

PHASE II GROUND INVESTIGATION REPORT



**CLEATOR MOOR ACTIVITY CENTRE, CLEATOR MOOR, CUMBRIA, CA25 5AN
PREPARED FOR ALLIANCE LEISURE SERVICES LIMITED**



QUALITY CONTROL

Project No.	GEOL22-8472	Client	Alliance Leisure Services Limited
Report Type	Phase II Ground Investigation Report		
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Project Type	Redevelopment of Cleator Moor Activity Centre comprising a new sports facility replacing the existing sports facility, along with a change in layout to on-site parking areas		
Site Address	Cleator Moor Activity Centre, Cleator Moor, Cumbria, CA25 5AN		
NGR	302150, 515090		
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1.0 Introduction

Geol Consultants Limited (GEOL) were instructed by Furness Partnership Limited on behalf of Alliance Leisure Services Limited to undertake an appropriate programme of intrusive ground investigation works on land within the grounds of Cleator Moor Activity Centre in Cleator Moor, Cumbria. The proposed development comprises the replacement of the existing sports facility, with the construction of a new sports facility. Alterations to existing on-site car parking areas are also envisaged. The National Grid Reference for the centre of the development area is 302150, 515090. A copy of the proposed development layout plan can be seen attached in Appendix I.

A Phase I Preliminary Contamination Risk Assessment (PCRA) was completed for the site by GEOL (reference GEOL22-8472) dated July 2022. The findings from the report have been summarised in Section 2.0 on the following page. This report should be read in conjunction with the PCRA.

The purpose of this report is to provide information relating to the following to assist with the new development proposals.

- ▼ Identify the ground conditions below the site area where access would allow, to assess the geotechnical properties of the underlying made ground and natural deposits to assist with determining suitable and appropriate new building foundation designs
- ▼ Assess the soil permeability characteristics of the underlying natural deposits to determine the suitability of these as a drainage medium for the discharge of surface water as part of a SuDS / soakaway design scheme
- ▼ Determine the levels of contamination within the existing shallow soil deposits, to assess the impacts from those contaminants towards the future site end-users (Human Health)
- ▼ Determine the ground gas regime for the site
- ▼ Determine the scope of any further investigation works or remediation measures required for the site prior to commencing with the development works

The information contained in this technical report is limited to the area of the site as shown on the proposed development layout plan attached in Appendix I, and to those areas accessible at the time of the ground investigation works being undertaken. When considering the scope of works completed for the development proposals, any features or issues not specifically mentioned cannot be assumed to have been covered.

2.0 Summary of the Phase I PCRA

As part of the Land Contamination Management Procedure (April 2021), a PCRA was completed for the site and the main findings of this report are given below.

- ▼ Site History – Based on available historical Ordnance Survey (OS) maps the site has remained undeveloped since the earliest published mapping, until 1962 when Pavilion structures are marked over the central-western part of the site. These structures are no longer marked by 1985 and replaced by an indoor bowling centre by 1991. The surrounding area comprises predominately a residential land-use
- ▼ Geology – The site is shown to be initially overlain by superficial (drift) deposits comprising Devensian Till, formed up to 2 million years ago during the Quaternary Period. These deposits are expected to be <5m in thickness until bedrock deposits are encountered. The bedrock deposits beneath the site are shown to comprise the Buttermere Formation (mudstone and sandstone), Frizlington Limestone Formation (limestone) and the Stainmore Formation (mudstone, siltstone and sandstone), all formed during the Ordovician and Carboniferous Periods.
- ▼ Landfill & Waste – There are no Registered Landfill Sites, Registered Waste Treatment or Disposal Sites recorded within 250m of the site boundary. However, there are 3 no. areas of potentially infilled land (non-water) recorded within a plausible migration distance to the site, thought to be associated with former surface quarrying activities
- ▼ Controlled Waters – The superficial deposits underlying the site have been designated as Secondary Undifferentiated Aquifer. The underlying bedrock formations have been classified as either a Secondary A Aquifer or Secondary B Aquifer
- ▼ Radon Gas – The site lies within an area where full radon protection measures are required for new structures
- ▼ Ground Contamination – Based on the data reviewed, the PCRA identified a low risk in terms of contaminated soils
- ▼ Ground Gas – Based on the data reviewed, the Phase I PCRA identified a medium risk in terms of ground gas. Therefore, it was concluded that an appropriate programme ground gas and groundwater monitoring be carried out for the site, in accordance with CIRIA C665

3.0 Scope of Works

To determine the shallow ground conditions below the site, the ground investigation works completed by GEOL comprised the sinking of 7 no. windowless sampling boreholes (labelled BH01 to BH07), using our own inhouse Archway Competitor Dart Rig and drilling team. Combined ground gas and water monitoring wells were installed at borehole locations BH01, BH03 and BH07.

In addition, 2 no. hand dug trial pits (labelled TP01 and TP02) were excavated adjacent to the existing activity centre in order to expose the existing building foundations (type and dimensions) and underlying founding strata.

To assist with the construction of the new car park, 5 no. TRL Dynamic Cone Penetrometer (DCP) tests (labelled DCP01 to DCP05) were completed to obtain in-situ equivalent CBR values relating to the upper soil deposits.

The borehole, trial pit and DCP positions can be seen on the investigation location plan attached in Appendix II. Detailed descriptions of the strata encountered during the investigation works are presented on the borehole and trial pit record sheets attached in Appendix II.

4.0 Ground Conditions

4.1 Soil Profile

A summary of the ground conditions encountered at the windowless sampling borehole locations are given in the Table on the following page.

There was no obvious visual or olfactory evidence of any fuel / oil type contamination or potential asbestos containing materials (ACM's) or bundles of fibres noted at the borehole locations. Similarly, there was also no evidence of any biodegradable or putrescible deposits at the borehole locations, or ashy deposits.

4.0 Ground Conditions (Cont'd)

4.1 Soil Profile (Cont'd)

Strata	Depths Recorded	Description & Comments
MADE GROUND (Variable)	From 0.00m up to 1.00m to 1.50m	The initial surfacing at most of the boreholes comprised topsoil over either soft brown sandy gravelly clay (BH07 noted occasional coal fragments) or brown very clayey gravelly sand. The initial surfacing at BH06 comprised dark grey and black sandy gravelly soil with fragments of bricks and concrete
TOPSOIL	From 0.00m up to 0.20m	The initial surfacing at BH02 comprised dark grey and brown clayey sandy gravelly TOPSOIL
SUPERFICIAL GEOLOGY Devensian Till	From 0.20m to 1.50m up to 5.20m (base of BH03)	The superficial deposits beneath the site comprise mostly firm and stiff reddish brown sandy slightly gravelly CLAY with occasional cobbles. Occasional sand 'bands' are noted within BH03 and BH06

4.2 Foundation Details

Two manually excavated trial pits were created alongside the existing activity centre to determine the existing building foundations (type and dimensions) and the soil deposits in which the foundations are based.

The trial pits remained stable during the investigation period. TP01 was noted to be wet at 1.10m, whereas TP02 was noted to remain dry. Copies of the foundation inspection pits (foundation detail / photographic record) sheets can be seen attached in Appendix II. The foundation details identified are summarised in the Table on the following page.

4.0 Ground Conditions (Cont'd)

4.2 Foundation Details (Cont'd)

Trial pit location	Foundation details
TP01	The existing building wall extended to a depth of 0.70m below current ground levels, where a concrete footing was encountered. The concrete was noted to project out from the existing building wall by 0.20m and was noted to be 0.30m in thickness and based within the natural stiff clay deposits
TP02	The existing building wall extended to a depth of 0.80m below current ground levels, where a concrete footing was encountered. The concrete footing was noted to project out from the existing building wall 1.60m and was noted to be 0.30m in thickness and based within the natural stiff clay deposits

4.3 Groundwater

During the investigation works BH01, BH02 and BH03 remained dry, whereas BH04, BH05, BH06 and BH07 noted water at depths ranging between 0.60m and 3.00m below ground level. Post fieldwork monitoring encountered water levels in BH01, BH03 and BH07 to range between 0.12m and 1.94m below ground levels.

Therefore, water ingresses may occur within construction related excavations, and it would be prudent to allow for the introduction of temporary groundwater control techniques (i.e. sump pumping) to take care of any localised ingresses of groundwater during the construction period, especially during the wetter periods of the year. It should also be noted that instability within such excavations is also likely to occur because of water inflow.

Adequate lateral trench support may also be required for excavations, to prevent trench wall collapse or over excavation, as well as to create a safe working environment, and any excavations on this site should remain open for as short a period as possible, since the initial made ground and superficial deposits could be susceptible to deterioration, if left open to the natural elements for any significant period of time.

5.0 Insitu Geotechnical Testing

5.1 Insitu Standard Penetration Tests

Insitu standard penetration tests (SPT's) were undertaken within the made ground and natural deposits encountered at the windowless sampling borehole locations. A summary of the results obtained can be seen in the Table below.

Strata	SPT Results	Comments
MADE GROUND	One SPT test recorded an 'N' value of 3	The SPT test is indicative of very loose strata
Natural CLAY Deposits	Eighteen SPT tests recorded 'N' values ranging between 1 and 48, and two test recorded 50 blows for limited penetration	The SPT 'N' values obtained for the natural clay deposits are suggestive of generally firm, stiff and very stiff strata. The tests recording 50 blows for limited penetration is thought to have been influenced by cobbles within the clay deposits
Natural SAND Deposits	Two SPT tests recorded 'N' values of 15 and 43, and one test recorded 50 blows for limited penetration	The SPT 'N' values obtained for the natural sand deposits are indicative of medium dense and dense strata. The test recording 50 blows for limited penetration is thought to have been influenced by cobbles within the sand deposits

5.2 Insitu TRL Dynamic Cone Penetrometer Tests

In total 5 no. DCP tests were completed over the area of proposed new hardstanding, to determine the insitu strength / density of the underlying ground deposits to provide characteristic design CBR values for the soil deposits. The DCP field results are analysed using the UK DCP 3.1 software package to calculate the thickness and strength / density of differing layers.

The calculated results provided comprise penetration rates (mm / blow) & CBR values (%), and the DCP test results, including a graphical representation, can be seen within the DCP test reports attached in Appendix II.

5.0 Insitu Geotechnical Testing (Cont'd)

5.2 Insitu TRL Dynamic Cone Penetrometer Tests (Cont'd)

The results have identified, where new hardstanding surfacing is to be constructed and where the initial ground deposits are used as an undisturbed subgrade (in their present condition) a typical equivalent CBR design value of 5% can be adopted for design purposes for the deposits present below 0.45m, although loose spots may be present due to the nature of the soil ground. The achievable CBR values for the area investigated should improve under compaction and therefore higher CBR values may be attainable.

It is advised that any topsoil deposits are removed prior to construction.

5.3 Insitu Variable (Falling) Head Permeability Tests

Insitu variable (falling) head permeability tests were completed at the locations of BH01, BH03 and BH07, to assess the permeability characteristics of the underlying natural deposits for determining the suitability of using conventional soakaways / SuDS as part of the drainage design scheme for the site.

Due to the impermeable nature of the natural deposits (cohesive strata) there was no discharge of water during the monitoring test period, therefore a permeability value (k) could not be calculated, due to the test 'failing'. Therefore, the tests indicate the natural deposits have a practically impermeable soil permeability classification and practically impervious drainage characteristic.

6.0 Laboratory Testing

6.1 Determination of Chemical Attack on Buried Concrete

Ten representative samples of the soil deposits encountered at the windowless sampling borehole and trial pit locations were tested by Derwentside Environmental Testing Services Limited (DETS) to determine their pH value and soluble sulphate levels, so these materials can be classified in accordance with the guidance BRE Special Digest 1:2005, Concrete in Aggressive Ground. The results of the tests are contained in the DETS Certificate of Analysis Report (reference 22-21498), a copy of which can be seen in Appendix III.

6.0 Laboratory Testing (Cont'd)

6.1 Determination of Chemical Attack on Buried Concrete (Cont'd)

The laboratory test results have recorded soluble sulphate concentrations ranging between <10mg/l up to 100mg/l, and pH values ranging between 7.4 to 8.5.

Based on the results obtained, where future foundations and buried concrete are to be constructed the site can be given a Design Sulphate Class classification of DS-1. The Aggressive Chemical Environment for Concrete (ACEC) class for the deposits present can be assessed as AC-1, assuming mobile water ground conditions and based on brownfield ground locations.

6.2 Determination of Liquid & Plastic Limits

Eight representative samples of the natural clay deposits recovered at the windowless sampling borehole locations were tested to determine their moisture content and liquid & plastic limits, to ascertain their volume change potential (shrinkage or swelling), to help assist with future foundation designs. The results of the tests are contained in the Professional Soils Laboratory (PSL) Laboratory Report (reference PSL22/6895), a copy of which can be seen attached in Appendix III.

The natural clay deposits tested fall within the low plasticity range, and when considering the amount passing the 425um sieve they display a negligible and low volume change (shrinkage or swelling) potential. Therefore, the natural clay deposits present below the site are unlikely to undergo significant changes in volume if large changes in their natural moisture content were to occur due to seasonal variations or the like, and as such if new foundations were to be based within the natural clay deposits, they should be placed at a minimum depth of 0.75m below finished ground levels.

The samples tested were noted to have moisture contents ranging between 6% and 16%, which may be attributable to existing trees and their water demand. As such, consideration will need to be given to the presence of existing, proposed or recently removed vegetation to avoid the effects of future shrinkage and swelling of the natural deposits, and as such minimum foundation depths may need to be increased to take this into account. Reference should be made to the NHBC Technical Standards guidance, Part 4.2 Building Near Trees, and BS5837:2012 – Trees in relation to design, demolition, and construction – Recommendations.

6.0 Laboratory Testing (Cont'd)

6.3 Contamination Screening / Screening Strategy

Five representative samples of the shallow made ground and topsoil deposits encountered at the windowless sampling borehole and trial pit locations were screened for a wide range of chemical analytes to determine the levels of contamination present, to allow an assessment of the risks these materials may pose to the future site end-users and construction workforce. Ground contamination laboratory testing was completed by DETS of Consett, Co. Durham (UKAS & MCERTS accredited), and the suite of chemical analysis carried out is summarised below.

The results of the tests are contained in the DETS Certificate of Analysis Report (reference 22-21498), a copy of which can be seen in Appendix III, and a summary of the contamination results can be seen in the Tables on the following pages.

- ▼ 5 no. soil samples tested for Arsenic, Cadmium, Chromium (III & VI), Copper, Lead, Mercury, Nickel, Selenium, Zinc, Cyanide (free) and Total Organic Carbon (TOC)
- ▼ 5 no. soil samples screened for Speciated Polycyclic Aromatic Hydrocarbons (PAH's) – based on the current USEPA 16 PAH's
- ▼ 5 no. soil samples screened for Petroleum Hydrocarbons (Aliphatic & Aromatic split)
- ▼ 5 no. soil samples tested for Asbestos (presence)

A Human Health Generic Quantitative Risk Assessment (GQRA) is carried out by comparing measured concentrations in soil with generic screening values appropriate for the Conceptual Model and pollutant linkage(s) being assessed. Provided the measured concentrations are below appropriate generic screening criteria, the risk from the pollutant linkages(s) being assessed are unlikely to represent a significant risk. The generic screening values referred to above usually take the form of risk-based Generic Assessment Criteria (GAC) values, that are most typically derived using the Environment Agency's Contaminated Land Exposure Assessment (CLEA) Model. For the purpose of this Human Health contamination risk assessment, and when considering the nature and sensitivity of the proposed development (commercial), the results have been compared against currently available assessment values published by LQM / CIEH (Suitable 4 Use Levels – S4UL's), CL:AIRE Category 4 Screening Levels (C4SL's) and Atkins ATRISKsoil Soil Screening Values (SSVs) for Cyanide only.

6.0 Laboratory Testing (Cont'd)

6.3 Contamination Screening / Screening Strategy (Cont'd)

To allow an assessment of the level of risk to be made, the shallow soil deposits present on this site have been assessed by comparing the maximum recorded value against the appropriate critical concentration.

Generic Analytes	Critical concentration (mg/kg)	No. of samples screened	Max. concentration recorded (mg/kg)
Arsenic	640 ⁽¹⁾	5	23
Cadmium	190 ⁽¹⁾	5	0.4
Chromium III	8600 ⁽¹⁾	5	21
Chromium VI	33 ⁽¹⁾	5	<1.0
Copper	68,000 ⁽¹⁾	5	60
Lead	310 ⁽³⁾	5	85
Mercury	1100 ⁽¹⁾	5	0.32
Nickel	980 ⁽¹⁾	5	27
Selenium	12,000 ⁽¹⁾	5	1.2
Zinc	730,000 ⁽¹⁾	5	110
Cyanide	34 ⁽²⁾	5	0.1
Asbestos	Presence	5	None recorded
Speciated PAH's			
Acenaphthene	100,000 ⁽¹⁾	5	9.1
Acenaphthylene	100,000 ⁽¹⁾	5	1.4
Anthracene	540,000 ⁽¹⁾	5	22
Benzo(a)anthracene	180 ⁽¹⁾	5	66
Benzo(a)pyrene	36 ⁽¹⁾	5	62 (BH04 0.20m-0.30m)
Benzo(b)fluoranthene	45 ⁽¹⁾	5	48 (BH04 0.20m-0.30m)

⁽¹⁾ = The LQM/CIEH Suitable 4 Use Levels (Commercial, 6% SOM) [GEOL S4UL3816](#), ⁽²⁾ = ATRISK^{SOIL} SSV (2015), ⁽³⁾ = CL:AIRE C4SLs (Commercial)

6.0 Laboratory Testing (Cont'd)

6.3 Contamination Screening / Screening Strategy (Cont'd)

Speciated PAH's	Critical concentration (mg/kg)	No. of samples screened	Max. concentration recorded (mg/kg)
Benzo(ghi)perylene	4000 ⁽¹⁾	5	36
Benzo(k)fluoranthene	1200 ⁽¹⁾	5	36
Chrysene	350 ⁽¹⁾	5	67
Dibenzo(ah)anthracene	3.6 ⁽¹⁾	5	8.8 (BH04 0.20m-0.30m)
Fluoranthene	23,000 ⁽¹⁾	5	140
Fluorene	71,000 ⁽¹⁾	5	12
Indeno(123cd)pyrene	510 ⁽¹⁾	5	46
Naphthalene	1100 ⁽¹⁾	5	0.5
Phenanthrene	23,000 ⁽¹⁾	5	75
Pyrene	54,000 ⁽¹⁾	5	120
Petroleum Hydrocarbons			
Aliphatic C5-C6	12,000 ⁽¹⁾	5	<0.01
Aliphatic C6-C8	40,000 ⁽¹⁾	5	<0.01
Aliphatic C8-C10	11,000 ⁽¹⁾	5	<0.01
Aliphatic C10-C12	47,000 ⁽¹⁾	5	<1.5
Aliphatic C12-C16	90,000 ⁽¹⁾	5	<1.2
Aliphatic C16-C21	1,800,000 ⁽¹⁾	5	<1.5
Aliphatic C21-C35	1,800,000 ⁽¹⁾	5	<3.4
Aromatic C5-C7	86,000 ⁽¹⁾	5	<0.01
Aromatic C7-C8	180,000 ⁽¹⁾	5	<0.01
Aromatic C8-C10	17,000 ⁽¹⁾	5	<0.01
Aromatic C10-C12	34,000 ⁽¹⁾	5	5.6

⁽¹⁾ = The LQM/CIEH Suitable 4 Use Levels (Commercial, 6% SOM) [GEOL S4UL3816](#), ⁽²⁾ = ATRISK^{SOIL} SSV (2015), ⁽³⁾ = CL:AIRE C4SLs (Commercial)

6.0 Laboratory Testing (Cont'd)

6.3 Contamination Screening / Screening Strategy (Cont'd)

Petroleum Hydrocarbons	Critical concentration (mg/kg)	No. of samples screened	Max. concentration recorded (mg/kg)
Aromatic C12-C16	38,000 ⁽¹⁾	5	14
Aromatic C16-C21	28,000 ⁽¹⁾	5	120
Aromatic C21-C35	28,000 ⁽¹⁾	5	240

⁽¹⁾ = The LQM/CIEH Suitable 4 Use Levels (Commercial, 6% SOM) [GEOL S4UL3816](#), ⁽²⁾ = ATRISK^{SOIL} SSV (2015), ⁽³⁾ = CL:AIRE C4SLs (Commercial)

6.4 Contamination Risk Assessment

Based on the laboratory contamination screening results, most of the contaminants listed in the Tables above and on the previous pages for the shallow made ground and topsoil deposits tested do not exceed the critical concentration values adopted for this site, based on a Commercial end-use. Therefore, most of the made ground and topsoil deposits recorded at the borehole and trial pit locations can remain on site without representing an unacceptable risk towards the future site end-users and construction workforce (Human Health), and as a result no remediation work or special protection measures are required.

However, a ‘hotspot’ of contamination has been identified within the initial topsoil at BH04 (sample 0.20m – 0.30m), with the laboratory testing recording exceedances of Dibenzo(ah)anthracene, Benzo(a)pyrene and Benzo(b)fluoranthene. This ‘hotspot’ of contamination will represent an unacceptable level of risk toward the future end-users where exposure pathways are available.

Therefore, further delineation should be undertaken to confirm the size of the affected area so the impacted soil can be excavated and removed from site in order to negate the risks. Alternatively, clean cover can be imported to site to raise ground levels, eliminating the pathway from the future end-user.

Furthermore, no asbestos fibres were detected in any of the soil samples tested.

7.0 Ground Gas Risk Assessment

Three combined ground gas and water monitoring standpipes were installed at the site and have been monitored by GEOL primarily to confirm the ground gas regime, although water levels were also observed at the standpipe locations during the monitoring period.

The monitoring standpipes were constructed at the locations of BH01, BH03 & BH07 using 50mm diameter HDPE standpipe, comprising 1.00m of solid pipe within a bentonite seal and a response zone using slotted pipe up to depths of between 3.50m and 5.00m below existing site levels. The design of the ground gas risk assessment for this site has been undertaken in general accordance with the CIRIA Report C665 (November 2007), BS8576:2013 – Guidance on investigations for ground gas and BS8485:2015 + A1:2019 – Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings and is based on the criteria listed below.

- ▼ The proposed commercial development has been classified as low sensitivity
- ▼ The risk associated with the generation potential of a source has been assessed as very low, based on the data reviewed within the PCRA and on the ground conditions recorded at the borehole locations
- ▼ Therefore, in accordance with Tables 5.5a and 5.5b in CIRIA C665, the typical / the initial idealised period of monitoring for this site has been determined as 4 no. recorded readings undertaken over a minimum period of 1 month
- ▼ Monitoring visits are undertaken to target and correlate with the worst-case conditions for ground gas emissions to occur, comprising falling atmospheric pressure trends and low atmospheric pressures. Monitoring of the weather conditions and predicted atmospheric pressures were carried out up to 72 hours in advance of the monitoring visits, in order that a reasonable period of data is obtained to determine atmospheric trends, and to target the worst-case scenario

Monitoring has been undertaken using a Gas Data GFM436 soil gas analyser with integral flow meter, and a Geotechnical Instruments electronic dip-meter. A summary of the programme of gas monitoring results obtained from the monitoring wells can be seen in the Table on the following page. A copy of the Ground Gas Monitoring Record Sheet can also be seen attached in Appendix IV.

7.0 Ground Gas Risk Assessment (Cont'd)

The atmospheric pressure trend shown in brackets have been taken from www.weatheronline.co.uk for Whitehaven.

Borehole Position	Date of visit	Atmospheric Pressure (mbar)	Water level (m)	Max CH ₄ (%v/v)	Max CO ₂ (%v/v)	Min O ₂ (%v/v)	Flow Rate (l/hr)
BH01	26/10/2022	1002 (Rising trend)	0.71	0.0	0.8	18.8	<0.1
BH03			1.75	0.0	0.0	20.4	<0.1
BH07			0.27	0.0	0.0	20.6	<0.1
BH01	10/11/2022	996 (Rising trend)	0.68	0.0	1.0	17.5	<0.1
BH03			1.58	0.0	1.2	12.5	<0.1
BH07			0.19	0.0	4.0	13.1	<0.1
BH01	14/12/2022	996 (Rising trend)	1.31	0.0	0.6	19.6	<0.1
BH03			1.94	0.0	1.9	5.2	<0.1
BH07			0.49	0.0	4.2	13.2	<0.1
BH01	22/12/2022	985 (Rising trend)	0.78	0.0	0.7	19.5	<0.1
BH03			0.57	0.0	0.0	7.6	<0.1
BH07			0.39	0.0	4.9	15.5	<0.1
BH01	10/01/2023	981 (Rising trend)	1.22	0.0	0.9	17.3	<0.1
BH03			1.22	0.0	2.2	1.9	<0.1
BH07			0.12	0.0	5.1	10.6	<0.1

No detectable concentrations of Methane have been recorded during the monitoring period. However, low concentrations of Carbon Dioxide have been recorded, ranging between 0.00% v/v up to 5.1% v/v at the monitoring wells, with depleted Oxygen concentrations also being recorded during some visits. Negligible flow rates have been consistently recorded (<0.1l/hr).

For the purposes of assessing the proposed development in accordance with Tables 8.5 & 8.7 in CIRIA C665 and Table 2 in BS8485:2015 + A1:2019, the site is characterised based on the limiting borehole hazardous gas flow rate (Q_{hg}) for Methane and Carbon Dioxide, known as the Gas Screening Value (GSV), and the calculation can be seen on the following page.

7.0 Ground Gas Risk Assessment (Cont'd)

The GSV equates to a Characteristic Situation classification which in turn determines the level of gas protection required in accordance with Table 4 in BS8485:2015 + A1:2019.

- ▼ Due to the lack of Methane recorded, a GSV cannot be calculated
- ▼ Multiply the maximum Carbon Dioxide concentration (taken as 5.1% v/v (0.051)) by the maximum flow rate (0.1l/hr), which gives a GSV value of 0.0051l/hr

Although the GSV calculated does not exceed the assessment value of 0.07l/hr for a Characteristic Situation 1 classification, GEOL feel that as a precaution due to the increasing Carbon Dioxide concentrations observed over the monitoring visits (i.e 4.0% to 5.1%) coupled with the low /depleted Oxygen concentrations, it is necessary to increase the characteristic situation classification to CS2, therefore requiring appropriate gas protection measures to be implemented. The implementation of this will also provide necessary protection for full radon protection measures (i.e below slab ventilation and provision of compliant ventilation and membrane).

8.0 Recommendations for New Foundations

From the 7 no. borehole locations sunk on site by GEOL, the initial surfacing comprises topsoil and made ground deposits, with topsoil deposits extending to a maximum depth of 0.30m, and made ground extending to depths of between 1.00m and 1.50m. The made ground deposits are underlain by natural superficial deposits typically comprising firm, stiff and very stiff clay deposits, with occasional sand layers.

The initial topsoil and made ground deposits will not be suitable for supporting new foundations, due to their inherent compressibility and inconsistencies with these types of deposits.

New foundations should be based within the natural clay deposits at depths of between 1.00m and 1.50m. These deposits will be able to provide an allowable bearing pressure of 100kN/m².

Foundations placed within the clay deposits should be placed at a minimum depth of 0.75m below finished ground levels.

8.0 Recommendations for New Foundations (Cont'd)

It would be prudent to make an allowance for all foundation excavations to be inspected by a suitably qualified Engineer during the construction phase of works, to verify the correct founding strata and depths have been achieved, and to ensure there are no significant changes or variations in the ground conditions below parts of the site where boreholes were not sunk.

Attention should be paid to those footings located within the zone of influence of existing or removed trees and shrubs. Where footings have to be deepened to cater for tree roots, reference should therefore be made to the BS5837:2012 – Trees in relation to design, demolition and construction – Recommendations.

9.0 General Comments

It is also recommended for any new developments, adequate surface drainage should be designed and installed by a competent contractor, to prevent surface water 'ponding' or collection, during and post construction, particularly where the existing surface drainage system is disrupted or damaged. In addition, for deeper excavations, drainage, service runs or the like that may pass close to or beneath any proposed new foundations, these should be undertaken with care and completed prior to the preparation of any new foundations, so as not to allow any loose or granular material to move or 'flow', thus causing settlement to occur to any new foundations based at a higher level.

During the ground preparation works and the development of the site, should the ground conditions appear to differ from those already identified at the borehole locations put down on site by GEOL, then advice should be sought from a suitably qualified Geotechnical Engineer to determine if a reassessment of the ground conditions and recommendations are required before the development progresses further.

End of Report

APPENDIX I

Site Location Plan & Proposed Development Layout Plan



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 **SITE LOCATION PLAN** 

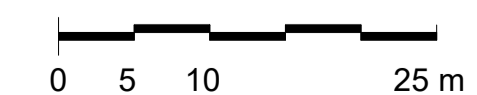
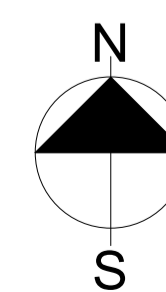
Report Type: Phase II Ground Investigation Report

Site Address: Cleator Moor Activity Centre, Cleator Moor, Cumbria, CA25 5AN

Project No.: GEOL22-8472

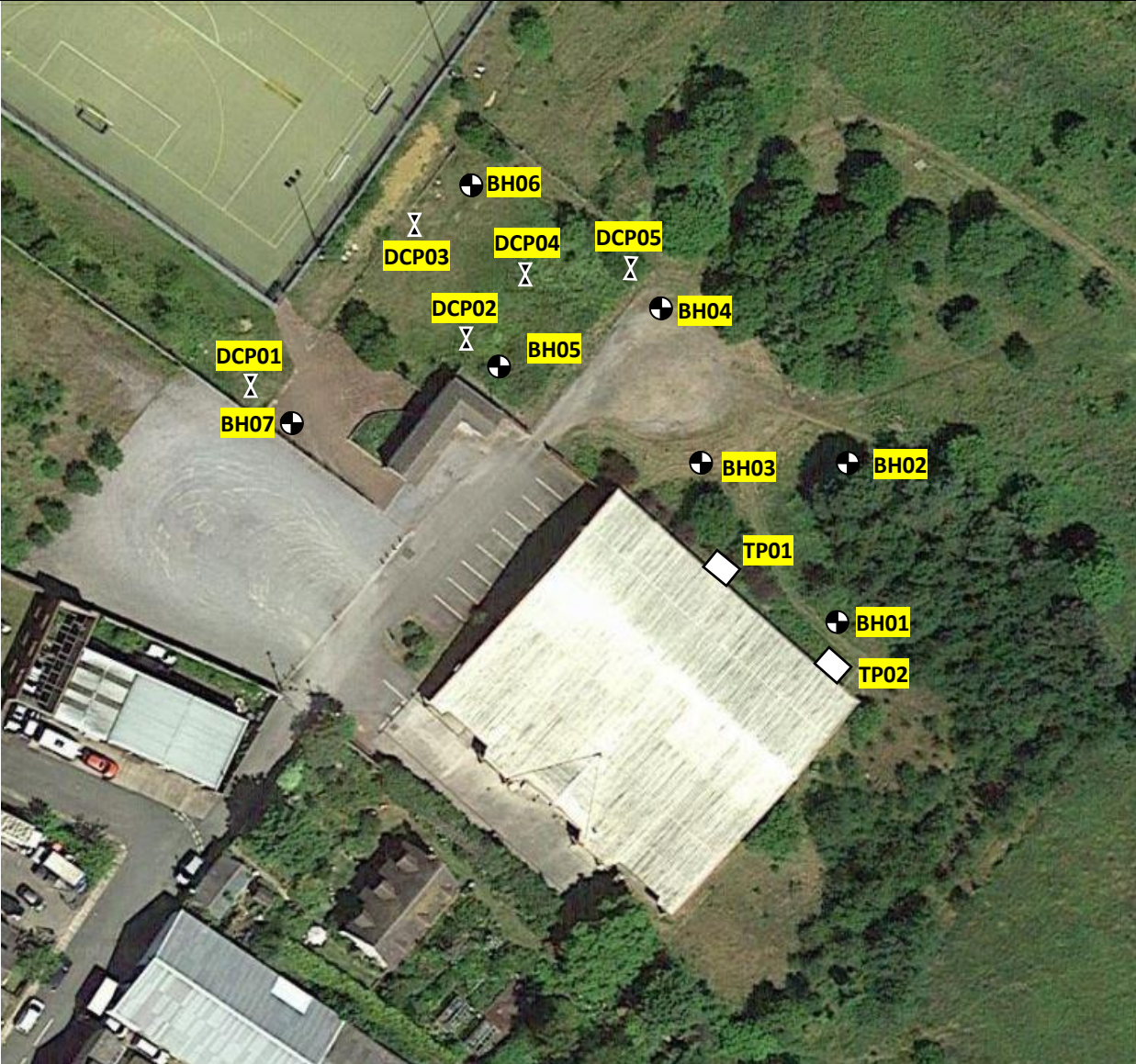


— Ownership Boundary



APPENDIX II

**Investigation Location Plan
Borehole Record Sheets
DCP Record Sheets &
Foundation Detail Sheets**



Key:

BH01 – Windowless Sampling Borehole 

TP01 – Manually Excavated Foundation Trial Pit 

DCP01 – Dynamic Cone Penetrometer Test 

INVESTIGATION LOCATION PLAN

Report Type: Phase II Ground Investigation Report

Site Address: Cleator Moor Activity Centre, Cleator Moor, Cumbria, CA25 5AN

Project No.: GEOL22-8472



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BOREHOLE LOG

Project Cleator Moor Activity Centre, Cleator Moor, Cumbria, CA25 5AN				BOREHOLE No BH01
Job No GEOL22-8472	Date 17-10-22 17-10-22	Ground Level (m)	Co-Ordinates ()	
Contractor GEOL Consultants Limited				Sheet 1 of 1

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
0.10	B					0.20	Dark grey and brown clayey sandy gravelly TOPSOIL.	
						(0.80)	Soft brown sandy gravelly clay (POSSIBLE MADE GROUND).	
0.80	B					1.00		
1.00-1.45	SPT	N=17					Firm and stiff reddish brown sandy slightly gravelly CLAY with occasional cobbles (DEVENSIAN TILL).	
1.80	B					(3.45)		
2.00-2.45	SPT	N=31						
2.80	B							
3.00-3.45	SPT	N=24						
3.80	B							
4.00-4.45	SPT	N=27				4.45		

GEOL WS LOG GEOL22-8472.GPJ GINT STD AGS 3.1.GDT 10/3/23

Windowless Sampling Drilling Progress						GENERAL REMARKS	
Depth	Casing	Diameter	Recovery	Remarks			
All dimensions in metres Scale 1:37.5					Client Alliance Lesuire Services Limited	Method/ Plant Used ARCHWAY DART	Logged By NW

WATER: Dry
 ADDITIONAL: Position
 CAT scanned before
 breaking ground.



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BOREHOLE LOG

Project Cleator Moor Activity Centre, Cleator Moor, Cumbria, CA25 5AN				BOREHOLE No BH02
Job No GEOL22-8472	Date 17-10-22 17-10-22	Ground Level (m)	Co-Ordinates ()	
Contractor GEOL Consultants Limited				Sheet 1 of 1

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.80	B					0.20	Dark grey and brown clayey sandy gravelly TOPSOIL.		
1.00-1.45	SPT	N=16				(2.25)	Firm and stiff reddish brown sandy slightly gravelly CLAY with occasional cobbles (DEVENSIAN TILL).		
1.80	B					2.45			
2.00-2.45	SPT	N=1					Borehole terminated due to suspected cobble.		

GEOL WS LOG GEOL22-8472.GPJ GINT STD AGS 3.1.GDT 10/3/23

Windowless Sampling Drilling Progress						GENERAL REMARKS	
Depth	Casing	Diameter	Recovery	Remarks			
All dimensions in metres Scale 1:37.5					Client Alliance Lesuire Services Limited	Method/ Plant Used ARCHWAY DART	Logged By NW

WATER: Dry
 ADDITIONAL: Position
 CAT scanned before
 breaking ground.



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BOREHOLE LOG

Project Cleator Moor Activity Centre, Cleator Moor, Cumbria, CA25 5AN				BOREHOLE No BH03
Job No GEOL22-8472	Date 17-10-22 17-10-22	Ground Level (m)	Co-Ordinates ()	
Contractor GEOL Consultants Limited				Sheet 1 of 1

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.10	B					0.20	Dark grey and brown clayey sandy gravelly TOPSOIL.		
						(0.80)	Soft brown sandy gravelly clay (POSSIBLE MADE GROUND).		
0.80	B					1.00			
1.00-1.45	SPT	N=10					Firm and stiff reddish brown sandy slightly gravelly CLAY with occasional cobbles (DEVENSIAN TILL).		
1.40	B								
2.00-2.45	SPT	N=27				(2.80)			
3.00-3.45	SPT	N=50							
3.60	B					3.80			
4.00-4.45	SPT	N=43				(1.40)	Dense becoming very dense dark grey and black clayey gravelly SAND with coal and shale.		
4.80	B								
5.00-5.20	SPT	50 blows				5.20			
							Borehole terminated due to refusal of the sampling and testing equipment.		

GEOL WS LOG GEOL22-8472.GPJ GINT STD AGS 3.1.GDT 10/3/23

Windowless Sampling Drilling Progress						GENERAL REMARKS
Depth	Casing	Diameter	Recovery	Remarks		
All dimensions in metres Scale 1:37.5					Client Alliance Lesuire Services Limited	Method/ Plant Used ARCHWAY DART
					Logged By NW	

WATER: Dry
 ADDITIONAL: Position CAT scanned before breaking ground.



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BOREHOLE LOG

Project Cleator Moor Activity Centre, Cleator Moor, Cumbria, CA25 5AN				BOREHOLE No BH04
Job No GEOL22-8472	Date 17-10-22 17-10-22	Ground Level (m)	Co-Ordinates ()	
Contractor GEOL Consultants Limited				Sheet 1 of 1

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
0.20-0.30	B					(0.30) 0.30	Dark grey and brown clayey sandy gravelly TOPSOIL.	
1.00-1.45	SPT	N=3				(1.20)	Very loose brown very clayey gravelly sand (POSSIBLE MADE GROUND).	
1.30	B					1.50		
1.80	B					(2.65)	Firm and stiff reddish brown sandy slightly gravelly CLAY with occasional cobbles (DEVENSIAN TILL).	
2.00-2.45	SPT	N=29						
2.80	B							
3.00-3.45	SPT	N=31						
3.80	B							
4.00-4.15	SPT	50 blows				4.15		
							Borehole terminated due to refusal of the sampling and testing equipment.	

GEOL WS LOG GEOL22-8472.GPJ GINT STD AGS 3.1.GDT 10/3/23

Windowless Sampling Drilling Progress						GENERAL REMARKS	
Depth	Casing	Diameter	Recovery	Remarks			
All dimensions in metres Scale 1:37.5					Client Alliance Lesuire Services Limited	Method/ Plant Used ARCHWAY DART	Logged By NW



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BOREHOLE LOG

Project Cleator Moor Activity Centre, Cleator Moor, Cumbria, CA25 5AN				BOREHOLE No BH05	
Job No GEOL22-8472	Date 17-10-22 17-10-22	Ground Level (m)	Co-Ordinates ()		
Contractor GEOL Consultants Limited				Sheet 1 of 1	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.80	B		↓			(1.00)	Brown very clayey gravelly sand (POSSIBLE MADE GROUND).		
1.00-1.45	SPT	N=18				1.00			
1.80	B					(1.45)	Firm and stiff reddish brown sandy slightly gravelly CLAY with occasional cobbles (DEVENSIAN TILL).		
2.00-2.45	SPT	N=48				2.45			
							Borehole terminated on suspected cobble.		

GEOL WS LOG GEOL22-8472.GPJ GINT STD AGS 3.1.GDT 10/3/23

Windowless Sampling Drilling Progress						GENERAL REMARKS	
Depth	Casing	Diameter	Recovery	Remarks		WATER: 1.35m ADDITIONAL: Position CAT scanned before breaking ground.	
All dimensions in metres Scale 1:37.5			Client Alliance Lesuire Services Limited	Method/ Plant Used ARCHWAY DART	Logged By NW		



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BOREHOLE LOG

Project Cleator Moor Activity Centre, Cleator Moor, Cumbria, CA25 5AN				BOREHOLE No BH06	
Job No GEOL22-8472	Date 17-10-22 17-10-22	Ground Level (m)	Co-Ordinates ()	Sheet 1 of 1	
Contractor GEOL Consultants Limited					

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.80	B		↓			(1.20)	Dark grey and black sandy gravelly soil with fragments of bricks and concrete (MADE GROUND).		
1.00-1.45	SPT	N=15				1.20			
1.60	B					(0.50)	Medium dense brown and red clayey SAND.		
1.80	B					1.70			
2.00-2.45	SPT	N=15				(2.75)	Firm and stiff reddish brown sandy slightly gravelly CLAY with occasional cobbles (DEVENSIAN TILL).		
2.80	B								
3.00-3.45	SPT	N=26							
4.00-4.45	SPT	N=35				4.45			

GEOL WS LOG GEOL22-8472.GPJ GINT STD AGS 3.1.GDT 10/3/23

Windowless Sampling Drilling Progress						GENERAL REMARKS	
Depth	Casing	Diameter	Recovery	Remarks		WATER: 0.60m ADDITIONAL: Position CAT scanned before breaking ground	
All dimensions in metres Scale 1:37.5			Client Alliance Lesuire Services Limited	Method/ Plant Used ARCHWAY DART	Logged By NW		



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BOREHOLE LOG

Project Cleator Moor Activity Centre, Cleator Moor, Cumbria, CA25 5AN				BOREHOLE No BH07
Job No GEOL22-8472	Date 17-10-22 17-10-22	Ground Level (m)	Co-Ordinates ()	
Contractor GEOL Consultants Limited				Sheet 1 of 1

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.80	B		↓ 1			(1.20)	Soft brown and red sandy gravelly clay with coal fragments (MADE GROUND).		
1.00-1.45	SPT	N=11				1.20			
1.80	B					(2.30)	Firm and stiff reddish brown sandy slightly gravelly CLAY with occasional cobbles (DEVENSIAN TILL).		
2.00-2.45	SPT	N=24			(2.30)				
2.80	B				(2.30)				
3.00-3.45	SPT	N=31			(2.30)				
3.40	B				(2.30)	3.50	Borehole terminated due to suspected cobbles.		

GEOL WS LOG GEOL22-8472.GPJ GINT STD AGS 3.1.GDT 10/3/23

Windowless Sampling Drilling Progress						GENERAL REMARKS WATER: 3.00m ADDITIONAL: Position CAT scanned before breaking ground.
Depth	Casing	Diameter	Recovery	Remarks		
All dimensions in metres Scale 1:37.5			Client Alliance Lesuire Services Limited	Method/ Plant Used ARCHWAY DART	Logged By NW	

Penetration Data Report

Project Name: GEOL22-8472 Cleator Moor Activity Centre

Chainage (km): 1.000
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 17/10/2022

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Unknown
 Moisture adjustment factor: Not adjusted

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	0	0.00					
2	1	1	130	130.00					
3	1	2	169	39.00					
4	5	7	260	18.20					
5	1	8	300	40.00					
6	1	9	344	44.00					
7	1	10	393	49.00					
8	1	11	435	42.00					
9	1	12	468	33.00					
10	1	13	506	38.00					
11	1	14	545	39.00					
12	5	19	584	7.80					
13	5	24	617	6.60					
14	5	29	650	6.60					
15	4	33	680	7.50					
16	1	34	709	29.00					
17	1	35	746	37.00					
18	1	36	769	23.00					
19	1	37	804	35.00					
20	1	38	822	18.00					
21	1	39	837	15.00					
22	1	40	855	18.00					
23	1	41	873	18.00					

Remarks: Test Location:- DCP01

Penetration Data Report

Project Name: GEOL22-8472 Cleator Moor Activity Centre

Chainage (km): 2.000
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 17/10/2022

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Unknown
 Moisture adjustment factor: Not adjusted

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	0	0.00					
2	2	2	126	63.00					
3	3	5	188	20.67					
4	5	10	244	11.20					
5	1	11	272	28.00					
6	2	13	322	25.00					
7	1	14	378	56.00					
8	1	15	439	61.00					
9	1	16	497	58.00					
10	1	17	522	25.00					
11	1	18	646	124.00					
12	1	19	671	25.00					
13	5	24	675	0.80					
14	10	34	681	0.60					
15	10	44	687	0.60					
16	10	54	696	0.90					
17	10	64	704	0.80					
18	10	74	712	0.80					

Remarks: Test Location:- DCP02

Penetration Data Report

Project Name: GEOL22-8472 Cleator Moor Activity Centre

Chainage (km): 3.000
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 17/10/2022

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Unknown
 Moisture adjustment factor: Not adjusted

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	0	0.00					
2	2	2	120	60.00					
3	1	3	170	50.00					
4	1	4	200	30.00					
5	1	5	249	49.00					
6	5	10	297	9.60					
7	10	20	365	6.80					
8	5	25	394	5.80					
9	5	30	445	10.20					
10	5	35	489	8.80					
11	5	40	538	9.80					
12	5	45	590	10.40					
13	5	50	643	10.60					
14	5	55	705	12.40					
15	2	57	736	15.50					
16	1	58	753	17.00					
17	1	59	773	20.00					
18	1	60	793	20.00					
19	1	61	810	17.00					
20	2	63	840	15.00					

Remarks: Test Location:- DCP03

Penetration Data Report

Project Name: GEOL22-8472 Cleator Moor Activity Centre

Chainage (km): 4.000

Direction:

Location/Offset: Lay-by / other

Cone Angle: 60 degrees

Zero Error (mm): 0

Test Date: 17/10/2022

Surface Type: Unpaved

Thickness (mm): 0

Base Type:

Thickness (mm):

Surface Moisture: Unknown

Moisture adjustment factor: Not adjusted

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	0	0.00					
2	1	1	109	109.00					
3	1	2	187	78.00					
4	1	3	256	69.00					
5	1	4	311	55.00					
6	1	5	356	45.00					
7	1	6	398	42.00					
8	1	7	436	38.00					
9	1	8	461	25.00					
10	1	9	484	23.00					
11	1	10	501	17.00					
12	1	11	519	18.00					
13	1	12	536	17.00					
14	1	13	552	16.00					
15	1	14	572	20.00					
16	1	15	599	27.00					
17	1	16	630	31.00					
18	1	17	657	27.00					
19	1	18	686	29.00					
20	1	19	719	33.00					
21	1	20	747	28.00					
22	1	21	769	22.00					
23	1	22	794	25.00					
24	1	23	822	28.00					
25	1	24	847	25.00					

Remarks: Test Location:- DCP04

Report Date: 01-Mar-2023

Page 4 of 5

Penetration Data Report

Project Name: GEOL22-8472 Cleator Moor Activity Centre

Chainage (km): 5.000
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 17/10/2022

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Unknown
 Moisture adjustment factor: Not adjusted

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	0	0.00					
2	1	1	130	130.00					
3	1	2	236	106.00					
4	1	3	308	72.00					
5	1	4	325	17.00					
6	1	5	363	38.00					
7	1	6	449	86.00					
8	1	7	474	25.00					
9	1	8	494	20.00					
10	5	13	533	7.80					
11	5	18	544	2.20					
12	7	25	572	4.00					
13	5	30	606	6.80					
14	5	35	655	9.80					
15	3	38	694	13.00					
16	4	42	722	7.00					
17	5	47	755	6.60					
18	2	49	771	8.00					
19	2	51	780	4.50					
20	5	56	790	2.00					
21	10	66	794	0.40					
22	10	76	795	0.10					

Remarks: Test Location:- DCP05

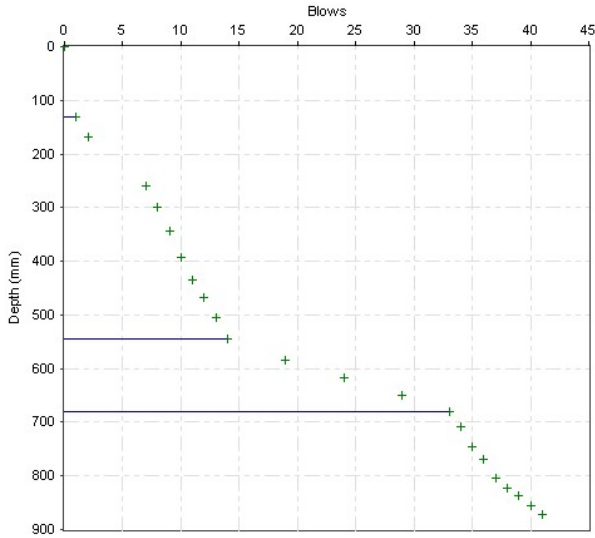
DCP Layer Strength Analysis Report

Project Name: GEOL22-8472 Cleator Moor Activity Centre

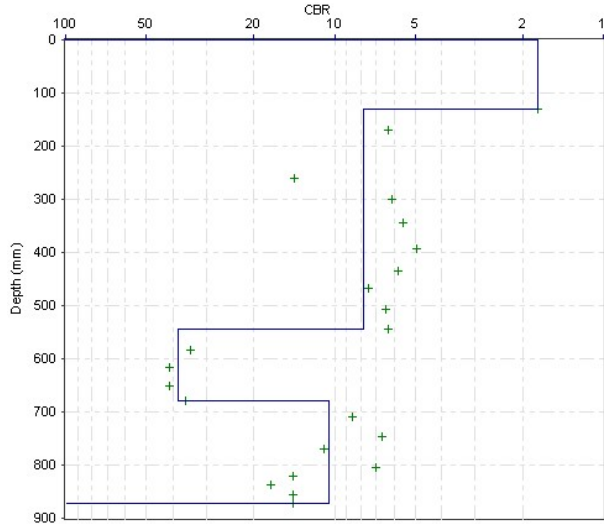
Chainage (km): 1.000
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 17/10/2022

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Unknown
 Moisture adjustment factor: Not adjusted

Layer Boundaries: Chainage 1.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)
1	130.00	2	130	130
2	31.92	8	415	545
3	7.11	38	135	680
4	24.13	10	193	873

CBR Relationship:

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

Report produced by

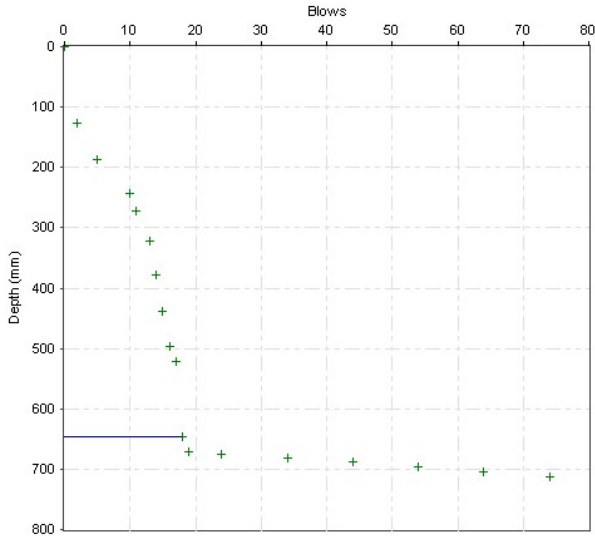
DCP Layer Strength Analysis Report

Project Name: GEOL22-8472 Cleator Moor Activity Centre

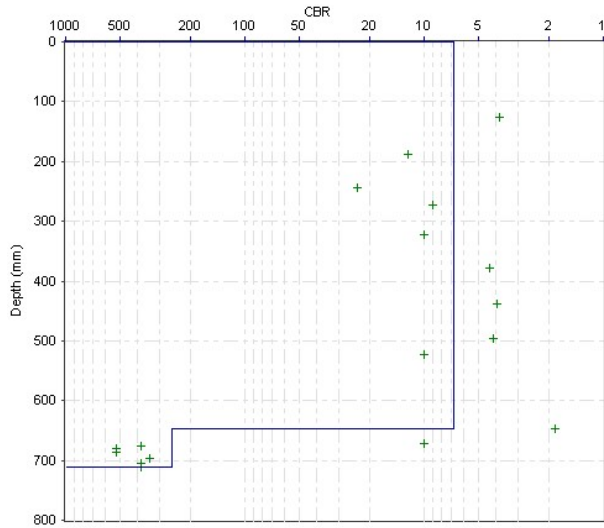
Chainage (km): 2.000
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 17/10/2022

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Unknown
 Moisture adjustment factor: Not adjusted

Layer Boundaries: Chainage 2.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)
1	35.89	7	646	646
2	1.18	254	66	712

CBR Relationship:

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

Report produced by

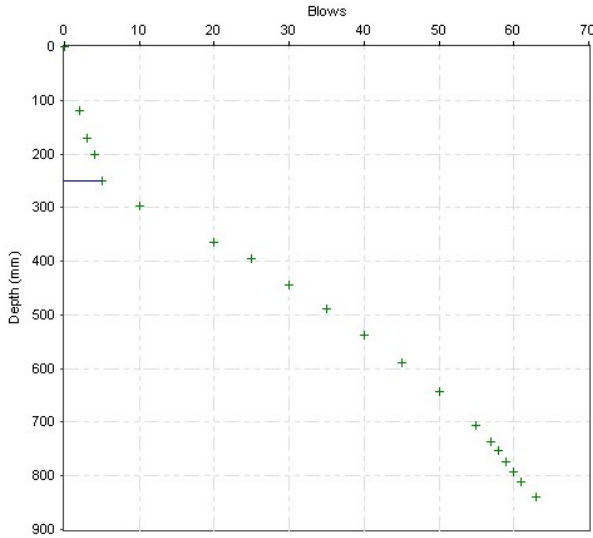
DCP Layer Strength Analysis Report

Project Name: GEOL22-8472 Cleator Moor Activity Centre

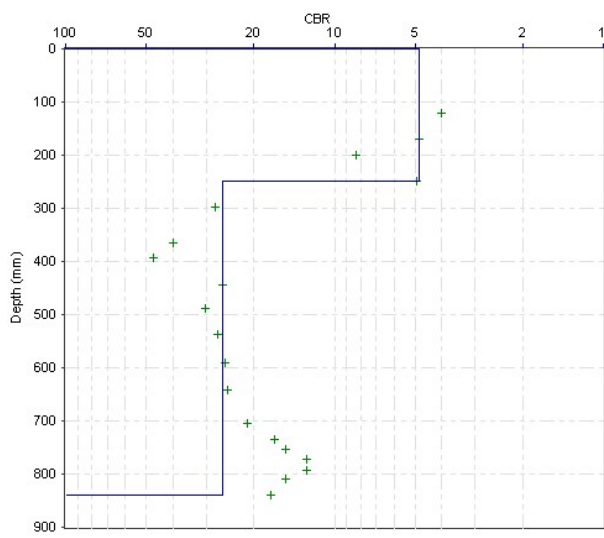
Chainage (km): 3.000
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 17/10/2022

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Unknown
 Moisture adjustment factor: Not adjusted

Layer Boundaries: Chainage 3.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)
1	49.80	5	249	249
2	10.19	26	591	840

CBR Relationship:

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

Report produced by

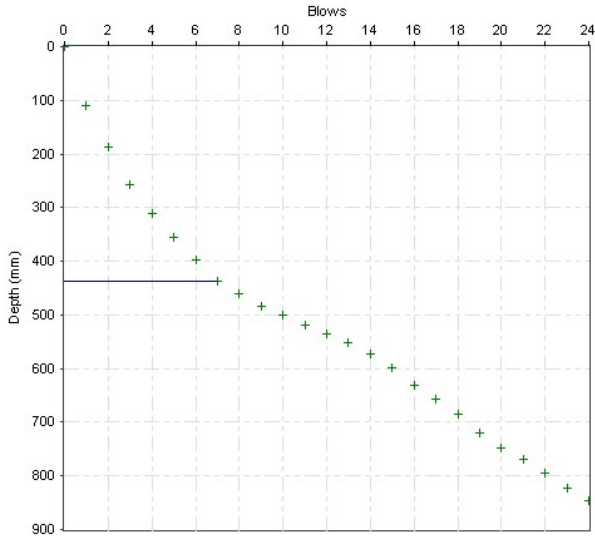
DCP Layer Strength Analysis Report

Project Name: GEOL22-8472 Cleator Moor Activity Centre

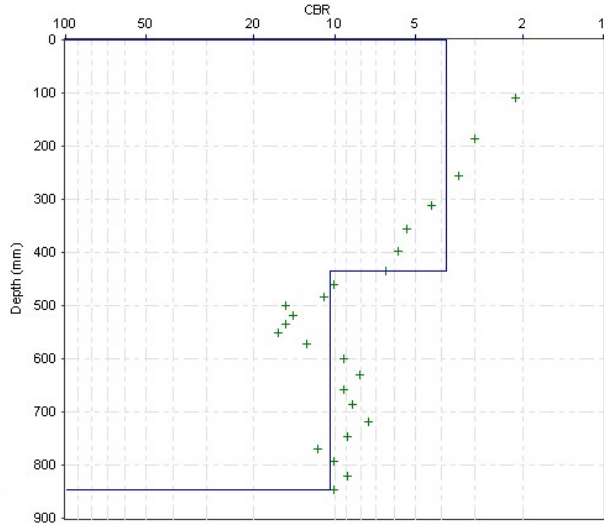
Chainage (km): 4.000
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 17/10/2022

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Unknown
 Moisture adjustment factor: Not adjusted

Layer Boundaries: Chainage 4.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)
1	62.29	4	436	436
2	24.18	10	411	847

CBR Relationship:

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

Report produced by

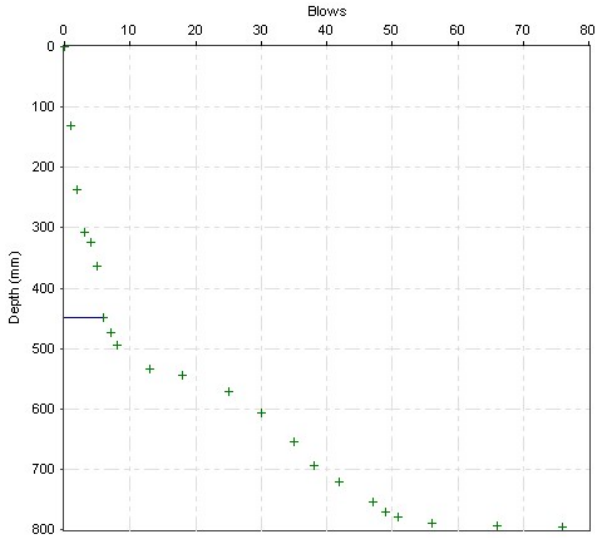
DCP Layer Strength Analysis Report

Project Name: GEOL22-8472 Cleator Moor Activity Centre

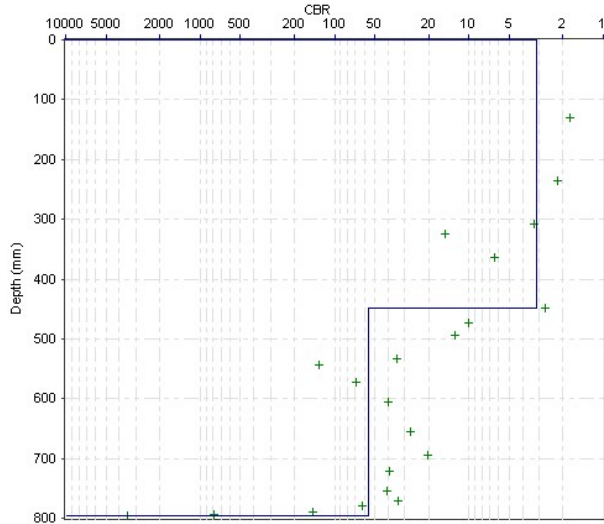
Chainage (km): 5.000
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 17/10/2022

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Unknown
 Moisture adjustment factor: Not adjusted

Layer Boundaries: Chainage 5.000



Layer Boundaries Chart



CBR Chart

Layer Properties

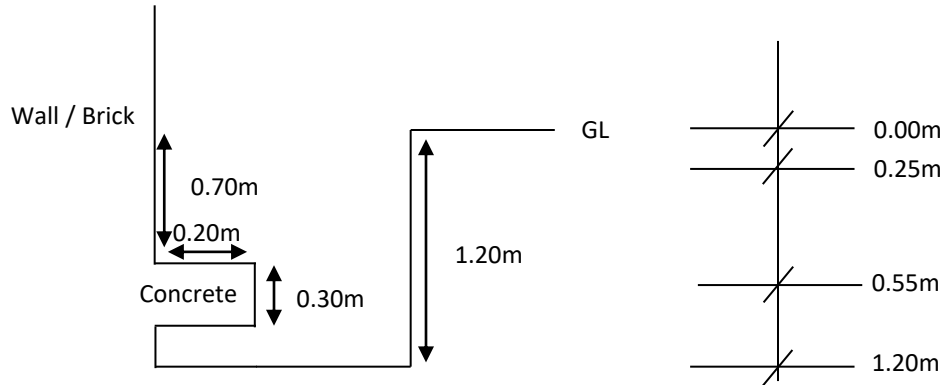
No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)
1	74.83	3	449	449
2	4.94	56	346	795

CBR Relationship:

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

Report produced by

Trial Pit Cross Section (TP01)



Trial Pit Strata (TP01)

0.00m to 0.25m

Grey gravel over pinkish brown sandy gravel of dolomite (MADE GROUND).

0.25m to 0.55m

Dark grey and pinkish brown gravelly sand (MADE GROUND).

0.55m to 1.20m

Stiff light brown and pinkish brown sandy gravelly CLAY (DEVENSIAN TILL).

Trial pit terminated at a depth of 1.20m.

Trial pit noted to be wet at 1.10m.

Trial pit stable.



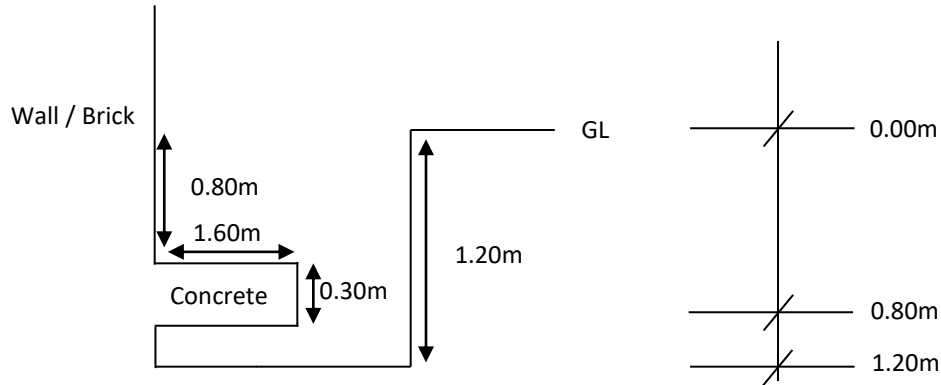
FOUNDATION DETAIL SHEET – TP01

Report Type: Phase II Ground Investigation Report

Site Address: Cleator Moor Activity Centre, Cleator Moor, Cumbria, CA25 5AN

Project No.: GEOL22-8472

**Trial Pit Cross
Section (TP02)**



Trial Pit Strata (TP02)

0.00m to 0.80m

Grey gravel over pinkish brown sandy gravel of dolomite (MADE GROUND).

0.80m to 1.20m

Stiff light brown and pinkish brown sandy gravelly CLAY (DEVENSIAN TILL).

Trial pit terminated at a depth of 1.20m.

Trial pit noted to be dry and stable.



APPENDIX III

Laboratory Testing Results



DETS

Certificate of Analysis

Certificate Number 22-21498

Issued: 01-Nov-22

Client Geol-Consultants Ltd.
Tectonic House
Unit 11 Queens Court North
Third Avenue
Team Valley Trading Estate
Gateshead, Tyne & Wear
NE11 0BU

Our Reference 22-21498

Client Reference GEOL22-8472

Order No GEOL22-8472

Contract Title Cleator Moor Activity Centre

Description 10 Soil samples.

Date Received 25-Oct-22

Date Started 25-Oct-22

Date Completed 01-Nov-22

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By



Kirk Bridgewood
General Manager



2139

Summary of Chemical Analysis

Soil Samples

Our Ref 22-21498

Client Ref GEOL22-8472

Contract Title Cleator Moor Activity Centre

Lab No	2076020	2076021	2076022	2076023	2076024	2076025
Sample ID	TP01	BH01	BH01	BH03	BH03	BH04
Depth	0.25-0.55	0.10-0.20	1.80-2.00	0.10-0.20	0.80-1.00	0.20-0.30
Other ID						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date	18/10/2022	17/10/2022	17/10/2022	17/10/2022	17/10/2022	17/10/2022
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units	11	23	15	6.4
Preparation							
Moisture Content	DETSC 1004	0.1	%	11	23	15	6.4
Metals							
Arsenic	DETSC 2301#	0.2	mg/kg	7.2	23	17	9.7
Cadmium	DETSC 2301#	0.1	mg/kg	0.2	0.4	0.3	0.3
Chromium	DETSC 2301#	0.15	mg/kg	11	21	15	11
Chromium III	DETSC 2301*	0.15	mg/kg	11	21	15	11
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	8.6	60	34	17
Lead	DETSC 2301#	0.3	mg/kg	10	85	45	23
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	0.32	0.25	0.10
Nickel	DETSC 2301#	1	mg/kg	7.3	27	17	12
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	1.2	< 0.5	0.5
Zinc	DETSC 2301#	1	mg/kg	12	110	58	35
Inorganics							
pH	DETSC 2008#		pH	8.3	7.7	8.4	7.9
Cyanide, Free	DETSC 2130#	0.1	mg/kg	< 0.1	0.1	< 0.1	< 0.1
Total Organic Carbon	DETSC 2084#	0.5	%	3.3	6.8	5.1	4.9
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	< 10	22	17	51
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	5.6
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	14
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	2.5	< 0.6	120
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	3.6	< 1.4	240
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	380
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	380
PAHs							
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	0.5
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	0.1	1.4

Summary of Chemical Analysis

Soil Samples

Our Ref 22-21498

Client Ref GEOL22-8472

Contract Title Cleator Moor Activity Centre

Lab No	2076020	2076021	2076022	2076023	2076024	2076025
Sample ID	TP01	BH01	BH01	BH03	BH03	BH04
Depth	0.25-0.55	0.10-0.20	1.80-2.00	0.10-0.20	0.80-1.00	0.20-0.30
Other ID						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date	18/10/2022	17/10/2022	17/10/2022	17/10/2022	17/10/2022	17/10/2022
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units	2076020	2076021	2076022	2076023	2076024	2076025
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1		< 0.1		9.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1		< 0.1		12
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	0.4		0.4		75
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	0.2		0.2		22
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	1.2		2.2		140
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	1.2		1.9		120
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	0.9		1.2		66
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	0.9		1.2		67
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	0.7		0.9		48
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	0.5		0.6		36
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	1.1		1.3		62
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	0.7		1.0		46
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	0.2		0.4		8.8
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	0.7		0.8		36
PAH 16 Total	DETSC 3301	1.6	mg/kg	< 1.6	8.6		12		740

Summary of Chemical Analysis

Soil Samples

Our Ref 22-21498

Client Ref GEOL22-8472

Contract Title Cleator Moor Activity Centre

Lab No	2076026	2076027	2076028	2076029
Sample ID	BH05	BH06	BH06	BH07
Depth	0.80-1.00	0.80-1.00	1.60-1.70	0.80-1.00
Other ID				
Sample Type	SOIL	SOIL	SOIL	SOIL
Sampling Date	18/10/2022	18/10/2022	18/10/2022	18/10/2022
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Preparation							
Moisture Content	DETS 1004	0.1	%		17		
Metals							
Arsenic	DETS 2301#	0.2	mg/kg		9.4		
Cadmium	DETS 2301#	0.1	mg/kg		< 0.1		
Chromium	DETS 2301#	0.15	mg/kg		4.5		
Chromium III	DETS 2301*	0.15	mg/kg		4.5		
Chromium, Hexavalent	DETS 2204*	1	mg/kg		< 1.0		
Copper	DETS 2301#	0.2	mg/kg		19		
Lead	DETS 2301#	0.3	mg/kg		12		
Mercury	DETS 2325#	0.05	mg/kg		< 0.05		
Nickel	DETS 2301#	1	mg/kg		13		
Selenium	DETS 2301#	0.5	mg/kg		0.9		
Zinc	DETS 2301#	1	mg/kg		22		
Inorganics							
pH	DETS 2008#		pH	7.9	8.5	7.9	8.1
Cyanide, Free	DETS 2130#	0.1	mg/kg		< 0.1		
Total Organic Carbon	DETS 2084#	0.5	%		11		
Sulphate Aqueous Extract as SO4	DETS 2076#	10	mg/l	13	100	30	28
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETS 3321*	0.01	mg/kg		< 0.01		
Aliphatic C6-C8	DETS 3321*	0.01	mg/kg		< 0.01		
Aliphatic C8-C10	DETS 3321*	0.01	mg/kg		< 0.01		
Aliphatic C10-C12	DETS 3072#	1.5	mg/kg		< 1.5		
Aliphatic C12-C16	DETS 3072#	1.2	mg/kg		< 1.2		
Aliphatic C16-C21	DETS 3072#	1.5	mg/kg		< 1.5		
Aliphatic C21-C35	DETS 3072#	3.4	mg/kg		< 3.4		
Aliphatic C5-C35	DETS 3072*	10	mg/kg		< 10		
Aromatic C5-C7	DETS 3321*	0.01	mg/kg		< 0.01		
Aromatic C7-C8	DETS 3321*	0.01	mg/kg		< 0.01		
Aromatic C8-C10	DETS 3321*	0.01	mg/kg		< 0.01		
Aromatic C10-C12	DETS 3072#	0.9	mg/kg		< 0.9		
Aromatic C12-C16	DETS 3072#	0.5	mg/kg		< 0.5		
Aromatic C16-C21	DETS 3072#	0.6	mg/kg		4.8		
Aromatic C21-C35	DETS 3072#	1.4	mg/kg		< 1.4		
Aromatic C5-C35	DETS 3072*	10	mg/kg		< 10		
TPH Ali/Aro Total C5-C35	DETS 3072*	10	mg/kg		< 10		
PAHs							
Naphthalene	DETS 3301	0.1	mg/kg		< 0.1		
Acenaphthylene	DETS 3301	0.1	mg/kg		< 0.1		

Summary of Chemical Analysis

Soil Samples

Our Ref 22-21498

Client Ref GEOL22-8472

Contract Title Cleator Moor Activity Centre

Lab No	2076026	2076027	2076028	2076029
Sample ID	BH05	BH06	BH06	BH07
Depth	0.80-1.00	0.80-1.00	1.60-1.70	0.80-1.00
Other ID				
Sample Type	SOIL	SOIL	SOIL	SOIL
Sampling Date	18/10/2022	18/10/2022	18/10/2022	18/10/2022
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Acenaphthene	DETSC 3301	0.1	mg/kg		< 0.1		
Fluorene	DETSC 3301	0.1	mg/kg		< 0.1		
Phenanthrene	DETSC 3301	0.1	mg/kg		< 0.1		
Anthracene	DETSC 3301	0.1	mg/kg		< 0.1		
Fluoranthene	DETSC 3301	0.1	mg/kg		< 0.1		
Pyrene	DETSC 3301	0.1	mg/kg		< 0.1		
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg		< 0.1		
Chrysene	DETSC 3301	0.1	mg/kg		< 0.1		
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg		< 0.1		
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg		< 0.1		
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg		< 0.1		
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg		< 0.1		
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg		< 0.1		
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg		< 0.1		
PAH 16 Total	DETSC 3301	1.6	mg/kg		< 1.6		

Summary of Asbestos Analysis

Soil Samples

Our Ref 22-21498

Client Ref GEOL22-8472

Contract Title Cleator Moor Activity Centre

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2076020	TP01 0.25-0.55	SOIL	NAD	none	Ben Rose
2076021	BH01 0.10-0.20	SOIL	NAD	none	Ben Rose
2076023	BH03 0.10-0.20	SOIL	NAD	none	Ben Rose
2076025	BH04 0.20-0.30	SOIL	NAD	none	Ben Rose
2076027	BH06 0.80-1.00	SOIL	NAD	none	Ben Rose

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 22-21498
 Client Ref GEOL22-8472
 Contract Cleator Moor Activity Centre

Containers Received & Deviating Samples

Lab No	Sample ID	Date		Holding time exceeded for tests	Inappropriate container for tests
		Sampled	Containers Received		
2076020	TP01 0.25-0.55 SOIL	18/10/22	GJ 250ml, PT 1L		
2076021	BH01 0.10-0.20 SOIL	17/10/22	GJ 250ml, PT 1L	pH + Conductivity (7 days)	
2076022	BH01 1.80-2.00 SOIL	17/10/22	PG	pH + Conductivity (7 days)	
2076023	BH03 0.10-0.20 SOIL	17/10/22	GJ 250ml, PT 1L	pH + Conductivity (7 days)	
2076024	BH03 0.80-1.00 SOIL	17/10/22	PG	pH + Conductivity (7 days)	
2076025	BH04 0.20-0.30 SOIL	17/10/22	GJ 250ml, PT 1L	pH + Conductivity (7 days)	
2076026	BH05 0.80-1.00 SOIL	18/10/22	PG		
2076027	BH06 0.80-1.00 SOIL	18/10/22	GJ 250ml, PT 1L		
2076028	BH06 1.60-1.70 SOIL	18/10/22	PG		
2076029	BH07 0.80-1.00 SOIL	18/10/22	PG		

Key: G-Glass P-Plastic J-Jar T-Tub G-Bag
 DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.
 Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.
 The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-
 Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report



LABORATORY REPORT



4043

Contract Number: PSL22/6895

Report Date: 14 November 2022
Client's Reference: GEOL22-8472
Client Name: Geol Consultants Ltd
Tectonic House, Unit 11 Queens Court North
Third Avenue
Team Valley Trading Estate
Gateshead
NE11 0BU

For the attention of: Terry McMenam

Contract Title: Cleator Moor Activity Centre
Date Received: 26/10/2022
Date Commenced: 26/10/2022
Date Completed: 14/11/2022

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)

L Knight
(Assistant Laboratory Manager)

S Eyre
(Senior Technician)


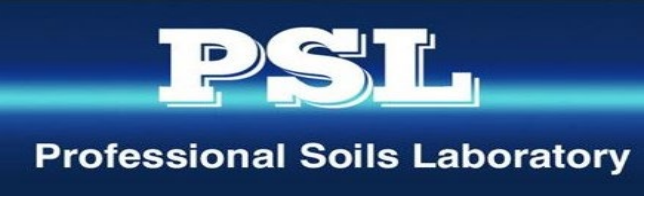
M Fennell
(Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rberriman@prosoils.co.uk
awatkins@prosoils.co.uk

Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
TP01			0.55	1.10	Reddish brown very gravelly very sandy CLAY.
TP02			0.80	1.10	Reddish brown gravelly very sandy CLAY.
BH01			2.80	3.00	Reddish brown very gravelly very sandy CLAY.
BH02			1.80	2.00	Reddish brown very gravelly very sandy CLAY.
BH03			1.40	1.50	Reddish brown very gravelly very sandy CLAY.
BH04			2.80	3.00	Reddish brown very gravelly very sandy CLAY.
BH05			1.80	2.00	Reddish brown slightly gravelly very sandy CLAY.
BH06			1.80	2.00	Reddish brown slightly gravelly very sandy CLAY.

 4043		Cleator Moor Activity Centre	Contract No:
			PSL22/6895
			Client Ref:
			GEO22-8472

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % <small>Clause 3.2</small>	Linear Shrinkage % <small>Clause 6.5</small>	Particle Density Mg/m ³ <small>Clause 8.2</small>	Liquid Limit % <small>Clause 4.3/4</small>	Plastic Limit % <small>Clause 5.3</small>	Plasticity Index % <small>Clause 5.4</small>	Passing .425mm %	Remarks
TP01			0.55	1.10	12			30	15	15	60	Low Plasticity CL
TP02			0.80	1.10	16			34	18	16	82	Low Plasticity CL
BH01			2.80	3.00	10			31	15	16	65	Low Plasticity CL
BH02			1.80	2.00	6.0			29	15	14	63	Low Plasticity CL
BH03			1.40	1.50	15			28	15	13	68	Low Plasticity CL
BH04			2.80	3.00	12			29	14	15	61	Low Plasticity CL
BH05			1.80	2.00	14			27	14	13	96	Low Plasticity CL
BH06			1.80	2.00	16			32	15	17	92	Low Plasticity CL

SYMBOLS : NP : Non Plastic

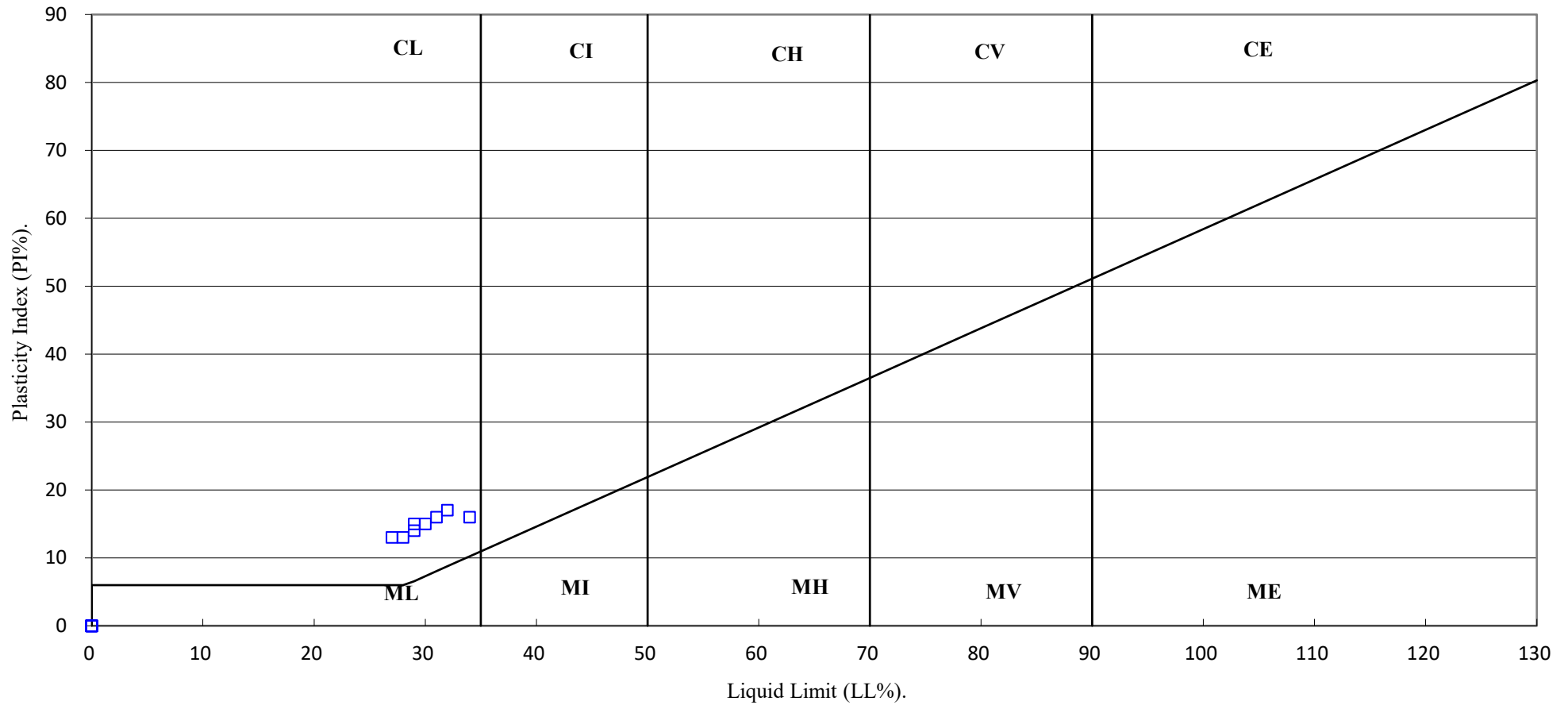
* : Liquid Limit and Plastic Limit Wet Sieved.



Cleator Moor Activity Centre

Contract No:
PSL22/6895
Client Ref:
GEOL22-8472

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



4043

PSL
Professional Soils Laboratory

Cleator Moor Activity Centre

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APPENDIX IV

Ground Gas Monitoring Record Sheet

Ground Gas Monitoring Record Sheet



Visit	Date	Time	Equipment	Weather	Site Engineer	Comments	Borehole Position	Gas Flow (l/hr)	Atmospheric Pressure (mbar)	Atmospheric Pressure Trend	Methane (% v/v)		Methane (% LEL)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Hydrocarbons (GFM 435 only)		Other Gases (PPM)			Depth to Water (m bgl)	Depth to Base (m bgl)
											Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady	Hex %	PID Cf	PID (Isobutylene)	H ₂ S	CO		
1	26/10/2022	16:30	GFM436	Overcast, wet & windy	IH	Bailed out BH1 & 7 after monitoring. *Bung valves left open BH3 & 7. Closed, waited for 30 mins before monitoring*	1	<0.1	1002	Rising 997 - 1003		0.0		0.0		0.8		18.8	0.003	1.0		0	0	0.71	3.88
							3	<0.1	1002			0.0		0.0		20.4	0.000	1.0		0	0	1.75	4.86		
							7	<0.1	1002			0.0		0.0		20.6	0.000	1.0		0	0	0.27	3.46		
2	10/11/2022	13:55	GFM436	Overcast, wet & windy	IH	Bailed out BH1 & 7 after monitoring	1	<0.1	996	Rising 987 - 1009		0.0		0.0		1.0		17.5	0.002	1.0		0	11	0.68	3.88
							3	<0.1	996			0.0		0.0		12.5	0.003	1.0		30	45	1.58	4.86		
							7	<0.1	996			0.0		0.0		13.1	0.002	1.0		230	961	0.19	3.46		
3	14/12/2022	13:10	GFM436	Sunny, Cold	IH	Bailed out BH1 & 7 after monitoring	1	<0.1	996	Rising 1009 - 1012		0.0		0.0		0.6		19.6	0.029	1.0		0	10	1.31	3.88
							3	<0.1	996			0.0		0.0		5.2	0.029	1.0		0	27	1.94	4.86		
							7	<0.1	998			0.0		0.0		4.2	0.025	1.0		70	887	0.49	3.46		
4	22/12/2022	13:30	GFM436	Overcast, wet	IH	Bailed out all BH's after monitoring	1	<0.1	985	Rising 995 - 1001		0.0		0.0		0.7		19.5	0.024	1.0		0	0	0.78	3.88
							3	<0.1	985			0.0		0.0		7.6	0.024	1.0		0	106	0.57	4.86		
							7	<0.1	986			0.0		0.0		4.9	0.021	1.0		0	11	0.39	3.46		
5	10/01/2023	10:15	GFM436	Raining, windy (very wet ground)	IH		1	<0.1	981	Rising 983 - 997		0.0		0.0		0.9		17.3	0.023	1.0		0	0	1.22	3.88
							3	<0.1	981			0.0		0.0		2.2	0.022	1.0		0	0	1.22	4.86		
							7	<0.1	981			0.0		0.0		5.1	0.002	1.0		0	0	0.12	3.46		
6																									