-	-	-	930
Total Sulphur	%	0.005	MCERTS	-	-	-	-	0.093
Ammonium as NH4 (10:1 leachate equivalent)	mg/l	0.05	MCERTS	-	-	-	-	0.12
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	-	-	-	0.8	-
Water Soluble Nitrate (2:1) as NO3	mg/kg	2	NONE	-	-	-	-	< 2.0
Water Soluble Nitrate (2:1) as NO3 (leachate equivalent)	mg/l	5	NONE	-	-	-	-	< 5.0

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	-	-	-	< 1.0	-
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	-	-	-	< 0.05	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	-	< 0.05	-
Acenaphthene	mg/kg	0.05	MCERTS	-	-	-	0.18	-
Fluorene	mg/kg	0.05	MCERTS	-	-	-	0.12	-
Phenanthrene	mg/kg	0.05	MCERTS	-	-	-	1.2	-
Anthracene	mg/kg	0.05	MCERTS	-	-	-	0.21	-
Fluoranthene	mg/kg	0.05	MCERTS	-	-	-	2.1	-
Pyrene	mg/kg	0.05	MCERTS	-	-	-	1.8	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	-	0.92	-
Chrysene	mg/kg	0.05	MCERTS	-	-	-	0.93	-
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	-	-	-	1.1	-
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	-	-	-	0.48	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	-	0.94	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	-	0.51	-
Dibenzo(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	-	0.14	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	-	0.57	-

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	-	-	-	11.2	-
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Analytical Report Number: 23-100077
Project / Site name: Fletcher Fold
Your Order No: PO23006231

Lab Sample Number	100351	100352	100353	100354	100355
Sample Reference	WS15 ES11	WS16 ES12	WS17 ES13	WS3 ES14	WS3 ES15
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.50	0.50	0.60	0.20	0.60
Date Sampled	04/12/2023	04/12/2023	04/12/2023	04/12/2023	04/12/2023
Time Taken	1349	1404	1415	1431	1434
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	39	-
Boron (water soluble)	mg/kg	0.2	MCERTS	-	-	-	0.5	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	-	-	-	< 0.2	-
Chromium (hexavalent)	mg/kg	1.8	MCERTS	-	-	-	< 1.8	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	18	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	31	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	67	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	-	-	-	< 0.3	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	18	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	< 1.0	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	73	-

Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	-	-	-	3.9
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Petroleum Hydrocarbons

TPHCWG - Aliphatic >C5 - C6 HS_1D_AL	mg/kg	0.02	NONE	-	-	-	< 0.020	-
TPHCWG - Aliphatic >C6 - C8 HS_1D_AL	mg/kg	0.02	NONE	-	-	-	< 0.020	-
TPHCWG - Aliphatic >C8 - C10 HS_1D_AL	mg/kg	0.05	NONE	-	-	-	< 0.050	-
TPHCWG - Aliphatic >C10 - C12 EH_CU_1D_AL_#1_#2	mg/kg	1	MCERTS	-	-	-	< 1.0	-
TPHCWG - Aliphatic >C12 - C16 EH_CU_1D_AL_#1_#2	mg/kg	2	MCERTS	-	-	-	< 2.0	-
TPHCWG - Aliphatic >C16 - C21 EH_CU_1D_AL_#1_#2	mg/kg	8	MCERTS	-	-	-	< 8.0	-
TPHCWG - Aliphatic >C16 - C35 EH_CU_1D_AL_#1_#2	mg/kg	10	MCERTS	-	-	-	13	-
TPHCWG - Aliphatic >C21 - C35 EH_CU_1D_AL_#1_#2	mg/kg	8	MCERTS	-	-	-	13	-
TPHCWG - Aliphatic >C35 - C44 EH_CU_1D_AL_#1_#2	mg/kg	8.4	NONE	-	-	-	11	-
TPHCWG - Aliphatic >C5 - C35 EH_CU+HS_1D_AL_#1_#2	mg/kg	10	NONE	-	-	-	13	-
TPHCWG - Aliphatic >C5 - C44 EH_CU+HS_1D_AL_#1_#2	mg/kg	10	NONE	-	-	-	23	-

TPHCWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.01	NONE	-	-	-	< 0.010	-
TPHCWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	NONE	-	-	-	< 0.010	-
TPHCWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.05	NONE	-	-	-	< 0.050	-
TPHCWG - Aromatic >EC10 - EC12 EH_CU_1D_AR_#1_#2	mg/kg	1	MCERTS	-	-	-	< 1.0	-
TPHCWG - Aromatic >EC12 - EC16 EH_CU_1D_AR_#1_#2	mg/kg	2	MCERTS	-	-	-	2.1	-
TPHCWG - Aromatic >EC16 - EC21 EH_CU_1D_AR_#1_#2	mg/kg	10	MCERTS	-	-	-	< 10	-
TPHCWG - Aromatic >EC21 - EC35 EH_CU_1D_AR_#1_#2	mg/kg	10	MCERTS	-	-	-	26	-
TPHCWG - Aromatic >EC35 - EC44 EH_CU_1D_AR_#1_#2	mg/kg	8.4	NONE	-	-	-	25	-
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_1D_AR_#1_#2	mg/kg	10	NONE	-	-	-	28	-
TPHCWG - Aromatic >EC5 - EC44 EH_CU+HS_1D_AR_#1_#2	mg/kg	10	NONE	-	-	-	53	-

VOCs

MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	-	-	-	< 5.0	-
Benzene	µg/kg	5	MCERTS	-	-	-	< 5.0	-
Toluene	µg/kg	5	MCERTS	-	-	-	< 5.0	-
Ethylbenzene	µg/kg	5	MCERTS	-	-	-	< 5.0	-
p & m-Xylene	µg/kg	5	MCERTS	-	-	-	< 5.0	-
o-Xylene	µg/kg	5	MCERTS	-	-	-	< 5.0	-

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 23-100077
Project / Site name: Fletcher Fold
Your Order No: PO23006231

Lab Sample Number	100356	100357	100358	100359	100360
Sample Reference	WS4 ES16	WS4 ES17	WS5 ES18	WS5 ES19	WS7 ES21
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.35	1.60	0.10	1.50	0.10
Date Sampled	05/12/2023	05/12/2023	05/12/2023	05/12/2023	06/12/2023
Time Taken	0931	0940	1045	1058	1016
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	9.7	16	12	16	13
Total mass of sample received	kg	0.1	NONE	0.8	0.4	0.5	0.5	0.7

Asbestos

Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected	-	Not-detected	-	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	IZJ	-	DSO	-	DSO

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	9.1	8	11	8.1	8.2
Total Sulphate as SO4	%	0.005	MCERTS	-	0.032	-	0.021	-
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	81	-	24	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	40.3	-	11.9	-
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	1.8	-	0.8	-
Total Sulphur	mg/kg	50	MCERTS	-	530	-	120	-
Total Sulphur	%	0.005	MCERTS	-	0.053	-	0.012	-
Ammonium as NH4 (10:1 leachate equivalent)	mg/l	0.05	MCERTS	-	< 0.05	-	< 0.05	-
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	0.6	-	0.9	-	1.3
Water Soluble Nitrate (2:1) as NO3	mg/kg	2	NONE	-	< 2.0	-	< 2.0	-
Water Soluble Nitrate (2:1) as NO3 (leachate equivalent)	mg/l	5	NONE	-	< 5.0	-	< 5.0	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	0.31
Fluorene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	0.25
Phenanthrene	mg/kg	0.05	MCERTS	0.24	-	0.17	-	2.7
Anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	0.43
Fluoranthene	mg/kg	0.05	MCERTS	0.37	-	0.33	-	3.7
Pyrene	mg/kg	0.05	MCERTS	0.35	-	0.32	-	3.3
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.23	-	0.19	-	1.3
Chrysene	mg/kg	0.05	MCERTS	0.25	-	0.18	-	1.5
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	0.32	-	0.3	-	1.6
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.16	-	0.11	-	0.63
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.23	-	0.22	-	1.3
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.16	-	0.15	-	0.66
Dibenzo(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	0.21
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.17	-	0.17	-	0.77

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	2.48	-	2.14	-	18.6
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Analytical Report Number: 23-100077

Project / Site name: Fletcher Fold

Your Order No: PO23006231

Lab Sample Number	100356	100357	100358	100359	100360
Sample Reference	WS4 ES16	WS4 ES17	WS5 ES18	WS5 ES19	WS7 ES21
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.35	1.60	0.10	1.50	0.10
Date Sampled	05/12/2023	05/12/2023	05/12/2023	05/12/2023	06/12/2023
Time Taken	0931	0940	1045	1058	1016
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	6.4	-	6.6	-	19
Boron (water soluble)	mg/kg	0.2	MCERTS	0.6	-	0.4	-	0.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	-	< 0.2	-	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	-	< 1.8	-	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	18	-	16	-	15
Copper (aqua regia extractable)	mg/kg	1	MCERTS	23	-	22	-	41
Lead (aqua regia extractable)	mg/kg	1	MCERTS	35	-	32	-	140
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	-	< 0.3	-	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	17	-	17	-	18
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	56	-	56	-	92

Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	7.7	-	5.9	-
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Petroleum Hydrocarbons

TPHCWG - Aliphatic >C5 - C6 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	-	< 0.020	-	< 0.020
TPHCWG - Aliphatic >C6 - C8 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	-	< 0.020	-	< 0.020
TPHCWG - Aliphatic >C8 - C10 HS_1D_AL	mg/kg	0.05	NONE	< 0.050	-	< 0.050	-	< 0.050
TPHCWG - Aliphatic >C10 - C12 EH_CU_1D_AL_#1_#2	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
TPHCWG - Aliphatic >C12 - C16 EH_CU_1D_AL_#1_#2	mg/kg	2	MCERTS	< 2.0	-	< 2.0	-	< 2.0
TPHCWG - Aliphatic >C16 - C21 EH_CU_1D_AL_#1_#2	mg/kg	8	MCERTS	< 8.0	-	< 8.0	-	< 8.0
TPHCWG - Aliphatic >C16 - C35 EH_CU_1D_AL_#1_#2	mg/kg	10	MCERTS	< 10	-	< 10	-	< 10
TPHCWG - Aliphatic >C21 - C35 EH_CU_1D_AL_#1_#2	mg/kg	8	MCERTS	< 8.0	-	< 8.0	-	9.7
TPHCWG - Aliphatic >C35 - C44 EH_CU_1D_AL_#1_#2	mg/kg	8.4	NONE	< 8.4	-	< 8.4	-	< 8.4
TPHCWG - Aliphatic >C5 - C35 EH_CU+HS_1D_AL_#1_#2	mg/kg	10	NONE	< 10	-	< 10	-	< 10
TPHCWG - Aliphatic >C5 - C44 EH_CU+HS_1D_AL_#1_#2	mg/kg	10	NONE	< 10	-	< 10	-	< 10

TPHCWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	-	< 0.010	-	< 0.010
TPHCWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	-	< 0.010	-	< 0.010
TPHCWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.05	NONE	< 0.050	-	< 0.050	-	< 0.050
TPHCWG - Aromatic >EC10 - EC12 EH_CU_1D_AR_#1_#2	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
TPHCWG - Aromatic >EC12 - EC16 EH_CU_1D_AR_#1_#2	mg/kg	2	MCERTS	< 2.0	-	< 2.0	-	3.4
TPHCWG - Aromatic >EC16 - EC21 EH_CU_1D_AR_#1_#2	mg/kg	10	MCERTS	< 10	-	< 10	-	< 10
TPHCWG - Aromatic >EC21 - EC35 EH_CU_1D_AR_#1_#2	mg/kg	10	MCERTS	< 10	-	< 10	-	16
TPHCWG - Aromatic >EC35 - EC44 EH_CU_1D_AR_#1_#2	mg/kg	8.4	NONE	< 8.4	-	< 8.4	-	< 8.4
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_1D_AR_#1_#2	mg/kg	10	NONE	< 10	-	< 10	-	19
TPHCWG - Aromatic >EC5 - EC44 EH_CU+HS_1D_AR_#1_#2	mg/kg	10	NONE	< 10	-	< 10	-	19

VOCs

MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	-	< 5.0	-	< 5.0
Benzene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	-	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	-	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	-	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	-	< 5.0
o-Xylene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	-	< 5.0

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 23-100077
Project / Site name: Fletcher Fold
Your Order No: PO23006231

Lab Sample Number	100361	100362	100363	100364	100365
Sample Reference	WS7 ES22	WS20 ES24	WS19 ES25	WS21 ES25	WS22 ES26
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.80	0.25	0.10	0.10	0.10
Date Sampled	06/12/2023	06/12/2023	06/12/2023	06/12/2023	06/12/2023
Time Taken	1018	1104	1139	1151	1208
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	15	9.8	24	24	24
Total mass of sample received	kg	0.1	NONE	1.1	0.9	0.8	0.9	0.8

Asbestos

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

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	8	8.3	7.4	7.9	8.4
Total Sulphate as SO4	%	0.005	MCERTS	0.07	-	-	-	-
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	82	-	-	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	41.2	-	-	-	-
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	0.6	-	-	-	-
Total Sulphur	mg/kg	50	MCERTS	330	-	-	-	-
Total Sulphur	%	0.005	MCERTS	0.033	-	-	-	-
Ammonium as NH4 (10:1 leachate equivalent)	mg/l	0.05	MCERTS	< 0.05	-	-	-	-
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	-	1	3.1	3.3	2.8
Water Soluble Nitrate (2:1) as NO3	mg/kg	2	NONE	3.6	-	-	-	-
Water Soluble Nitrate (2:1) as NO3 (leachate equivalent)	mg/l	5	NONE	< 5.0	-	-	-	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	-	0.1	0.2	0.27	0.12
Acenaphthylene	mg/kg	0.05	MCERTS	-	< 0.05	0.08	0.11	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	-	0.19	0.39	1.3	0.2
Fluorene	mg/kg	0.05	MCERTS	-	0.12	0.24	1	0.14
Phenanthrene	mg/kg	0.05	MCERTS	-	1.3	2.9	8.9	1.6
Anthracene	mg/kg	0.05	MCERTS	-	0.3	0.6	2.3	0.36
Fluoranthene	mg/kg	0.05	MCERTS	-	2.1	4.2	12	2.7
Pyrene	mg/kg	0.05	MCERTS	-	1.9	3.8	9.9	2.5
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	0.76	1.6	4.7	1.2
Chrysene	mg/kg	0.05	MCERTS	-	0.94	2	5.1	1.3
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	-	0.92	1.8	5.1	1.3
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	-	0.33	0.75	2.1	0.58
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	0.76	1.6	4.1	1.2
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	0.42	0.79	2.4	0.59
Dibenzo(a,h)anthracene	mg/kg	0.05	MCERTS	-	0.13	0.26	0.67	0.13
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	0.49	0.94	2.6	0.73

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	-	10.7	22	62	14.7
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Analytical Report Number: 23-100077
Project / Site name: Fletcher Fold
Your Order No: PO23006231

Lab Sample Number	100361	100362	100363	100364	100365
Sample Reference	WS7 ES22	WS20 ES24	WS19 ES25	WS21 ES25	WS22 ES26
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.80	0.25	0.10	0.10	0.10
Date Sampled	06/12/2023	06/12/2023	06/12/2023	06/12/2023	06/12/2023
Time Taken	1018	1104	1139	1151	1208
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	-	22	18	20	31
Boron (water soluble)	mg/kg	0.2	MCERTS	-	0.4	0.5	0.7	0.5
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	-	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	-	< 1.8	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	23	15	12	18
Copper (aqua regia extractable)	mg/kg	1	MCERTS	-	27	51	39	48
Lead (aqua regia extractable)	mg/kg	1	MCERTS	-	66	140	99	120
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	-	< 0.3	< 0.3	0.4	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	-	17	18	14	19
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	-	71	98	78	96

Magnesium (leachate equivalent)	mg/l	2.5	NONE	4.8	-	-	-	-
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Petroleum Hydrocarbons

TPHCWG - Aliphatic >C5 - C6 HS_1D_AL	mg/kg	0.02	NONE	-	< 0.020	< 0.020	< 0.020	< 0.020
TPHCWG - Aliphatic >C6 - C8 HS_1D_AL	mg/kg	0.02	NONE	-	< 0.020	< 0.020	< 0.020	< 0.020
TPHCWG - Aliphatic >C8 - C10 HS_1D_AL	mg/kg	0.05	NONE	-	< 0.050	< 0.050	< 0.050	< 0.050
TPHCWG - Aliphatic >C10 - C12 EH_CU_1D_AL_#1_#2	mg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0
TPHCWG - Aliphatic >C12 - C16 EH_CU_1D_AL_#1_#2	mg/kg	2	MCERTS	-	< 2.0	< 2.0	< 2.0	< 2.0
TPHCWG - Aliphatic >C16 - C21 EH_CU_1D_AL_#1_#2	mg/kg	8	MCERTS	-	< 8.0	< 8.0	< 8.0	< 8.0
TPHCWG - Aliphatic >C16 - C35 EH_CU_1D_AL_#1_#2	mg/kg	10	MCERTS	-	11	25	11	12
TPHCWG - Aliphatic >C21 - C35 EH_CU_1D_AL_#1_#2	mg/kg	8	MCERTS	-	11	25	11	12
TPHCWG - Aliphatic >C35 - C44 EH_CU_1D_AL_#1_#2	mg/kg	8.4	NONE	-	< 8.4	45	12	< 8.4
TPHCWG - Aliphatic >C5 - C35 EH_CU+HS_1D_AL_#1_#2	mg/kg	10	NONE	-	11	25	11	12
TPHCWG - Aliphatic >C5 - C44 EH_CU+HS_1D_AL_#1_#2	mg/kg	10	NONE	-	11	70	23	12

TPHCWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.01	NONE	-	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	NONE	-	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.05	NONE	-	< 0.050	< 0.050	< 0.050	< 0.050
TPHCWG - Aromatic >EC10 - EC12 EH_CU_1D_AR_#1_#2	mg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0
TPHCWG - Aromatic >EC12 - EC16 EH_CU_1D_AR_#1_#2	mg/kg	2	MCERTS	-	3.2	2.1	3.7	< 2.0
TPHCWG - Aromatic >EC16 - EC21 EH_CU_1D_AR_#1_#2	mg/kg	10	MCERTS	-	12	12	28	< 10
TPHCWG - Aromatic >EC21 - EC35 EH_CU_1D_AR_#1_#2	mg/kg	10	MCERTS	-	37	69	62	33
TPHCWG - Aromatic >EC35 - EC44 EH_CU_1D_AR_#1_#2	mg/kg	8.4	NONE	-	23	100	25	8.9
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_1D_AR_#1_#2	mg/kg	10	NONE	-	52	83	95	33
TPHCWG - Aromatic >EC5 - EC44 EH_CU+HS_1D_AR_#1_#2	mg/kg	10	NONE	-	75	180	120	41

VOCs

MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	-	< 5.0	< 5.0	< 5.0	< 5.0
Benzene	µg/kg	5	MCERTS	-	< 5.0	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	-	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	-	< 5.0	< 5.0	< 5.0	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	-	< 5.0	< 5.0	< 5.0	< 5.0
o-Xylene	µg/kg	5	MCERTS	-	< 5.0	< 5.0	< 5.0	< 5.0

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 23-100077

Project / Site name: Fletcher Fold

Your Order No: PO23006231

Lab Sample Number				100366	100367
Sample Reference				HD1 ES27	HD1 ES28
Sample Number				None Supplied	None Supplied
Depth (m)				0.20	0.35
Date Sampled				06/12/2023	06/12/2023
Time Taken				1220	1225
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	17	16
Total mass of sample received	kg	0.1	NONE	0.9	0.8

Asbestos

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

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	8.1	8.1
Total Sulphate as SO4	%	0.005	MCERTS	-	-
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	-
Total Sulphur	mg/kg	50	MCERTS	-	-
Total Sulphur	%	0.005	MCERTS	-	-
Ammonium as NH4 (10:1 leachate equivalent)	mg/l	0.05	MCERTS	-	-
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	1.9	1.7
Water Soluble Nitrate (2:1) as NO3	mg/kg	2	NONE	-	-
Water Soluble Nitrate (2:1) as NO3 (leachate equivalent)	mg/l	5	NONE	-	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.13	0.46
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.21	0.45
Fluorene	mg/kg	0.05	MCERTS	0.16	0.37
Phenanthrene	mg/kg	0.05	MCERTS	1.6	2.8
Anthracene	mg/kg	0.05	MCERTS	0.37	0.69
Fluoranthene	mg/kg	0.05	MCERTS	2.2	3
Pyrene	mg/kg	0.05	MCERTS	2	2.7
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.94	1.2
Chrysene	mg/kg	0.05	MCERTS	1.1	1.3
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	1	1.2
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.4	0.42
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.86	1
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.44	0.57
Dibenzo(a,h)anthracene	mg/kg	0.05	MCERTS	0.16	0.18
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.52	0.58

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	12	16.9
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Analytical Report Number: 23-100077

Project / Site name: Fletcher Fold

Your Order No: PO23006231

Lab Sample Number				100366	100367
Sample Reference				HD1 ES27	HD1 ES28
Sample Number				None Supplied	None Supplied
Depth (m)				0.20	0.35
Date Sampled				06/12/2023	06/12/2023
Time Taken				1220	1225
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	16	17
Boron (water soluble)	mg/kg	0.2	MCERTS	< 0.2	0.4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	15	18
Copper (aqua regia extractable)	mg/kg	1	MCERTS	65	43
Lead (aqua regia extractable)	mg/kg	1	MCERTS	99	120
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.3	1.2
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	17	20
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	83	88

Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	-
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Petroleum Hydrocarbons

TPHCWG - Aliphatic >C5 - C6 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	< 0.020
TPHCWG - Aliphatic >C6 - C8 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	< 0.020
TPHCWG - Aliphatic >C8 - C10 HS_1D_AL	mg/kg	0.05	NONE	< 0.050	< 0.050
TPHCWG - Aliphatic >C10 - C12 EH_CU_1D_AL_#1_#2	mg/kg	1	MCERTS	< 1.0	< 1.0
TPHCWG - Aliphatic >C12 - C16 EH_CU_1D_AL_#1_#2	mg/kg	2	MCERTS	< 2.0	< 2.0
TPHCWG - Aliphatic >C16 - C21 EH_CU_1D_AL_#1_#2	mg/kg	8	MCERTS	< 8.0	< 8.0
TPHCWG - Aliphatic >C16 - C35 EH_CU_1D_AL_#1_#2	mg/kg	10	MCERTS	28	< 10
TPHCWG - Aliphatic >C21 - C35 EH_CU_1D_AL_#1_#2	mg/kg	8	MCERTS	28	< 8.0
TPHCWG - Aliphatic >C35 - C44 EH_CU_1D_AL_#1_#2	mg/kg	8.4	NONE	24	< 8.4
TPHCWG - Aliphatic >C5 - C35 EH_CU+HS_1D_AL_#1_#2	mg/kg	10	NONE	28	< 10
TPHCWG - Aliphatic >C5 - C44 EH_CU+HS_1D_AL_#1_#2	mg/kg	10	NONE	52	< 10

TPHCWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	< 0.010
TPHCWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	< 0.010
TPHCWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.05	NONE	< 0.050	< 0.050
TPHCWG - Aromatic >EC10 - EC12 EH_CU_1D_AR_#1_#2	mg/kg	1	MCERTS	< 1.0	< 1.0
TPHCWG - Aromatic >EC12 - EC16 EH_CU_1D_AR_#1_#2	mg/kg	2	MCERTS	< 2.0	2.3
TPHCWG - Aromatic >EC16 - EC21 EH_CU_1D_AR_#1_#2	mg/kg	10	MCERTS	< 10	< 10
TPHCWG - Aromatic >EC21 - EC35 EH_CU_1D_AR_#1_#2	mg/kg	10	MCERTS	43	18
TPHCWG - Aromatic >EC35 - EC44 EH_CU_1D_AR_#1_#2	mg/kg	8.4	NONE	23	< 8.4
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_1D_AR_#1_#2	mg/kg	10	NONE	43	20
TPHCWG - Aromatic >EC5 - EC44 EH_CU+HS_1D_AR_#1_#2	mg/kg	10	NONE	66	20

VOCs

MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0
Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0
o-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number : 23-100077
Project / Site name: Fletcher Fold

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
100341	WS8 ES1	None Supplied	0.1	Brown sand with gravel and stones
100342	WS9 ES2	None Supplied	0.5	Brown clay and sand with gravel and stones
100343	WS1 ES3	None Supplied	0.2	Brown clay and loam with gravel and vegetation
100344	WS1 ES4	None Supplied	0.7	Brown clay and sand with gravel
100345	WS10 ES5	None Supplied	0.2	Brown clay and sand with gravel and vegetation
100346	WS11 ES6	None Supplied	0.6	Brown clay and sand with gravel and stones
100347	WS12 ES7	None Supplied	0.6	Brown clay and sand with gravel and stones
100348	WS13 ES8	None Supplied	0.65	Brown clay and sand with gravel
100349	WS14 ES9	None Supplied	0.7	Brown clay and sand with gravel
100350	WS2 ES10	None Supplied	0.3	Brown sandy loam with gravel
100354	WS3 ES14	None Supplied	0.2	Brown clay and sand with gravel and vegetation
100355	WS3 ES15	None Supplied	0.6	Brown clay and sand with gravel and vegetation
100356	WS4 ES16	None Supplied	0.35	Brown clay and sand with gravel
100357	WS4 ES17	None Supplied	1.6	Brown clay and sand
100358	WS5 ES18	None Supplied	0.1	Brown clay and sand with gravel
100359	WS5 ES19	None Supplied	1.5	Brown sandy clay with gravel
100360	WS7 ES21	None Supplied	0.1	Brown clay and sand with gravel and vegetation
100361	WS7 ES22	None Supplied	0.8	Brown clay and sand with gravel and vegetation
100362	WS20 ES24	None Supplied	0.25	Brown clay and sand with gravel
100363	WS19 ES25	None Supplied	0.1	Brown clay and sand with gravel and vegetation
100364	WS21 ES25	None Supplied	0.1	Brown loam and clay with gravel and vegetation
100365	WS22 ES26	None Supplied	0.1	Brown clay and sand with gravel and vegetation
100366	HD1 ES27	None Supplied	0.2	Brown clay and sand with gravel
100367	HD1 ES28	None Supplied	0.35	Brown clay and sand with gravel and vegetation

Analytical Report Number : 23-100077

Project / Site name: Fletcher Fold

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques	In-house method based on HSG 248, 2021	A001B	D	ISO 17025
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L009B	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method.	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L038B	D	MCERTS
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES	In-house method based on Second Site Properties version 3	L038B	D	MCERTS
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES	In-house method based on TRL 447	L038B	D	NONE
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES	In-house method	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES	In-house method	L038B	D	MCERTS
Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS with carbon banding aliphatic and aromatic	In-house method	L076B/L088	D/W	MCERTS
Water Soluble Nitrate (leachate equivalent)	Determination of nitrate by reaction with sodium salicylate and colorimetry	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction	L078	D	NONE
Nitrate, water soluble, in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction	L078	D	NONE
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry	In-house method	L080	W	MCERTS

Analytical Report Number : 23-100077

Project / Site name: Fletcher Fold

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	MCERTS
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser	In-house method	L082B	D	MCERTS
Ammonium as NH ₄ in soil	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method, 10:1 water extraction.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082B	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement	In-house method	L099	D	MCERTS

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
-	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

Sample Deviation Report



Analytical Report Number : 23-100077

Project / Site name: Fletcher Fold

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis. Please note that the associated result(s) may be unreliable and should be interpreted with care.

Key: a - No sampling date b - Incorrect container c - Holding time d - Headspace e - Temperature

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
WS7 ES21	N/A	S	100360	b	Monohydric phenols in soil	L080	b
WS7 ES21	N/A	S	100360	b	Semi-volatile organic compounds in soil	L064B	b
WS7 ES21	N/A	S	100360	b	Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	L076B/L088	b
WS7 ES21	N/A	S	100360	b	Volatile organic compounds in soil	L073B	b



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Analytical Report Number : 23-100222

Replaces Analytical Report Number: 23-100222, issue no. 1

Additional analysis undertaken.

PAH16, Monohydric phenols & CWG-44 add to all samples by laboratory.

Project / Site name:	Fletcher Fold	Samples received on:	07/12/2023
Your job number:	23-12-115972	Samples instructed on/ Analysis started on:	20/12/2023
Your order number:	PO23006231	Analysis completed by:	16/01/2024
Report Issue Number:	2	Report issued on:	17/01/2024
Samples Analysed:	4 leachate samples		

Signed:

Joanna Szwagrzak
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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



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Environmental Science

Analytical Report Number: 23-100222

Project / Site name: Fletcher Fold

Your Order No: PO23006231

Lab Sample Number	101074	101075	101076	101077
Sample Reference	WS8	WS3	WS7	WS21
Sample Number	ES1	ES14	ES21	ES25
Depth (m)	0.10	0.20	0.10	0.10
Date Sampled	04/12/2023	04/12/2023	04/12/2023	04/12/2023
Time Taken	0938	1431	1016	1151
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status	

General Inorganics

pH (automated)	pH Units	N/A	ISO 17025	7.7	7.8	7.7	7.6
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	8.3	12	12	13

Total Phenols

Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10
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Speciated PAHs

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01
Dibenzo(a,h)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01

Total PAH

Total EPA-16 PAHs	µg/l	0.16	NONE	< 0.16	< 0.16	< 0.16	< 0.16
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Heavy Metals / Metalloids

Arsenic (dissolved)	µg/l	1	ISO 17025	< 1.0	< 1.0	4.1	7.8
Boron (dissolved)	µg/l	10	ISO 17025	< 10	< 10	< 10	12
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08	< 0.08	< 0.08
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0
Chromium (dissolved)	µg/l	0.4	ISO 17025	3.7	1.4	5.3	2.2
Copper (dissolved)	µg/l	0.7	ISO 17025	9.7	19	25	31
Lead (dissolved)	µg/l	1	ISO 17025	< 1.0	1.7	14	8.5
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5	< 0.5	< 0.5
Nickel (dissolved)	µg/l	0.3	ISO 17025	2.5	1.8	3.2	3.9
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0	< 4.0	< 4.0
Zinc (dissolved)	µg/l	0.4	ISO 17025	5	7.1	20	13



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Environmental Science

Analytical Report Number: 23-100222

Project / Site name: Fletcher Fold

Your Order No: PO23006231

Lab Sample Number				101074	101075	101076	101077
Sample Reference				WS8	WS3	WS7	WS21
Sample Number				ES1	ES14	ES21	ES25
Depth (m)				0.10	0.20	0.10	0.10
Date Sampled				04/12/2023	04/12/2023	04/12/2023	04/12/2023
Time Taken				0938	1431	1016	1151
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status				

Petroleum Hydrocarbons

TPH - Aliphatic >C5 - C6 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH - Aliphatic >C6 - C8 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH - Aliphatic >C8 - C10 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH - Aliphatic >C10 - C12 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH - Aliphatic >C12 - C16 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH - Aliphatic >C16 - C21 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH - Aliphatic >C21 - C35 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH - Aliphatic >C35 - C40 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH - Aliphatic >C35 - C44 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH - Aliphatic >C40 - C44 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH - Aliphatic >C5 - C35 HS+EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH - Aliphatic >C5 - C44 HS+EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10

TPH - Aromatic >EC5 - EC7 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH - Aromatic >EC7 - EC8 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH - Aromatic >EC8 - EC10 EH_1D_AR_#1_#2_MS	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH - Aromatic >EC10 - EC12 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH - Aromatic >EC12 - EC16 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH - Aromatic >EC16 - EC21 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH - Aromatic >EC21 - EC35 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH - Aromatic >EC35 - EC40 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH - Aromatic >EC35 - EC44 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH - Aromatic >EC40 - EC44 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH - Aromatic >EC5 - EC44 HS+EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH - Aromatic >EC6 - EC35 HS+EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10

VOCs

MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0
Benzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Toluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Ethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
p & m-xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
o-xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected



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Environmental Science

Analytical Report Number : 23-100222

Project / Site name: Fletcher Fold

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Dissolved Organic Carbon in leachate	Determination of dissolved organic carbon in leachate by the measurement on a non-dispersive infrared analyser of carbon dioxide released by acidification	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037B	W	NONE
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L039B	W	ISO 17025
Total petroleum hydrocarbons with carbon banding by GC-MS/GC-MS HS in leachate	Determination of total petroleum hydrocarbons in leachate by GC-MS/GC-MS HS with carbon banding aliphatic and aromatic	In-house method	L070B/L088	W	ISO 17025
Volatile organic compounds in leachate	Determination of volatile organic compounds in leachate by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	ISO 17025
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry	In-house method	L080	W	ISO 17025
Monohydric phenols in leachate	Determination of phenols in leachate by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	ISO 17025
pH at 20°C in leachate (automated)	Determination of pH in leachate by electrometric measurement	In-house method	L099	W	ISO 17025
SVOCs and PAHs in leachate	SVOCs and PAHs in leachate	In-house method	L102B		ISO 17025
Total Organic Carbon in leachate	Determination of total organic carbon in leachate by the measurement on a non-dispersive infrared analyser of carbon dioxide released by acidification.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037B	W	NONE

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30°C.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Appendix G

Radon Report

FLETCHER FOLD, BURY, BL9 9RX

Professional opinion

Site plan



Search results

In a radon affected area

The property is in a radon affected area. This could mean that inhabitants are at risk from the harmful effects of radon.

The percentage of homes estimated to be affected by radon in your local area is between 1% and 3%.

Please see [page 3 >](#)

Useful contacts

UK Health Security Agency (UKHSA) / UKRadon
Radon Survey
Chemical, Radiation and Environmental Hazards
Chilton, Didcot
Oxon
OX11 0RQ
<https://www.ukradon.org/> ↗

UK Radon Association
<http://www.radonassociation.co.uk/> ↗

Overview of findings and recommendations

Radon

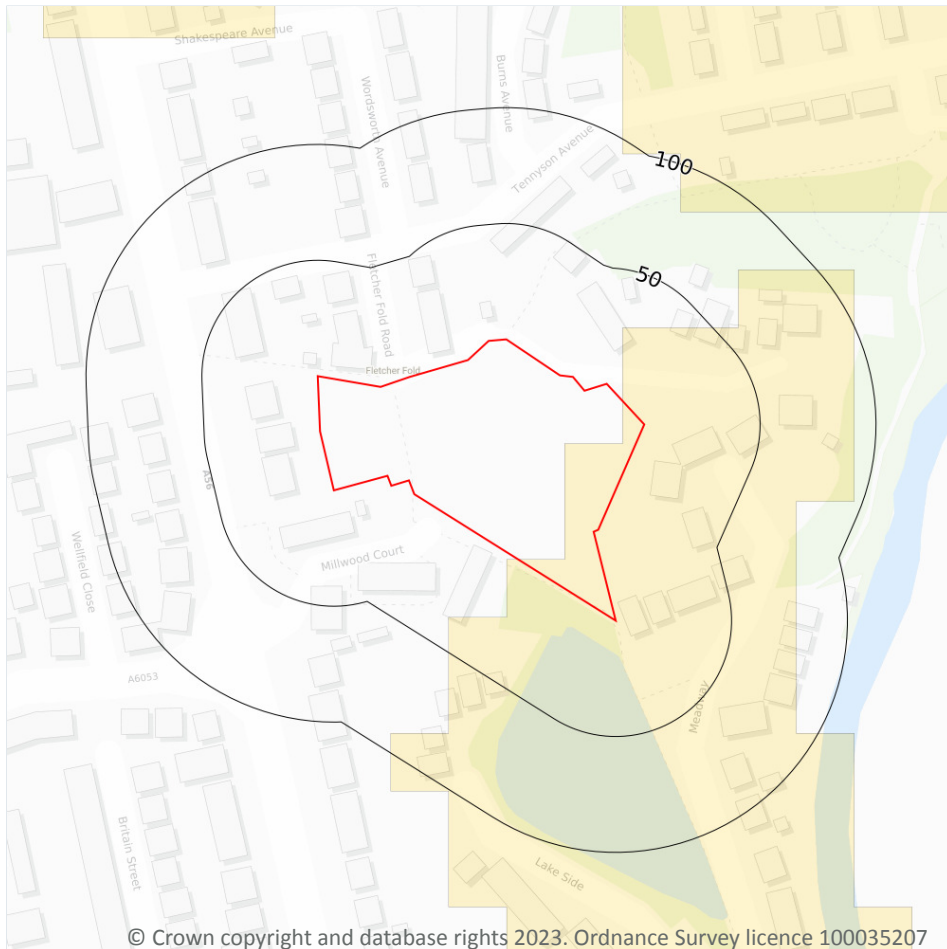
The property is in an area where elevated radon levels are expected to be found in 1-3% of properties.

Next steps for consideration:

- if the property is a new build, you can check compliance on radon protection with the developer
- if you are buying a currently occupied property, ask the present owner whether radon levels have been measured and, if so, whether the results were above the radon Action Level. If they were, ask what remedial measures were installed, were radon levels re-tested and did the re-testing confirm the measures have been effective
- if testing has not been carried out, it would be a sensible precaution to arrange for the property to be tested with radon detectors. If initial short-term radon screening tests are inconclusive, or the purchaser would prefer to carry out a full three-month test, it may be possible to arrange a 'radon bond'
- high levels of radon can be reduced through carrying out remedial works to the property
- no radon protection measures will be required to be installed in the event that any new buildings or extensions are added to the property
- all basement and cellar areas are considered at additional risk from high radon levels. If an underground room such as a cellar or basement makes up part of the living or working accommodation, the property should be tested regardless of radon Affected Area status
- see <http://www.radonassociation.co.uk/guide-to-radon/information-for-house-buyers-and-sellers/> ↗ for further information



Radon



— Site Outline
Search buffers in metres (m)

- Greater than 30%
- Between 10% and 30%
- Between 5% and 10%
- Between 3% and 5%
- Between 1% and 3%
- Less than 1%

The property is in a radon affected area, meaning there is an increased risk that properties will contain elevated levels of radon.

In order to determine if there is a problem at your property, a radon measurement in the building must be taken. Access to a testing service and further information on radon is available from UK Health Security Agency (UKHSA) or www.ukradon.org ↗.

Radon is a colourless, odourless radioactive gas present in all areas of the United Kingdom, usually at levels that pose a negligible risk. However, the property is situated in an area where levels of radon can be much higher and pose a health risk. High levels of radon can cause lung cancer, particularly for smokers and ex-smokers. The higher the level and the longer the period of exposure, the greater the risk.

Please see [page 2](#) > for further advice.

This data is sourced from the British Geological Survey/UK Health Security Agency.



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Contact us with any questions at:
info@groundsure.com ↗
01273 257 755

Ref: GS-M6D-3KL-NTM-UEK
Your ref: Fletcher_Fold_PO23006184
Grid ref: 380648 408677

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