



GEO

Environmental Engineering



PHASE 2: GROUND INVESTIGATION REPORT

PROPOSED RESIDENTIAL DEVELOPMENT OF

LAND AT HOME FARM, RHEDA CLOSE

FRIZINGTON, CUMBRIA

FOR:

KCS AGRICULTURE LTD

GEO Environmental Engineering

DOCUMENT CONTROL SHEET

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Prepared By: James Brock *BSc. MSc.* – Geo Environmental Engineer/Associate

Author
Signature:

Checked By: Andrew Hampson *B.Sc. (Hons), FGS* – Geo Environmental Engineer/Associate

Client Title: KCS Agriculture Ltd

Consultant: Site Evolution Ltd

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1.0 Introduction

1.1 Brief

GEO Environmental Engineering Ltd (GEO) were commissioned by the Consultant, Site Evolution Ltd on behalf of the Client, KCS Agriculture Ltd to carry out a ground investigation on land at Home Farm off Rheda Close in Frizington, Cumbria as indicated on the site location plan included in Appendix I.

The investigation was carried out to determine the ground conditions across the site to aid the design of foundations, roads and drainage and to assess the risk to human health and environmental receptors from possible contamination and ground gas.

1.2 Site Location and Description

The site, occupying an area of c.1.87ha is located in North Park to the west of Frizington as indicated on the site location plan included in Appendix I. During the site walkover, access to the site was along a private driveway to Home farm from Meadowcroft Road (B5294) to the south.

- National Grid Reference: 302678, 516830
- Post Code: CA26 3TB

The site is part of a large agricultural field which is surfaced with grass and used for pasture. The eastern part of the site includes a copse of mature deciduous trees. The site is delineated to the south east and west by wire / wooden fencing. There are no physical boundaries to the north.

There was no evidence of any contamination sources (bulk fuel/oil or chemical storage) noted on the site during the site works.

From the site entrance in the east, the site rises to the central part, dropping away gently to the north and west. Ordnance Survey data suggests that the site is at an elevation of c.140 to 150m OD.

1.3 Proposed Development

It is understood that the Client is considering developing the site for residential end use. A proposed site layout plan has not been provided, however, it is anticipated that a residential development would comprise conventional housing with private gardens, general areas of soft landscaping, access roads, car parking and other associated infrastructure.

2.0 Previous Reports

2.1 Previous Report for the Site

GEO completed a Phase 1: Desk Top Study (DTS) Report for the site, details of which are included below:

- Phase I Desk Top Study (Preliminary Environmental Risk Assessment), ref: 2023-6111, dated: 12.02.2024.

A brief summary is included below, however, it is recommended that the DTS is read in conjunction with this report.

Historical data indicates that the site has not been developed previously.

Geological data indicates that the majority of the site is devoid of superficial drift deposits, therefore, residual soils overlying shallow bedrock were anticipated. The eastern part of the site is recorded as being underlain by glacial till deposits (firm and stiff gravelly clays with bands of sand and gravel).

The DTS indicated a very low geotechnical risk. A negligible to very low risk was deemed appropriate with respect to possible ground contamination. The risk to Controlled Waters and adjacent land was deemed negligible. A very low risk of ground gas (carbon dioxide and methane) was determined. Radon protection measures were not deemed necessary in accordance with the UK Health Security Agency.

The DTS recommended a ground investigation to determine the ground conditions beneath the site and allow laboratory screening of soil samples and ground gas monitoring as part of a human health risk assessment.

2.2 Previous Report for Adjacent Land

GEO have also completed a ground investigation for the residential development to the south of the site, details of which are included below:

- Phase 2: Ground Investigation Report, ref: 2018-3719, dated: 28.06.2019 (v3 dated: 27.03.2020).

The investigation comprised 5 No. boreholes, 14 No. trial pits, ground gas monitoring, soil infiltration tests and laboratory geotechnical and chemical analysis of soil samples.

The investigation encountered topsoil overlying stiff friable dark red brown sandy gravelly clay across the south and east parts. The clay was absent across the central and north western parts. weathered sandstone bedrock was encountered across the site at depths of between c.0.18m and c.2.16m bgl. Groundwater was not encountered.

Chemical laboratory screening of the soils did not identify any contamination issues and remediation was not necessary. Standard strip foundations within the stiff clay or weathered bedrock was recommended.

Elevated concentrations of carbon dioxide were recorded during the monitoring (up to 14.7% v/v) and basic gas protection measures in line with Characteristic Situation 2 (CS2) were recommended. However, extended monitoring was completed which confirmed negligible flow rates and the risk was deemed negligible. Consequently, the requirement for gas protection measures was negated.

3.0 Ground Investigation Reporting

3.1 Ground Investigation Aims and Objectives

The overall objective of this Ground Investigation is to provide information relating to the geotechnical and environmental properties of the ground and groundwater across the development area in order to facilitate foundation and drainage design and determine any risks to human health or the surrounding environment.

3.2 Guidelines, Codes of Practice and Third-Party Accreditations

This report contains information relating to the geotechnical properties of the soils encountered on site to aid foundation and highway design by a Structural Engineer. The report also incorporates a Level 1 Ground Contamination and Ground Gas Risk Assessment for Human Health (Generic Quantitative Risk Assessment – GQRA).

The laboratory testing (geotechnical and ground contamination) was completed by UKAS and MCERTS accredited laboratories with details given in Sections 6, with copies of the test reports contained within Appendix III.

This Ground Investigation Report has generally been completed in accordance with the following documents:

- Land Contamination Risk Management Stages 1 to 4 (LCRM – www.gov.uk) – April 2021.
- BS10175: 2017: Code of Practice for the Investigation of Potentially Contaminated Sites.
- BS5930: 2020: Code of Practice for Site Investigations.
- BS1377: 1990: Methods of test for soils for civil engineering purposes.
- BS8485: 2019: Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings.
- BS8576: 2013: Guidance on Ground Gas Investigations.
- CIRIA Report C665: 2015.
- BR211: 2023 Radon, Guidance on protective measures for new buildings.
- Eurocode 7 – Geotechnical Design (Part 1: General Rules and; Part 2: Ground Investigation and Testing).
- UK Specification for Ground Investigation, 2nd Edition. Site Investigation Steering Group, 2011.
- Effective Site Investigation. Site Investigation Steering Group, 2013.
- SP1010 Development of Category 4 Screening Levels Main Report, 2014.
- The LQM/CIEH S4UL's for Human Health Risk Assessment, 2015.
- CIRIA C758D 2019 - Abandoned Mine Workings Manual

3.3 Ground Investigation Limitations of Use

Although every effort is made to ensure a full and comprehensive investigation has been completed, it should always be borne in mind that ground conditions have the potential to vary between exploratory hole locations and it is recommended that the developer adopt a “watching brief” during the redevelopment works to ensure that any potential variations encountered are identified and dealt with in an appropriate manner.

The conclusions and recommendations presented within this report are considered reasonable based on the available information. However, these cannot be guaranteed to gain regulatory approval. Therefore, the report should be passed to the appropriate regulatory authorities and/or other key stakeholders, including warranty providers in order to seek their approval of the findings prior to undertaking any development works.

The Ground Investigation Report and its contents are limited to the boundaries of the site, as indicated on the Plans in Appendix I. No reliance, copying or use of this report (in part or whole) by any Third Party is permitted without prior written approval from Geo Environmental Engineering Ltd, with intellectual copyright remaining the sole property of the author. Reliance on the report and its associated information is strictly in accordance with Geo Environmental Engineering Ltd Terms and Conditions, copies of which are available on request.

3.4 Consideration for Residential End Use

It is understood that the site will be developed for residential end use with houses, gardens, car parking, access roads, and other associated infrastructure. Consequently, when considering the intended development, the site is considered suitable for assessment using a Level 1 Generic Quantitative Risk Assessment (GQRA).

A GQRA provides details of potential future risks to Human Health (proposed end users) from any contamination which may be identified on site in made ground or natural soils. For the Human Health Risk Assessment, it is considered that the future residents will be subjected to the greatest exposure periods and consequently the most risk. Therefore, in accordance with current guidance and legislation a CLEA end use classification of *residential* has been considered most appropriate.

4.0 Ground Investigation Fieldwork

4.1 Intrusive Investigation Fieldworks Summary

The ground investigation works were completed between the 4th and 5th of January 2024. The exploratory holes were located across the site to provide general site coverage taking into consideration the locations of buried utilities, overhead cables and surface obstructions (trees).

The exploratory hole location plan is provided in Appendix I.

The ground investigation works comprised:

- 5 No. Dynamic (Windowless) Sampling Boreholes (BH01 to BH05) to depths of between c.1.40m and c.2.00m bgl.
- 10 No. Mechanically Excavated Trial Pits (TP01 to TP10) to depths of between c.0.70m and c.2.10m bgl.
- 12 No. Dynamic Probe Super Heavy tests (DP01 to DP12) to depths of between c.1.00m and c.2.80m bgl.
- Gas and groundwater monitoring (6 visits completed).
- 6 No. In-Situ Dynamic Cone Penetrometer (DCP) Tests.
- In-situ geotechnical testing (Standard Penetration Tests (SPT).
- In-situ hand shear vane tests in the trial pits.
- Laboratory based geotechnical testing.
- Laboratory chemical screening of soil samples.

The investigation fieldworks were undertaken in accordance with BS5930:2020, BS1377:1990 and Eurocode 7 (Part I and II). Site supervision was provided by a suitably qualified and experienced Geo-Environmental Engineer.

At each exploratory hole location, the surfacing type, made ground, natural ground and groundwater conditions were observed, with in-situ testing undertaken and samples recovered. Details of the ground conditions are included on the exploratory hole logs which are included in Appendix II together with other relevant ground investigation data.

The results of the in-situ SPT tests are presented on the borehole logs included in Appendix II.

The results of the in-situ hand shear vane tests that were carried out in the trial pits are presented on the trial pit logs in Appendix II.

The results of the Dynamic Cone Penetrometer (DCP) tests and the calculated CBR values are presented in Appendix II.

The geotechnical and chemical laboratory tests results are provided in Appendix III.

All depths included in the report are in metres below ground level (m bgl), unless stated otherwise.

5.0 Ground and Groundwater Conditions

5.1 General

The following section provides a summary of the ground conditions encountered across the site during the investigation. Reference should be made to the exploratory hole logs included in Appendix II for detailed descriptions of the strata and groundwater conditions.

All depths are reported in metres below ground level (m bgl) unless stated otherwise.

5.1.1 Made Ground and Topsoil

Made ground was not encountered during the ground investigation.

Topsoil was encountered across the site to depths of between c.0.20m and c.0.37m bgl. The topsoil was described as dark brown silty sandy very gravelly loam.

No visual or olfactory evidence of fuel/oil type contamination (no staining, odour or free product) was encountered.

5.1.2 Natural Drift Deposits

Firm, and firm to stiff dark red brown gravelly clay was encountered to depths exceeding c.2.00m bgl across the eastern parts of the site. The clay thinned abruptly to the west and was locally absent across most of the central and western parts. The topsoil/clay was underlain by suspected weathered sandstone bedrock (this is discussed below in Section 4.1.3).

However, a localised lens of firm to stiff gravelly clay was encountered to a depth of c.1.50m bgl in trial pit TP07 which was located centrally within the site. The surrounding exploratory holes recorded weathered bedrock directly beneath the shallow topsoil. Other localised lenses of clay may, therefore, be encountered elsewhere on site.

A plan has been provided in Appendix I indicating the approximate area where weathered bedrock is anticipated at depths of less than c.1.50m bgl.

Hand shear vane tests were carried out in the trial pits where feasible and safe to confirm field descriptions and aid foundation design. Hand shear vane tests within the firm, and firm to stiff clay deposits gave undrained shear strengths of between 75kN/m² and 120kN/m². The results indicate clays of medium to high and high strength.

In-situ Standard Penetration Tests (SPTs) were completed in the boreholes at depths of between c.1.00m and c.2.00m bgl. Only one test was completed within the clay deposits which gave an 'N' value of 13, indicative of clay of high strength.

5.1.3 Solid Geological Deposits (Bedrock)

Suspected weathered sandstone bedrock was encountered in the exploratory holes at depths of between c.0.20m and in excess of c.2.00m bgl. The weathered rock was typically shallowest across the central and western parts, becoming deeper to the east. The weathered rock was recovered as dark red brown silty angular gravel and cobbles of weak sandstone. Photos of the weathered rock are provided on the trial pit logs.

The trial pits and boreholes were terminated within the weathered rock at depths of between c.0.70m and c.1.90m bgl due to refusal as further penetration was not possible or very slow. However, it is

possible that a larger excavator could achieve deeper penetration, especially using rock ripping equipment or breaker.

In-situ Standard Penetration Tests (SPTs) were completed in the boreholes at depths of between c.1.00m and c.2.00m bgl. Several tests were completed within the weathered rock deposits which gave 'N' values of between 11 and >50, indicating initially medium dense deposits which became very dense with depth.

Bedrock can only be proven by rotary coring which has not been carried out, hence the material is recorded as 'suspected weathered bedrock' until proven.

5.2 Groundwater

Groundwater was only encountered within borehole BH04 which was located in the north western part of the site. The groundwater was recorded as perched at c.1.64m bgl. All other exploratory holes remained dry.

Groundwater monitoring wells were installed in boreholes BH01 to BH05 to depths of between c.1.40m and c.2.00m bgl and monitoring has been completed on six occasions. During the monitoring, groundwater was recorded in boreholes BH01 and BH04 at depths of between c.1.90m and c.1.95m bgl. All of the other wells remained "dry".

Based on the results of the ground investigation, significant groundwater ingress is not anticipated.

6.0 Exploratory Hole Testing

In-situ site testing and monitoring was generally undertaken in accordance with BS5930:1999, BS1377:1990 and Eurocode 7 (Part I and II).

6.1 Standard Penetration Tests

6.1.1 Standard Penetration Test Methodology

To determine the relative density and strength of the underlying soils, Standard Penetration Tests (SPT's) were completed within the boreholes. The test uses a "split spoon" sample tube (external diameter of c.50mm, internal diameter of c.35mm and a length of around c.650mm) driven from the base of the borehole as it is progressed, usually at c.1.00m spacing's/intervals.

The sample tube is driven by blows of a slide hammer with a weight of c.63.5kg falling over a c.760mm drop. The sample tube is driven c.150mm into the ground (seating blows) and then the number of blows needed for the tube to penetrate each c.75mm increment up to a depth of c.450mm is recorded.

The number of blows for the final c.300mm of penetration is referred to as the "standard penetration resistance" or "N" value, which are presented on the exploratory hole logs adjacent to each sample depth. Where 50 blows are insufficient to advance the test through a c.75mm interval the amount of penetration after 50 blows is recorded and the test is referred to as a "refusal".

6.1.2 Standard Penetration Test Results

In-situ Standard Penetration Tests (SPTs) were completed in the boreholes at depths of between c.1.00m and c.2.00m bgl.

Only one test was completed within the clay deposits which gave an 'N' value of 13, indicative of clay of high strength. Several tests were completed within the weathered rock deposits which gave 'N' values of between 11 and >50, indicating initially medium dense deposits which became very dense with depth.

The results of the standard penetration tests are presented on the borehole logs which are included in Appendix II.

6.2 In-situ Dynamic Probe

6.2.1 In-situ Dynamic Probe Test Methodology

The Dynamic Probe test is used to determine the resistance of soils in-situ to the intermittent penetration of a cone, driven dynamically in a standard manner and in accordance to B.S. 1377: Part 9. The equipment consists of a 90° cone which may be sacrificial or retained for recovery, a series of extension or driving rods, a torque wrench and a driving device.

There are two types of test: Heavy Dynamic Probing (DPH) and Super Heavy Dynamic Probing (DPSH). The dimensions of the cone and the mass and drop height of the driving weight differ between the two tests.

The extension rods used in the test are either 0.5-metre-long (for top of the hole) or 1-metre-long, manufactured from 35mm diameter heat-treated alloy steel, with graduations marked every 100mm along their length. The rods are flush-coupled and designed such that rod ends butt-up fully against each other

when driving, forming a continuous jointed series with a straight axis. The driving device may be an Automatic Trip Hammer as part of a Dynamic Sampling drilling rig or a purpose-designed Probing Rig with characteristics conforming to BS 1377: Part 9.

The blow count is recorded for every 100mm of driving (N100) and the results presented as a plot of blow count against depth. Where the DPSH is utilised the sum total of three N100 increments (c.300mm penetration – N300 value) correlates to an equivalent SPT “N” value. Both N100 and N300 values are presented on the In-situ Dynamic Probe Record Sheet which is presented in Appendix II.

As no samples are recovered during the probing, it is not possible to determine if the blow count relate to made ground or natural deposits, however, they provide a good indication of the relative density of the materials.

6.2.2 In-situ Dynamic Probe Test Results

Dynamic Probe Super Heavy (DPSH) tests were located across the site as indicated on the exploratory hole location plan included in Appendix I.

The tests were completed from ground level to give an indication of the relative density of the natural drift deposits. The test gave low N300 values of less than 10 to depths of between c.0.40m and c.1.00m bgl. However, below this, the N300 values increased significantly indicating high strength clay deposits or dense weathered bedrock deposits.

Refusal (further penetration not possible) was encountered at depths of between c.1.00m and c.2.80m bgl. It is likely that the probe terminated due to the dense weathered bedrock deposits or solid sandstone strata.

6.3 Hand Shear Vane Tests

Hand shear vane tests were carried out in the trial pits where feasible and safe to confirm field descriptions and aid foundation design. Hand shear vane tests within the firm, and firm to stiff clay deposits gave undrained shear strengths of between 75kN/m² and 120kN/m². The results indicate clays of medium to high and high strength.

The results of the hand shear vane tests are presented on the trial pit logs which are included in Appendix II.

6.4 Dynamic Cone Penetrometer Tests (DCP)

The Dynamic Cone Penetration (DCP) Test provides a measure of a material's in-situ resistance to penetration. The test is performed by driving a metal cone into the ground by repeated striking it with an 8kg weight dropped from a distance of 575 mm. The penetration of the cone is measured after each blow and is recorded to provide a continuous measure of shearing resistance up to c.0.85m below the ground surface. Test results can be correlated to California Bearing Ratio to aid pavement design by a Civil Engineer.

10 No. DCP tests were completed, and these were located adjacent to the trial pits. The DCP tests were undertaken from ground level.

The results of the Dynamic Cone Penetrometer tests and the calculations of the equivalent CBR values are included in Appendix II (Dynamic Cone Penetrometer Calculation Sheet).

It should be borne in mind that the results of the Dynamic Cone Penetrometer tests can be influenced by the coarse content (gravel, cobbles, etc...) within the materials tested, therefore, it is always recommended that the appropriate CBR value is confirmed by way of plate load testing at formation level.

6.5 Ground Gas Monitoring

To assess the on-site potential for hazardous ground gases, the boreholes (BH01 to BH05) were installed with ground gas monitoring wells to facilitate a period of ground gas monitoring.

The boreholes were installed to depths of between c.1.40m and c.2.00m bgl with a 50mm diameter HDPE standpipe. The top section of the well comprised solid pipe surrounded by a bentonite seal and the lower section comprised slotted pipe and a gravel filter. A plastic cap was placed at the base of the well and the rubber bung and gas valve were fitted at the surface. The installation details are presented on the borehole logs in Appendix II.

The monitoring and assessment has been completed in accordance with BS8485: 2015: Code of practice for the characterisation and remediation from ground gas affected developments, CIRIA Report C665, November 2015 and the NHBC Document; Guidance on the evaluation of development proposals on site where methane and carbon dioxide are present, March 2015.

As it is the intention of the Client to develop the site for Residential end use, the monitoring of ground gas monitoring must comprise at least six site visits over a minimum period of three months.

The wells have been monitored on six occasions between the January and April 2024 in general accordance with CIRIA C665 (Table 5.5a and 5.5b) using a GFM436 Gas Analyser with Integral Flow Pod.

The results of monitoring are included on the Ground Gas Monitoring Record Sheets included in Appendix II. The ground gas risk assessment is presented in Section 9.2 of this report.

7.0 Laboratory Testing

7.1 Geotechnical Testing

Geotechnical testing was completed in general accordance with BS1377:1990: Part 1 to 4 by the following UKAS and MCERTS accredited laboratory:

- Northumberland County Council Highways Laboratory, Cramlington, Northumberland (NCC).

7 No. Samples of the natural clay and weathered bedrock deposits recovered from the exploratory holes at depths of between c.0.40m and c.1.30m bgl were subjected to the following laboratory based geotechnical tests:

- Moisture Content
- Atterberg - Liquid and Plastic Limits

7.2 Chemical Screening

7.2.1 Determination of pH and Water-Soluble Sulphate

In order to determine the correct concrete classification for buried structures (foundations), the following samples were scheduled for laboratory pH and water-soluble sulphate (SO₄) screening:

- 8 No. samples of topsoil (c.0.20m bgl)
- 5 No. samples of the natural drift / weathered bedrock deposits (c.0.80m to c.1.30m bgl)

The testing was completed in general accordance with BS1377:1990: Part 1 to 4 by the following UKAS and MCERTS accredited laboratory:

- Derwentside Environmental Testing Services Ltd (DETS).

The results of the testing are summarised in Section 10 and presented in the DETS report (ref: 24-00866) contained in Appendix III.

7.2.2 Contamination Testing for Human Health

To enable the completion of a Level 1 Generic Quantitative Risk Assessment (GQRA) for Human Health, the following samples were scheduled for chemical screening:

- 8 No. samples of topsoil (c.0.20m bgl)

The samples were subjected to analysis at the following UKAS and MCERTS accredited laboratory:

- Derwentside Environmental Testing Services Ltd (DETS).

Potential Contaminants of Concern (PCOC's) have been determined for the development area based on the descriptions of the materials encountered within the exploratory holes and the potential for made ground of an unknown source. The samples were screened for the contaminants detailed below:

- **Inorganic Soil Suite (Human Health Risk Assessment):** Metals (Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium and Zinc), Cyanide and Total Organic Carbon.

- **Organic Soil Suite (Human Health Risk Assessment):** Speciated Polycyclic Aromatic Hydrocarbons (PAH – USEPA 16).
- **Other:** Asbestos

The full catalogue of soil screening results and test detection limits can be seen in the DETS report (ref: 24-00866) contained in Appendix III.

No visual or olfactory evidence of organic contamination was identified during the fieldworks, therefore, the samples were not screened for petroleum hydrocarbons or associated derivatives.

No evidence of contamination was noted within the natural drift deposits, therefore, no samples of the drift were scheduled for chemical screening.

7.3 Controlled Waters Risk Assessment

The Phase I Desk Top Study indicated that the risk to Controlled Waters was considered negligible based on the site's history and the lack of sensitive receptors. During the intrusive site works, no evidence of significant contamination or mobile contaminants was encountered. As such, no further assessment is deemed to be required with respect to controlled waters.

8.0 Geotechnical Analysis

8.1 Testing for Moisture Content, Liquid and Plastic Limits

7 No. samples of the drift clay deposits recovered from the exploratory holes at a depths of between c.0.40m and c.1.30m bgl were scheduled for classification tests to determine their moisture content, liquid and plastic limits. The results of the testing are contained in the NCC report (ref: S1775) presented in Appendix III and summarised below.

4 No. samples were classified as NP (non-plastic). This included:

- BH02 at 0.40m bgl – clayey sand and gravel
- BH04 at 0.90m bgl – sandy gravelly clay
- TP01 at 0.70m bgl – sandy gravelly clay
- TP03 at 0.80m bgl – sandy gravelly clay

Natural moisture contents of between 17.0% and 20.1% were observed, with liquid limits of between 28% and 35% and plasticity indices of between 12% and 17% being recorded. The results indicate clays of low, occasionally low to intermediate plasticity and a low volume change potential.

9.0 Generic Quantitative Risk Assessment (GQRA)

9.1 Human Health Risk Assessment

9.1.1 Human Health Risk Assessment - Methodology for Assessing Risks

Within the UK, the current framework for assessing potential ground contamination is utilising the Contaminated Land Exposure Assessment (CLEA) model as set out by the Department of the Environment, Farming and Rural Affairs (DEFRA) and comprises of the established pollutant linkage model of *Source – Pathway – Receptor*. For a risk to be present to the proposed end user (*Receptor*) there must be an identified *Source* and a plausible *Pathway*. Where one or more of the links are missing then risk is negated. In order for the land to be classified as contaminated under Part IIa of the Environmental Protection Act (EPA) 1990 all three elements of the pollutant linkage must be present.

A human health risk assessment can be completed using the contamination levels recorded in the soils by comparing the values against published Generic Assessment Criteria (GAC), such as CLEA Soil Guideline Values (SGV's), CL:AIRE/DEFRA Category 4 Screening Levels (C4SLs), Land Quality Management (LQM) and Chartered Institute of Environmental Health (CIEH) S4UL Values and Atkins ATRISK^{SOIL} Soil Screening Values (SSV's). The guidelines are generally based on three main land uses as outlined below:

- *Residential*
(with or without plant uptake)
- *Allotments*
- *Commercial*

Where these land uses are not deemed appropriate, other land use values can be considered with the DEFRA C4SLs, LQM S4UL's values and the ATRISK^{SOIL} SSV's (i.e. parks/playing fields/Public Open Space). Alternatively, it is possible to determine site specific intervention values as part of a Detailed Quantitative Risk Assessment (DQRA).

It is anticipated that the proposed development will incorporate a residential development with private gardens. Therefore, for the purposes of this basic Human Health ground contamination risk assessment, the maximum site recorded values for the soil samples have been compared to GAC for a CLEA end use classification of: Residential with Plant Uptake End Use to determine if a potential risk is present to the proposed end users.

Contaminant Analysis Sheets that include the results of the relevant Human Health Risk Assessment and the Generic Assessment Criteria (GAC) values are presented in Appendix IV.

9.1.2 Human Health Risk Assessment - Inorganic Soil Contaminants

The maximum concentration values for each inorganic analyte have been compared to the most relevant published Generic Assessment Criteria (GAC) as part of the Maximum Value Test. The GAC have been selected using the following guidance documents:

- LQM/CIEH S4UL 2015 (Residential with Plant Uptake End Use).
- CL:AIRE/DEFRA Cat 4 Screening Levels C4SL (Residential with Plant Uptake End Use).
- Atkins ATRISK Screening Values (Residential with Consumption of Homegrown Produce).

As discussed in Section 8.1, the contaminant concentrations have been assessed against GAC for a residential with plant uptake end use as it is anticipated that the proposed development will incorporate private gardens.

Based on the results of the contaminant analysis sheet contained in Appendix IV none of the inorganic contaminant concentrations exceed the assessment criteria and as such do not pose a risk to human health.

In addition, phytotoxic elements (copper, nickel and zinc) are within the acceptable limits for topsoil (BS3882: Specification for Topsoil, 2015).

9.1.3 Human Health Risk Assessment - Organic Soil Contaminants

The maximum concentration values for the organic analytes tested for (i.e. Speciated PAH) have been compared to the most relevant and appropriate published guidance values (generic assessment criteria) as part of the Maximum Value Test. The GAC have been selected using the following guidance documents:

- LQM/CIEH S4UL 2015 (Residential with Plant Uptake End Use).

Taking in to account the average TOC of the soils on the site, this assessment has been completed utilising a 2.5% SOM.

Based on the results of the contaminant analysis sheet contained in Appendix IV it can be seen that none of the organic contaminant concentrations exceed the assessment criteria and as such do not pose a risk to human health.

9.1.4 Human Health Risk Assessment - Asbestos Containing Materials (ACM's)

8 No. samples of the topsoil have been subjected to laboratory microscopic analysis to determine the presence or not of Asbestos Containing Materials (ACM's) in accordance with the methodology within HSG 248.

Of the samples tested, all returned a negative result for ACM's and were recorded as NAD (no asbestos detected), i.e. no asbestos was encountered.

9.1.5 Human Health Risk Assessment - – Summary

The following is a summary of the Human Health risk assessment based on a *Residential with Plant Uptake End Use*:

- **Generic Contamination:** None.
- **Organic Contamination:** None.
- **Other Contamination:** None.

Based on the Human Health risk assessment above, none of the contaminants have been identified as posing a potential risk to human health with respect to a residential end use with plant uptake.

As such, the topsoil does not pose a risk to human health and remediation is not required. The topsoil is considered suitable for re use in a residential context in accordance with BS3882: Specification for Topsoil, 2015.

9.2 Ground Gas Risk Assessment

As indicated in Section 6.5, gas and groundwater monitoring wells have been installed in boreholes BH01 to BH05 and monitoring has been completed on six occasions.

During the monitoring, atmospheric air pressures varied between 969mb and 1021mb and included both rising and falling pressure trends.

A maximum Carbon Dioxide (CO₂) concentration of 6.7%v/v has been recorded and no Methane (CH₄) was detected. The minimum Oxygen (O₂) concentration was 7.5% and the flow was <0.1l/h throughout.

In accordance with CIRIA C665 the maximum recorded CO₂ concentration has been converted to a Gas Screening Value (GSV), summarised as follows.

In this instance, the CO₂ GSV is:

- **CO₂ GSV = (Max CO₂ (%) / 100) x Max Flow (l/hr),**
- **Therefore; (6.7 / 100) x 0.1 = 0.0067 l/hr GSV**

Since no Methane have been detected no GSV has or can be formulated.

Although the result for carbon dioxide marginally exceeds 5%, the risk to the proposed end user is still considered negligible given the lack of significant gas sources within the vicinity and the lack of flow within the boreholes. Therefore, in accordance with CIRIA C665 Table 8.5, Characteristic Situation 1 (CS1) is considered suitable. This indicates that gas precautions are not necessary at this stage.

9.3 Determination of pH and Water-Soluble Sulphate

As indicated in Section 6, selected samples of topsoil and natural soil have been screened to determine their pH and soluble sulphate potential to aid the design of buried concrete. The results of the chemical screening are presented in the DETS report (ref: 24-00866) contained in Appendix III.

From the results, the following observations can be seen:

- pH values in the soils ranged from 4.8 to 6.5 (acidic).
- Water Soluble Sulphate (SO₄) levels were recorded as ranging from <10mg/l to 30mg/l.

In accordance with BRE Special Digest 1: 2005 the results recorded equate to a Design Sulphate classification of DS-1 and an ACEC classification of AC-3z for potentially mobile groundwater on a brownfield land.

10.0 Construction Related Excavations and Off-Site Disposal

During the construction works it is likely that materials will be excavated on site (i.e. future foundations and buried utilities, etc.) that will not be able to be accommodated on site during to space and level constraints, ultimately requiring removal off site.

During the construction works, different materials should be stockpiled separately, and an appropriate waste disposal classification should be determined by the Design Team prior to removal. It may be the case that WAC testing is required to aid the assessment.

Where made ground materials or disturbed natural strata is to be removed, the results of the soil testing undertaken within this report can be used as a preliminary assessment and the anticipated waste disposal facility should be provided with a copy of the results for review. It may be the case that the waste facility requires additional contamination screening to aid the characterisation of the made ground for off-site disposal (i.e. Waste Acceptance Criteria – WAC) and it is recommended that this be confirmed by the design team prior to commencing on site.

During the construction phase, it may be the case that WAC screening is required to aid classification for disposal and it is recommended that all materials are classified prior to excavation and disposal off site.

Conversely, if materials are required to be brought to site to raise site levels or as part of a clean cover system then certification and/or soil testing results should be reviewed by a suitably experienced and qualified geo-environmental engineer to ensure that potentially contaminated materials are not being brought to site.

Any material movements may require a Material Management Plan (MMP) in accordance with CL:AIRE.

11.0 Discussion and Recommendations

11.1 Ground and Groundwater Conditions Summary

The ground investigation has encountered topsoil overlying firm/firm to stiff gravelly clay and shallow weathered sandstone bedrock. The clay was typically encountered across the eastern parts and appears to become thicker to the east. However, localised lenses of gravelly clay were also encountered in other parts of the site to a depth of c.1.50m bgl. Elsewhere, the topsoil was underlain by weathered sandstone bedrock which was recovered an angular gravel.

Localised perched groundwater was encountered in borehole BH04 only. All of the other exploratory holes remained dry. The water was recorded at c.1.64m bgl during the field works and at between c.1.90m and c.1.95m bgl during the monitoring.

No visual or olfactory evidence of fuel/oil type contamination (no staining, odour or free product) was encountered.

11.2 Future Foundations, Pavements and Buried Structures

It is understood that the proposed development will incorporate residential housing. Based on the results of the ground investigation, conventional strip foundations within the firm to stiff gravelly clay or weathered sandstone bedrock are considered appropriate.

Foundations within the clay deposits should be at least 0.75m deep. However, given the presence of existing mature trees along the eastern and western boundaries, it is recommended that the foundations are designed in accordance with NHBC Standards (Chapter 4.2, "Building Near Trees"). Therefore, some over deepening of the foundations within the clay deposits may be required in the vicinity of trees.

To avoid the potential for differential settlement, foundations should be placed wholly within the same material and should not transition between the drift deposits and the suspected weathered bedrock. Where this cannot be avoided, the Structural Engineer should design the foundations with sufficient reinforcement to accommodate and mitigate against potential differential settlement.

A safe bearing resistance for the firm to stiff sandy gravelly clay and/or the weathered sandstone bedrock of 120kN/m² is considered appropriate.

With respect to buried structures (concrete), the pH levels and soluble sulphate concentrations in the soils equate to a Design Sulphate classification of DS-1 and an ACEC classification of AC-3z (BRE Special Digest 1: 2005). Buried concrete should be specified accordingly.

Based on the ground conditions and the results of the DCP tests, conventional road and pavement construction techniques should be suitable. However, it is always recommended that the appropriate CBR value is confirmed by way of plate load testing at formation level prior to construction.

11.3 Ground Contamination

11.3.1 Ground Contamination – Human Health

Following the results of the contamination assessment it can be seen that none of the contaminant concentrations exceed the assessment criteria for a residential development with plant uptake and asbestos fibres have not been detected. As such, the topsoil does not pose a risk to human health and is

suitable for re-use in areas of private gardens and soft landscaping. In addition, phytotoxic elements (copper, nickel and zinc) are within the acceptable limits for topsoil.

In view of the above, remediation is not considered necessary in order to develop the site for residential end use.

Given the results of the chemical screening, standard water supply pipes are considered suitable. However, it is recommended that the relevant utility suppliers are contacted in this respect, as a site-specific risk assessment may be required.

Any imported materials required on site should be screened prior to placement on site to ensure contaminated materials are not being brought to site and that they are suitable for use within a residential setting.

If topsoil is brought on to site, the materials should be as specified in BS 3882:2015 as 'suitable for the intended purpose'. BS3882:2015 relates to nutrient content of topsoil and phytotoxic contamination and does not consider contaminants that pose a risk specifically to human health. Soils should be tested for contaminants that are considered to pose a risk to human health in addition to BS3882:2015 to ensure that they are suitable for their intended use. All materials brought on to site that are to be used as part of soft landscaped areas should be assessed with regards to human health criteria.

11.3.2 Ground Contamination – Environmental Receptors

Based on the ground conditions observed and the results of the chemical screening, the risk to environmental receptors from possible contamination on site is considered negligible and no further assessment or works are required in this respect.

11.4 Ground Gas

The results of the ground gas monitoring indicate no methane, low concentrations of carbon dioxide and low flow rates. Gas protection measures are not considered necessary at this stage.

Radon protection measures are not considered necessary at this time.

11.5 Post Investigation Works

Redundant boreholes should be made safe and secure and should not cause a preferential pathway for contaminants and ground gasses.

Based on the ground gas levels recorded on the site throughout the monitoring period and the ground conditions encountered, the wells that were installed as part of this investigation are not considered to pose a significant risk to the proposed development and are very unlikely to provide a preferential pathway for contaminants based on current or proposed land uses.

Where decommissioning is required, the works should be completed in accordance Environment Agency Guidelines: "Guidance on the design and installation of groundwater Monitoring points", Section 5.5 Decommissioning (Page 59), and "Decommissioning abandoned boreholes and wells".

11.6 General Comments

Consideration must be made for variations to occur in the ground conditions between the exploratory hole locations for which GEO holds no responsibility and areas where limited access was available. It is therefore recommended that a “watching brief” and “observational technique” be applied to this site to ensure that if ground conditions appear to vary from those identified within this investigation report then advice should be sought from a suitably qualified and experienced Engineering Geologist, Geotechnical or Geo-Environmental Engineer.

The recommendations and opinions expressed in this report are based on the strata observed within the exploratory holes in addition to the results of the site and laboratory tests commissioned by GEO. Consequently, GEO takes no responsibility for conditions that have not been revealed or which occur between them. GEO takes no responsibility for the accuracy of third party information provided by sub-contract drillers or laboratories.

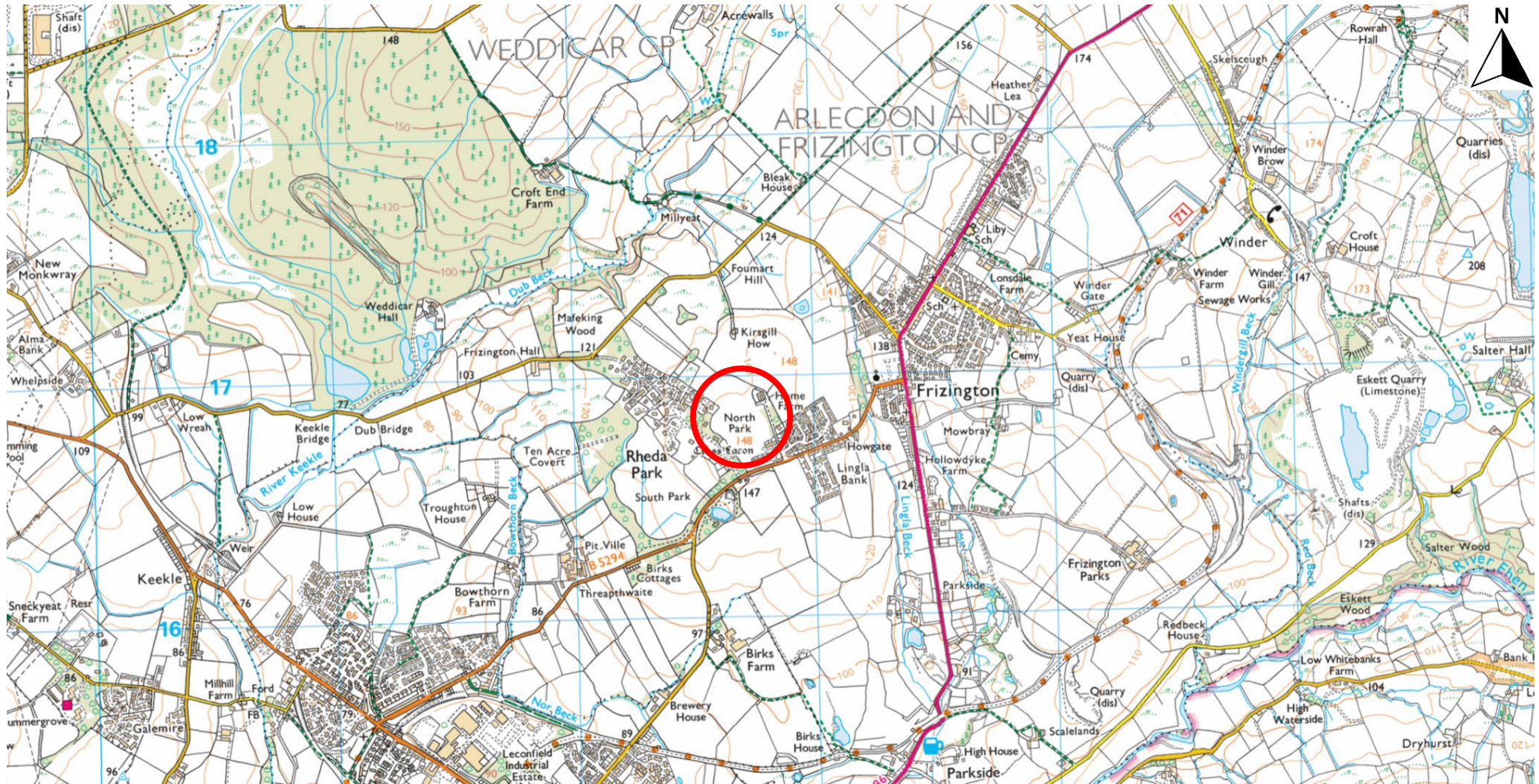
The conclusions and recommendations presented within this report are considered reasonable based on the available information. However, these cannot be guaranteed to gain regulatory approval. Therefore, the report should be passed to the appropriate regulatory authorities and/ or other key stakeholders including warranty providers in order to seek their approval of the findings prior to undertaking any works on site.

End of Report

Appendix I

- Site Location Plan
- Exploratory Hole Location Plan
- Weathered Bedrock Depth Profile

GEO2023-6111: North Park, Home Farm, Rheda Close, Frizington – Site Location

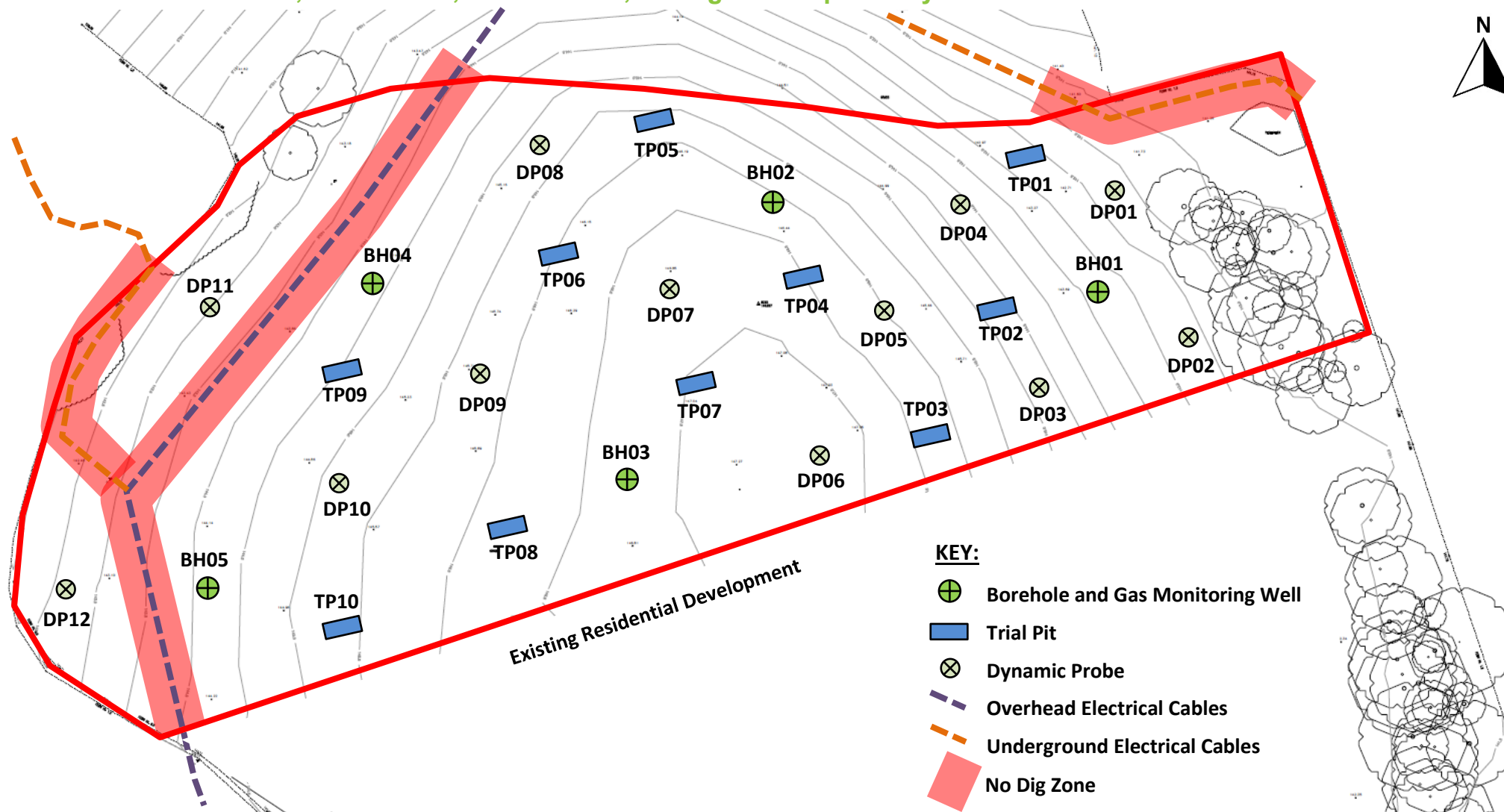


Website: www.geoenvironmentalengineering.com

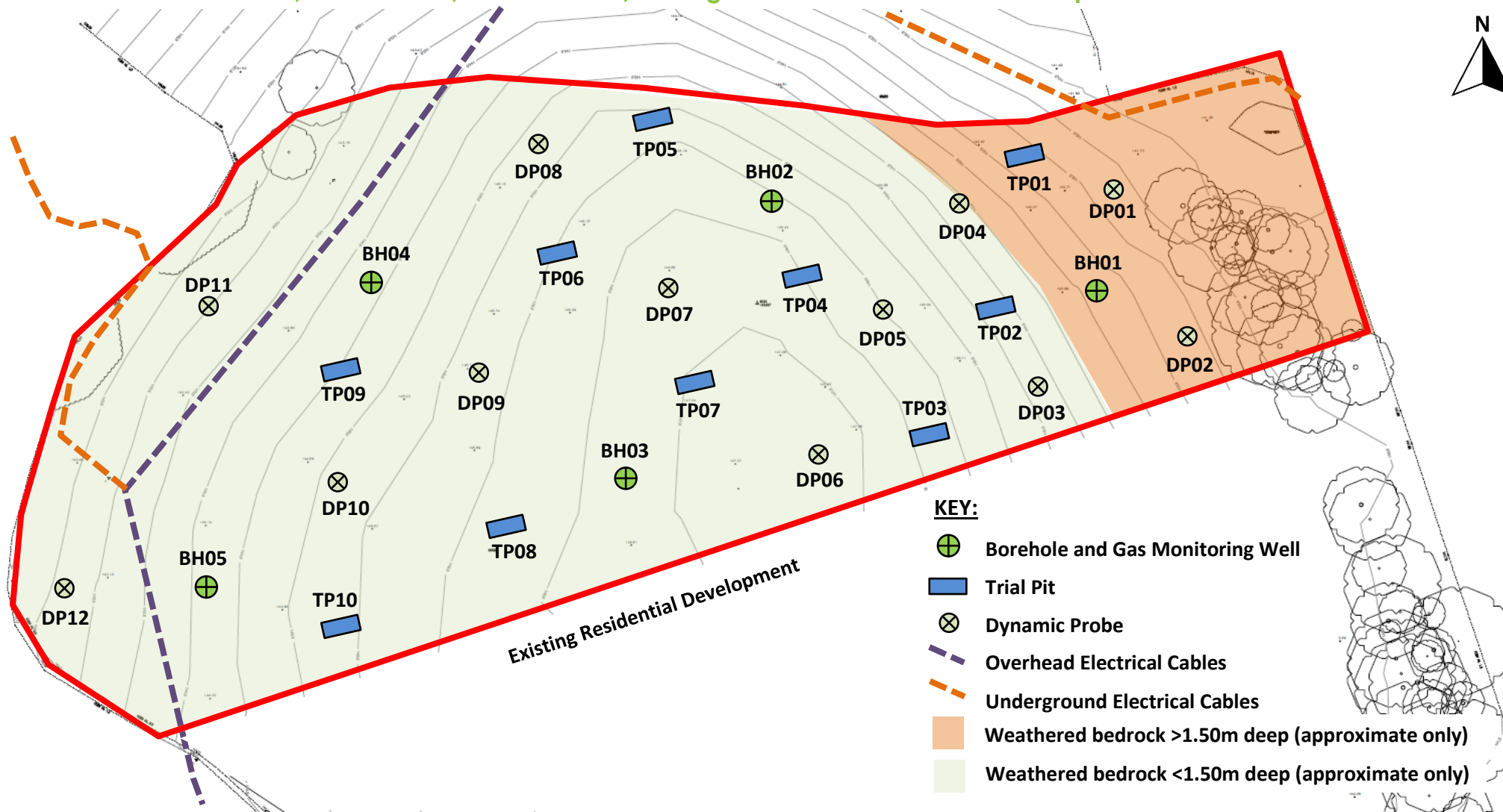
Email: info@geoenvironmentalengineering.com

Telephone: 07883 440 186

GEO2023-6111: North Park, Home Farm, Rheda Close, Frizington – Exploratory Hole Location Plan



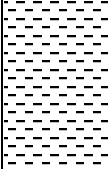
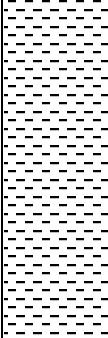
GEO2023-6111: North Park, Home Farm, Rheda Close, Frizington – Weathered Bedrock Depth Profile



Appendix II

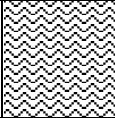
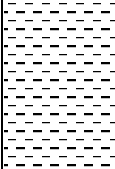
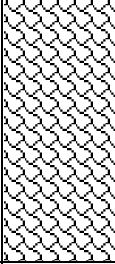
- Exploratory Hole Logs
- DCP and Dynamic Probe Result Sheets
- Ground Gas Monitoring Sheets

GEO2023-6111: North Park, Home Farm, Rheda Close, Frizington – TP01

Depth From (m)	Depth To (m)	Strata Description	Legend	Testing / Samples
0.00	0.34	TOPSOIL: Dark brown silty sandy LOAM.		0.20 - J
0.34	0.90	Firm red brown silty sandy gravelly CLAY.		0.70 HSV = 75kPa 0.70 - T
0.90	2.10	Firm to stiff becoming stiff dark red brown gravelly CLAY. Becoming very gravelly with depth. Gravel is fine to coarse angular sandy siltstone.		1.30 - T
		Trial hole remained open and dry on completion. Trial hole backfilled with arisings on completion.		
Engineer: J.Brock Site Works Date: 05/01/2024 Plant: Tracked 360 Excavator			Log Notes: HSV = Hand Shear Vane (kN/m ²) LP = Limited Penetration (HSV/CBR) B = Bulk Bag, J = Amber Glass Jar, T = Plastic Tub	

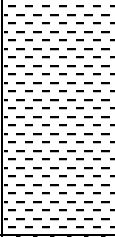
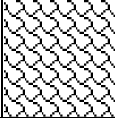


GEO2023-6111: North Park, Home Farm, Rheda Close, Frizington – TP02

Depth From (m)	Depth To (m)	Strata Description	Legend	Testing / Samples
0.00	0.37	TOPSOIL: Dark brown silty sandy LOAM.		
0.37	1.00	Firm to stiff dark red brown silty sandy gravelly CLAY.		0.80 HSV = 90kPa
1.00	1.90	POSSIBLE WEATHERED BEDROCK: Recovered as dark red brown very silty/clayey angular GRAVEL and COBBLES of very weak angular sandy siltstone. Becoming more competent with depth.		
		Trial hole remained open and dry on completion. Trial hole backfilled with arisings on completion.		
Engineer: J.Brock Site Works Date: 05/01/2024 Plant: Tracked 360 Excavator			Log Notes: HSV = Hand Shear Vane (kN/m ²) LP = Limited Penetration (HSV/CBR) B = Bulk Bag, J = Amber Glass Jar, T = Plastic Tub	



GEO2023-6111: North Park, Home Farm, Rheda Close, Frizington – TP03

Depth From (m)	Depth To (m)	Strata Description	Legend	Testing / Samples
0.00	0.32	TOPSOIL: Dark brown silty sandy LOAM.		
0.32	1.10	Firm to stiff dark red brown silty sandy gravelly CLAY.		0.80 - T 1.00 HSV = 120kPa
1.10	1.50	POSSIBLE WEATHERED BEDROCK: Recovered as dark red brown very silty/clayey angular GRAVEL and COBBLES of very weak angular sandy siltstone. Becoming competent with depth. Slow digging from 1.40m bgl.		1.30 - T
		Trial hole remained open and dry on completion. Trial hole backfilled with arisings on completion.		
Engineer: J.Brock Site Works Date: 05/01/2024 Plant: Tracked 360 Excavator			Log Notes: HSV = Hand Shear Vane (kN/m ²) LP = Limited Penetration (HSV/CBR) B = Bulk Bag, J = Amber Glass Jar, T = Plastic Tub	



GEO2023-6111: North Park, Home Farm, Rheda Close, Frizington – TP04

Depth From (m)	Depth To (m)	Strata Description	Legend	Testing / Samples
0.00	0.20	TOPSOIL: Dark brown silty sandy very gravelly LOAM.		
0.20	1.00	WEATHERED BEDROCK: Dark red brown silty angular GRAVEL and COBBLES of silty weak sandstone. Very slow digging from 0.90m bgl.		
		Trial hole remained open and dry on completion. Trial hole backfilled with arisings on completion.		

Engineer: J.Brock

Site Works Date: 05/01/2024

Plant: Tracked 360 Excavator

Log Notes:

HSV = Hand Shear Vane (kN/m²)

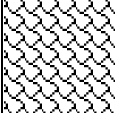
LP = Limited Penetration (HSV/CBR)

B = Bulk Bag, J = Amber Glass Jar, T = Plastic Tub



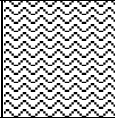
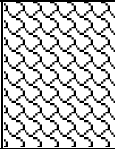
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GEO2023-6111: North Park, Home Farm, Rheda Close, Frizington – TP05

Depth From (m)	Depth To (m)	Strata Description	Legend	Testing / Samples
0.00	0.31	TOPSOIL: Dark brown silty sandy very gravelly LOAM.		0.20 - J
0.31	0.70	WEATHERED BEDROCK: Dark red brown silty angular GRAVEL and COBBLES of silty weak sandstone. Very slow digging from 0.60m bgl.		
		Trial hole remained open and dry on completion. Trial hole backfilled with arisings on completion.		
Engineer: J.Brock Site Works Date: 05/01/2024 Plant: Tracked 360 Excavator			Log Notes: HSV = Hand Shear Vane (kN/m ²) LP = Limited Penetration (HSV/CBR) B = Bulk Bag, J = Amber Glass Jar, T = Plastic Tub	

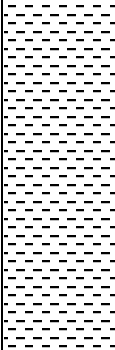


GEO2023-6111: North Park, Home Farm, Rheda Close, Frizington – TP06

Depth From (m)	Depth To (m)	Strata Description	Legend	Testing / Samples
0.00	0.37	TOPSOIL: Dark brown silty sandy very gravelly LOAM.		0.20 - J
0.37	0.90	WEATHERED BEDROCK: Dark red brown very silty angular GRAVEL and COBBLES of silty weak sandstone. Very slow digging from 0.80m bgl.		0.80 - T
		Trial hole remained open and dry on completion. Trial hole backfilled with arisings on completion.		
Engineer: J.Brock Site Works Date: 05/01/2024 Plant: Tracked 360 Excavator			Log Notes: HSV = Hand Shear Vane (kN/m ²) LP = Limited Penetration (HSV/CBR) B = Bulk Bag, J = Amber Glass Jar, T = Plastic Tub	

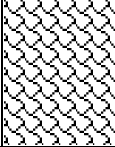


GEO2023-6111: North Park, Home Farm, Rheda Close, Frizington – TP07

Depth From (m)	Depth To (m)	Strata Description	Legend	Testing / Samples
0.00	0.34	TOPSOIL: Dark brown silty sandy very gravelly LOAM.		
0.34	1.50	Firm to stiff dark red brown gravelly CLAY. Becoming very gravelly with depth.		1.00 - T
1.50	1.70	POSSIBLE WEATHERED BEDROCK: Recovered as dark red brown very silty angular GRAVEL of very weak angular sandy siltstone.		
		Trial hole remained open and dry on completion. Trial hole backfilled with arisings on completion.		
Engineer: J.Brock Site Works Date: 05/01/2024 Plant: Tracked 360 Excavator			Log Notes: HSV = Hand Shear Vane (kN/m ²) LP = Limited Penetration (HSV/CBR) B = Bulk Bag, J = Amber Glass Jar, T = Plastic Tub	

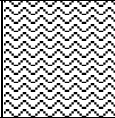
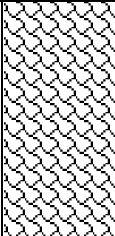
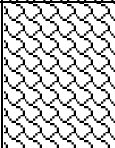


GEO2023-6111: North Park, Home Farm, Rheda Close, Frizington – TP08

Depth From (m)	Depth To (m)	Strata Description	Legend	Testing / Samples
0.00	0.33	TOPSOIL: Dark brown silty sandy very gravelly LOAM.		
0.33	0.80	WEATHERED BEDROCK: Dark red brown very silty angular GRAVEL and COBBLES of silty weak sandstone. Very slow digging from 0.70m bgl.		
		Trial hole remained open and dry on completion. Trial hole backfilled with arisings on completion.		
Engineer: J.Brock Site Works Date: 05/01/2024 Plant: Tracked 360 Excavator			Log Notes: HSV = Hand Shear Vane (kN/m ²) LP = Limited Penetration (HSV/CBR) B = Bulk Bag, J = Amber Glass Jar, T = Plastic Tub	



GEO2023-6111: North Park, Home Farm, Rheda Close, Frizington – TP09

Depth From (m)	Depth To (m)	Strata Description	Legend	Testing / Samples
0.00	0.36	TOPSOIL: Dark brown silty sandy very gravelly LOAM.		0.20 - J
0.36	1.20	POSSIBLE WEATHERED BEDROCK: Recovered as dark red brown very silty angular GRAVEL of angular sandy very weak siltstone.		
1.20	1.50	WEATHERED BEDROCK: Dark red brown very silty angular GRAVEL and COBBLES of weak sandstone. Very slow digging from 1.30m bgl.		
		Trial hole remained open and dry on completion. Trial hole backfilled with arisings on completion.		
Engineer: J.Brock Site Works Date: 05/01/2024 Plant: Tracked 360 Excavator			Log Notes: HSV = Hand Shear Vane (kN/m ²) LP = Limited Penetration (HSV/CBR) B = Bulk Bag, J = Amber Glass Jar, T = Plastic Tub	



GEO2023-6111: North Park, Home Farm, Rheda Close, Frizington – TP10

Depth From (m)	Depth To (m)	Strata Description	Legend	Testing / Samples
0.00	0.20	TOPSOIL: Dark brown silty sandy very gravelly LOAM.		
0.20	0.60	POSSIBLE WEATHERED BEDROCK: Dark red brown very silty angular GRAVEL and COBBLES of weak sandstone.		
0.60	1.30	WEATHERED BEDROCK: Recovered as dark red brown very silty angular GRAVEL of angular sandy very weak siltstone. Very slow digging at 1.30m bgl. Possible sandstone bedrock.		
		Trial hole remained open and dry on completion. Trial hole backfilled with arisings on completion.		

Engineer: J.Brock

Site Works Date: 05/01/2024

Plant: Tracked 360 Excavator

Log Notes:

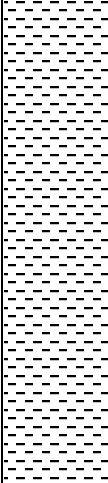
HSV = Hand Shear Vane (kN/m²)

LP = Limited Penetration (HSV/CBR)

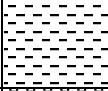
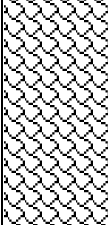
B = Bulk Bag, J = Amber Glass Jar, T = Plastic Tub



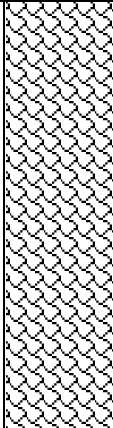
GEO2023-6111: North Park, Home Farm, Rheda Close, Frizington – BH01

Depth From (m)	Depth To (m)	Strata Description	Legend	Testing / Samples
0.00	0.32	TOPSOIL: Dark brown silty sandy LOAM.		0.20 - J
0.32	2.00	Firm to stiff becoming stiff dark red brown gravelly CLAY. Becoming very gravelly with depth. Gravel is fine to coarse angular sandy siltstone.		0.80 - T 1.00 SPT = N13 2.00 SPT = N64
		End of borehole at 2.00m due to sample tube and SPT refusal. Borehole remained open and dry on completion. Borehole installed: GL to 1.0 Plain pipe and bentonite 1.0 to 2.0 Slotted pipe and gravel.		Hand dug to 1.00m
Engineer: J.Brock Site Works Date: 04/01/2024 Plant: Archway Competitor C130 Superheavy			Log Notes: SPT = Standard Penetration test (N value) HSV = Hand Shear Vane (kN/m ²) LP = Limited Penetration (HSV/CBR) B = Bulk Bag, J = Amber Glass Jar, T = Plastic Tub	

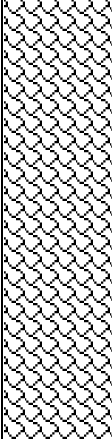
GEO2023-6111: North Park, Home Farm, Rheda Close, Frizington – BH02

Depth From (m)	Depth To (m)	Strata Description	Legend	Testing / Samples
0.00	0.30	TOPSOIL: Dark brown silty sandy LOAM.		0.20 - J
0.30	0.60	Firm to stiff dark red brown gravelly CLAY. Becoming very gravelly with depth.		0.40 - T
0.60	1.40	POSSIBLE WEATHERED BEDROCK: Recovered as dark red brown very silty/clayey angular GRAVEL and COBBLES of very weak angular sandy siltstone.		1.0 SPT = N11 1.20 – T 1.40 SPT = N50/80mm
		End of borehole at 1.40m due to sample tube and SPT refusal. Borehole remained open and dry on completion. Borehole installed: GL to 0.4 Plain pipe and bentonite 0.4 to 1.4 Slotted pipe and gravel.		Hand dug to 1.00m
Engineer: J.Brock Site Works Date: 04/01/2024 Plant: Archway Competitor C130 Superheavy			Log Notes: SPT = Standard Penetration test (N value) HSV = Hand Shear Vane (kN/m ²) LP = Limited Penetration (HSV/CBR) B = Bulk Bag, J = Amber Glass Jar, T = Plastic Tub	

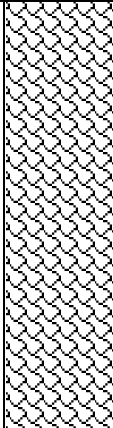
GEO2023-6111: North Park, Home Farm, Rheda Close, Frizington – BH03

Depth From (m)	Depth To (m)	Strata Description	Legend	Testing / Samples
0.00	0.29	TOPSOIL: Dark brown silty sandy LOAM.		0.20 - J
0.29	1.80	POSSIBLE WEATHERED BEDROCK: Recovered as dark red brown very silty/clayey angular GRAVEL and COBBLES of very weak angular siltstone.		1.00 SPT = N13 1.80 SPT = N50/15mm
		End of borehole at 1.80m due to sample tube and SPT refusal. Borehole remained open and dry on completion. Borehole installed: GL to 0.8 Plain pipe and bentonite 0.8 to 1.8 Slotted pipe and gravel.		Hand dug to 1.00m
Engineer: J.Brock Site Works Date: 04/01/2024 Plant: Archway Competitor C130 Superheavy			Log Notes: SPT = Standard Penetration test (N value) HSV = Hand Shear Vane (kN/m ²) LP = Limited Penetration (HSV/CBR) B = Bulk Bag, J = Amber Glass Jar, T = Plastic Tub	

GEO2023-6111: North Park, Home Farm, Rheda Close, Frizington – BH04

Depth From (m)	Depth To (m)	Strata Description	Legend	Testing / Samples
0.00	0.30	TOPSOIL: Dark brown silty sandy LOAM.		0.20 - J
0.30	2.00	POSSIBLE WEATHERED BEDROCK: Recovered as dark red brown very silty/clayey angular GRAVEL and COBBLES of very weak angular siltstone and sandstone. Occasional lenses of very gravelly silt/clay.		0.90 – T 1.00 SPT = N15 2.00 SPT = N50/0mm
		End of borehole at 1.80m due to sample tube and SPT refusal. Borehole remained open on completion. Standing water at 1.64m bgl on completion. Borehole installed: GL to 1.0 Plain pipe and bentonite 1.0 to 2.0 Slotted pipe and gravel.		Hand dug to 1.00m
Engineer: J.Brock Site Works Date: 04/01/2024 Plant: Archway Competitor C130 Superheavy			Log Notes: SPT = Standard Penetration test (N value) HSV = Hand Shear Vane (kN/m ²) LP = Limited Penetration (HSV/CBR) B = Bulk Bag, J = Amber Glass Jar, T = Plastic Tub	

GEO2023-6111: North Park, Home Farm, Rheda Close, Frizington – BH05

Depth From (m)	Depth To (m)	Strata Description	Legend	Testing / Samples
0.00	0.32	TOPSOIL: Dark brown silty sandy LOAM.		0.20 - J
0.32	2.00	POSSIBLE WEATHERED BEDROCK: Recovered as dark red brown very silty angular GRAVEL and COBBLES of weak angular sandstone. Occasional lenses of silty gravelly sand.		0.80 – T 1.00 SPT = N18 2.00 SPT = N50/25mm
		End of borehole at 1.80m due to sample tube and SPT refusal. Borehole remained open and dry on completion. Borehole installed: GL to 0.5 Plain pipe and bentonite 0.5 to 1.5 Slotted pipe and gravel.		Hand dug to 1.00m
Engineer: J.Brock Site Works Date: 04/01/2024 Plant: Archway Competitor C130 Superheavy			Log Notes: SPT = Standard Penetration test (N value) HSV = Hand Shear Vane (kN/m ²) LP = Limited Penetration (HSV/CBR) B = Bulk Bag, J = Amber Glass Jar, T = Plastic Tub	

In-Situ Dynamic Probe Record Sheet - Super Heavy DPSH

Site Location: North Park, Home Farm, Rheda Close, Frizington

Project Ref: 2023-6111

Driller: MK

Engineer: JB

Fieldworks Date: 05/01/2024

Fieldworks Notes: N/A

Standard: BS1377 Part 9 DPSH

KEY:

N300 = <10
N300 = ≥10

Probe Location:	DP01		DP02		DP03		DP04		DP05		DP06		DP07		DP08		DP09		DP10		DP11		DP12	
Depth (m bgl):	N100	N300	N100	N300	N100	N300	N100	N300	N100	N300	N100	N300	N100	N300	N100	N300	N100	N300	N100	N300	N100	N300	N100	N300
0.1	0		0		0		0		0		0		0		0		0		0		0		0	
0.2	0	0	0	2	0	0	0	0	0	1	1	4	0	0	0	4	0	1	0	4	0	1	0	7
0.3	0		2		0		0		1		3		0		4		1		4		1		7	
0.4	1		2		2		0		2		7		1		4		1		4		1		9	
0.5	0	2	3	7	1	4	1	2	2	8	19	52	1	3	5	15	2	4	6	18	2	6	10	42
0.6	1		2		1		1		4		26		1		6		1		8		3		23	
0.7	2		2		2		1		7		28		3		11		1		9		4		34	
0.8	3	8	3	10	3	7	1	3	9	26	30	108	4	10	12	37	8	16	9	30	4	14	47	131
0.9	3		5		2		1		10		50		3		14		7		12		6		50	
1	3		7		4		1		11				3		13		16		15		5			
1.1	3	10	8	22	10	30	4	15	30	59			12	57	11	41	16	55	15	44	5	17		
1.2	4		7		16		10		18				42		17		23		14		7			
1.3	4		9		15		7		14				46		23		36		18		10			
1.4	6	18	7	25	15	47	4	15	25	60			50	96	32	96	40	122	22	76	12	36		
1.5	8		9		17		4		21						41		46		36		14			
1.6	7		6		11		3		28						50		50		50		10			
1.7	6	20	6	20	6	23	4	10	32	110						50		50		50		18	49	
1.8	7		8		6		3		50												21			
1.9	10		6		6		3														26			
2	50	60	5	17	51	83	3	13													31	99		
2.1			6		26		7															42		
2.2			11		31		12														50			
2.3			14	46	42	123	14	43														50		
2.4			21		50		17																	
2.5			27				24																	
2.6			31	108			31	105																
2.7			50				50																	
2.8																								
2.9																								
3																								

www.geoenvironmentalengineering.com

info@geoenvironmentalengineering.com

Tel: 07883 440 186

Notes:

The Dynamic Probe test is used to determine the resistance of soils in-situ to the intermittent penetration of a cone, driven dynamically in a standard manner and in accordance to B.S. 1377: Part 9. The equipment consists of a 90° cone which may be sacrificial or retained for recovery, a series of extension or driving rods, a torque wrench and a driving device.

There are two types of test: Heavy Dynamic Probing (DPH) and Super Heavy Dynamic Probing (DPSH). The dimensions of the cone and the mass and drop height of the driving weight differ between the two tests. The extension rods used in the test are either 0.5-metre-long (for top of the hole) or 1-metre-long, manufactured from 35mm diameter heat-treated alloy steel, with graduations marked every 100mm along their length. The rods are flush-coupled and designed such that rod ends butt-up fully against each other when driving, forming a continuous jointed series with a straight axis. The driving device may be an Automatic Trip Hammer as part of a Dynamic Sampling drilling rig or a purpose-designed Probing Rig with characteristics conforming to BS 1377: Part 9.

The blow count is recorded for every 100mm of driving (N100) and the results presented as a plot of blow count against depth. Where the DPSH is utilised the sum total of three N100 increments (c.300mm penetration – N300 value). correlates to an equivalent SPT "N" value.

[illegible][illegible]

1 - TRRL Equation, $\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057\text{Log}_{10}(\text{mm/blow})$

[illegible]

1 - TRRL Equation, $\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057\text{Log}_{10}(\text{mm/blow})$

[illegible][illegible]

[illegible][illegible]

1 - TRRL Equation, $\log_{10}(\text{CBR}) = 2.48 - 1.057 \log_{10} (\text{mm/blow})$

[illegible][illegible]

1 - TRRL Equation, $\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057\text{Log}_{10}(\text{mm/blow})$

Ground Gas & Groundwater Monitoring Record Sheet 01

Site: Home Farm, Rheda Close, Frizington

Project No: 2023-6111

Date: 09/01/2024

Borehole	Pressure (mb)	Methane Initial (% v/v)	Methane Residual (% v/v)	Carbon Dioxide Initial (% v/v)	Carbon Dioxide Residual (% v/v)	Oxygen Initial (% v/v)	Oxygen Residual (% v/v)	Flow Rate (l/h)	Water Level (m)	Depth of base (m)	Water Sample Recovered?
BH01	1021 R	0	0	3.0	3.1	16.4	15.2	<0.1	DRY	2.0	-
BH02	1021 R	0	0	0.6	0.6	19.8	19.5	<0.1	DRY	1.4	-
BH03	1021 R	0	0	2.2	2.3	17.3	15.3	<0.1	DRY	1.8	-
BH04	1021 R	0	0	2.8	3.1	16.7	15.5	<0.1	1.90	2.0	-
BH05	1021 R	0	0	0.8	0.8	19.8	19.4	<0.1	DRY	1.5	-

Notes:

Initial Value = First recorded concentration taken immediately upon opening the gas valve; Residual Value = Constant or "steady" reading following peak.

Monitoring undertaken for a minimum of three minutes. Where high concentrations are initially noted then the monitoring should be increased to five minutes.

F = Falling Atmospheric Pressure, R = Rising Atmospheric Pressure, S = Steady Atmospheric Pressure

Nm – Not Monitored

Monitoring Completed By: JB

Equipment Used: GFM436 Gas Analyser with Flow Pod. Geotechnical Instruments Dipmeter.

Weather Conditions: Dry, Sunny, Frosty

Temperature: 2.0°C

Notes:

Website: www.geoenvironmentalengineering.com

Email: info@geoenvironmentalengineering.com

Telephone: 07883 440 186

Ground Gas & Groundwater Monitoring Record Sheet 02

Site: Home Farm, Rheda Close, Frizington

Project No: 2023-6111

Date: 06/02/2024

Borehole	Pressure (mb)	Methane Initial (% v/v)	Methane Residual (% v/v)	Carbon Dioxide Initial (% v/v)	Carbon Dioxide Residual (% v/v)	Oxygen Initial (% v/v)	Oxygen Residual (% v/v)	Flow Rate (l/h)	Water Level (m)	Depth of base (m)	Water Sample Recovered?
BH01	985 F	0	0	4.7	5.3	12.8	8.6	<0.1	DRY	2.0	-
BH02	985 F	0	0	3.8	4.0	14.5	14.9	<0.1	DRY	1.4	-
BH03	985 F	0	0	0.8	0.8	19.3	19.3	<0.1	DRY	1.8	-
BH04	985 F	0	0	5.8	5.9	12.5	11.7	<0.1	1.95	2.0	-
BH05	985 F	0	0	3.5	3.7	15.6	14.9	<0.1	DRY	1.5	-

Notes:

Initial Value = First recorded concentration taken immediately upon opening the gas valve; Residual Value = Constant or "steady" reading following peak.

Monitoring undertaken for a minimum of three minutes. Where high concentrations are initially noted then the monitoring should be increased to five minutes.

F = Falling Atmospheric Pressure, R = Rising Atmospheric Pressure, S = Steady Atmospheric Pressure

Nm – Not Monitored

Monitoring Completed By: JB

Equipment Used: GFM436 Gas Analyser with Flow Pod. Geotechnical Instruments Dipmeter.

Weather Conditions: Dry, Overcast

Temperature: 9.0°C

Notes:

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Email: info@geoenvironmentalengineering.com

Telephone: 07883 440 186

Ground Gas & Groundwater Monitoring Record Sheet 03

Site: Home Farm, Rheda Close, Frizington

Project No: 2023-6111

Date: 09/02/2024

Borehole	Pressure (mb)	Methane Initial (% v/v)	Methane Residual (% v/v)	Carbon Dioxide Initial (% v/v)	Carbon Dioxide Residual (% v/v)	Oxygen Initial (% v/v)	Oxygen Residual (% v/v)	Flow Rate (l/h)	Water Level (m)	Depth of base (m)	Water Sample Recovered?
BH01	956 F	0	0	0.3	5.2	19.5	10.2	<0.1	DRY	2.0	-
BH02	956 F	0	0	0.4	4.3	20.1	14.4	<0.1	DRY	1.4	-
BH03	956 F	0	0	0.2	0.4	20.2	20.1	<0.1	DRY	1.8	-
BH04	956 F	0	0	0.2	5.9	20.4	11.2	<0.1	DRY	2.0	-
BH05	956 F	0	0	0.2	3.4	20.5	16.6	<0.1	DRY	1.5	-

Notes:

Initial Value = First recorded concentration taken immediately upon opening the gas valve; Residual Value = Constant or "steady" reading following peak.

Monitoring undertaken for a minimum of three minutes. Where high concentrations are initially noted then the monitoring should be increased to five minutes.

F = Falling Atmospheric Pressure, R = Rising Atmospheric Pressure, S = Steady Atmospheric Pressure

Nm – Not Monitored

Monitoring Completed By: TE

Equipment Used: GFM436 Gas Analyser with Flow Pod. Geotechnical Instruments Dipmeter.

Weather Conditions: Raining, Overcast

Temperature: 6.0°C

Notes:

Website: www.geoenvironmentalengineering.com

Email: info@geoenvironmentalengineering.com

Telephone: 07883 440 186

Ground Gas & Groundwater Monitoring Record Sheet 04

Site: Home Farm, Rheda Close, Frizington

Project No: 2023-6144

Date: 29/02/2024

Borehole	Pressure (mb)	Methane Initial (% v/v)	Methane Residual (% v/v)	Carbon Dioxide Initial (% v/v)	Carbon Dioxide Residual (% v/v)	Oxygen Initial (% v/v)	Oxygen Residual (% v/v)	Flow Rate (l/h)	Water Level (m)	Depth of base (m)	Water Sample Recovered?
BH01	979 F	0	0	0	0.1	21.3	19.5	<0.1	1.95	2.0	-
BH02	979 F	0	0	0.1	0	21.2	21.0	<0.1	DRY	1.4	-
BH03	979 F	0	0	1.5	1.0	17.1	16.6	<0.1	DRY	1.8	-
BH04	979 F	0	0	0.4	0.2	20.1	19.3	<0.1	DRY	2.0	-
BH05	979 F	0	0	0.7	0.4	20.1	19.8	<0.1	DRY	1.5	-

Notes:

Initial Value = First recorded concentration taken immediately upon opening the gas valve; Residual Value = Constant or "steady" reading following peak.

Monitoring undertaken for a minimum of three minutes. Where high concentrations are initially noted then the monitoring should be increased to five minutes.

F = Falling Atmospheric Pressure, R = Rising Atmospheric Pressure, S = Steady Atmospheric Pressure

Nm – Not Monitored

Monitoring Completed By: MK

Equipment Used: GFM436 Gas Analyser with Flow Pod. Geotechnical Instruments Dipmeter.

Weather Conditions: Dry, Overcast (recent very heavy rainfall)

Temperature: 7.0°C

Notes:

Website: www.geoenvironmentalengineering.com

Email: info@geoenvironmentalengineering.com

Telephone: 07883 440 186

Ground Gas & Groundwater Monitoring Record Sheet 05

Site: Home Farm, Rheda Close, Frizington

Project No: 2023-6144

Date: 26/03/2024

Borehole	Pressure (mb)	Methane Initial (% v/v)	Methane Residual (% v/v)	Carbon Dioxide Initial (% v/v)	Carbon Dioxide Residual (% v/v)	Oxygen Initial (% v/v)	Oxygen Residual (% v/v)	Flow Rate (l/h)	Water Level (m)	Depth of base (m)	Water Sample Recovered?
BH01	969 F	0	0	6.1	6.9	13.2	7.2	<0.1	1.95	2.0	-
BH02	969 F	0	0	0.7	0.7	19.0	18.7	<0.1	DRY	1.4	-
BH03	969 F	0	0	3.4	3.5	14.3	13.8	<0.1	DRY	1.8	-
BH04	969 F	0	0	6.6	6.7	8.2	7.5	<0.1	DRY	2.0	-
BH05	969 F	0	0	5.7	5.9	10.2	9.6	<0.1	DRY	1.5	-

Notes:

Initial Value = First recorded concentration taken immediately upon opening the gas valve; Residual Value = Constant or "steady" reading following peak.

Monitoring undertaken for a minimum of three minutes. Where high concentrations are initially noted then the monitoring should be increased to five minutes.

F = Falling Atmospheric Pressure, R = Rising Atmospheric Pressure, S = Steady Atmospheric Pressure

Nm – Not Monitored

Monitoring Completed By: JB

Equipment Used: GFM436 Gas Analyser with Flow Pod. Geotechnical Instruments Dipmeter.

Weather Conditions: Dry, Overcast (recent very heavy rainfall)

Temperature: 9.0°C

Notes:

Website: www.geoenvironmentalengineering.com

Email: info@geoenvironmentalengineering.com

Telephone: 07883 440 186

Ground Gas & Groundwater Monitoring Record Sheet 06

Site: Home Farm, Rheda Close, Frizington

Project No: 2023-6111

Date: 22/04/2024

Borehole	Pressure (mb)	Methane Initial (% v/v)	Methane Residual (% v/v)	Carbon Dioxide Initial (% v/v)	Carbon Dioxide Residual (% v/v)	Oxygen Initial (% v/v)	Oxygen Residual (% v/v)	Flow Rate (l/h)	Water Level (m)	Depth of base (m)	Water Sample Recovered?
BH01	1020 F	0	0	0.3	0.6	19.1	20.6	<0.1	1.95	2.0	-
BH02	1020 F	0	0	0.2	0.5	19.8	20.9	<0.1	DRY	1.4	-
BH03	1020 F	0	0	1.7	1.2	16.5	18.3	<0.1	DRY	1.8	-
BH04	1020 F	0	0	0.3	0.7	18.8	20.1	<0.1	DRY	2.0	-
BH05	1020 F	0	0	0.3	0.8	20.7	19.4	<0.1	DRY	1.5	-

Notes:

Initial Value = First recorded concentration taken immediately upon opening the gas valve; Residual Value = Constant or "steady" reading following peak.

Monitoring undertaken for a minimum of three minutes. Where high concentrations are initially noted then the monitoring should be increased to five minutes.

F = Falling Atmospheric Pressure, R = Rising Atmospheric Pressure, S = Steady Atmospheric Pressure

Nm – Not Monitored

Monitoring Completed By: MK

Equipment Used: GFM436 Gas Analyser with Flow Pod. Geotechnical Instruments Dipmeter.

Weather Conditions: Dry, Cloudy.

Temperature: 10.0°C

Notes:

Website: www.geoenvironmentalengineering.com

Email: info@geoenvironmentalengineering.com

Telephone: 07883 440 186

Appendix III

- Laboratory Test Results



Certificate of Analysis

Certificate Number 24-00866

Issued: 22-Jan-24

Client GEO Environmental Engineering
NW Office
31 Casshow Way
Cockermouth
Cumbria
CA13 9FY

Our Reference 24-00866

Client Reference GEO2023-6111

Order No (not supplied)

Contract Title RHEDA, FRIZINGTON

Description 13 Soil samples.

Date Received 16-Jan-24

Date Started 16-Jan-24

Date Completed 22-Jan-24

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

A handwritten signature in black ink, appearing to read "K. Bridgewood".

Kirk Bridgewood
General Manager



2139

Summary of Chemical Analysis

Soil Samples

Our Ref 24-00866

Client Ref GEO2023-6111 Contract

Title RHEDA, FRIZINGTON

Lab No	2286996	2286997	2286998	2286999	2287000	2287001
Sample ID	BH01	BH02	BH03	BH04	BH05	TP01
Depth	0.20	0.20	0.20	0.20	0.20	0.20
Other ID						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date	08/01/2024	08/01/2024	08/01/2024	08/01/2024	08/01/2024	08/01/2024
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	10	10	12	12	11	12
Cadmium	DETSC 2301#	0.1	mg/kg	< 0.1	0.1	< 0.1	0.1	0.1	0.1
Chromium III	DETSC 2301*	0.15	mg/kg	16	15	18	20	14	16
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	15	12	12	12	11	11
Lead	DETSC 2301#	0.3	mg/kg	35	31	31	28	34	45
Mercury	DETSC 2325#	0.05	mg/kg	0.08	0.05	0.06	0.05	0.06	< 0.05
Nickel	DETSC 2301#	1	mg/kg	7.7	5.6	7.4	7.2	7.3	6.1
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	0.7	< 0.5	1.0	< 0.5	0.6
Zinc	DETSC 2301#	1	mg/kg	39	36	35	39	37	32
Inorganics									
pH	DETSC 2008#		pH	6.2	6.5	5.4	6.4	5.6	5.7
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.3	0.4	0.4	0.4	0.5	0.3
Total Organic Carbon	DETSC 2084#	0.5	%	2.7	2.4	2.6	2.0	3.4	1.8
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	30	17	14	28	24	14
PAHs									
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	0.2	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	0.2	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
PAH 16 Total	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6

Summary of Chemical Analysis

Soil Samples

Our Ref 24-00866

Client Ref GEO2023-6111 Contract

Title RHEDA, FRIZINGTON

Lab No	2287002	2287003	2287004	2287005	2287006	2287007
Sample ID	TP05	TP09	BH02	BH04	BH05	TP03
Depth	0.20	0.20	1.20	0.90	0.80	1.30
Other ID						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date	08/01/2024	08/01/2024	08/01/2024	08/01/2024	08/01/2024	08/01/2024
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	10	11				
Cadmium	DETSC 2301#	0.1	mg/kg	0.1	0.1				
Chromium III	DETSC 2301*	0.15	mg/kg	16	16				
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0				
Copper	DETSC 2301#	0.2	mg/kg	12	13				
Lead	DETSC 2301#	0.3	mg/kg	31	30				
Mercury	DETSC 2325#	0.05	mg/kg	0.06	0.05				
Nickel	DETSC 2301#	1	mg/kg	6.0	5.7				
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5				
Zinc	DETSC 2301#	1	mg/kg	38	75				
Inorganics									
pH	DETSC 2008#		pH	6.8	4.8	6.5	5.3	6.0	6.2
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.5	0.4				
Total Organic Carbon	DETSC 2084#	0.5	%	2.6	2.3				
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	15	12	< 10	< 10	< 10	< 10
PAHs									
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1				
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1				
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1				
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1				
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1				
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1				
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1				
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1				
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1				
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1				
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1				
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1				
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1				
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1				
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1				
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1				
PAH 16 Total	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6				

Summary of Chemical Analysis

Soil Samples

Our Ref 24-00866
 Client Ref GEO2023-6111 Contract
 Title RHEDA, FRIZINGTON

Lab No	2287008
Sample ID	TP06
Depth	0.80
Other ID	
Sample Type	SOIL
Sampling Date	08/01/2024
Sampling Time	n/s

Test	Method	LOD	Units	
Metals				
Arsenic	DETSC 2301#	0.2	mg/kg	
Cadmium	DETSC 2301#	0.1	mg/kg	
Chromium III	DETSC 2301*	0.15	mg/kg	
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	
Copper	DETSC 2301#	0.2	mg/kg	
Lead	DETSC 2301#	0.3	mg/kg	
Mercury	DETSC 2325#	0.05	mg/kg	
Nickel	DETSC 2301#	1	mg/kg	
Selenium	DETSC 2301#	0.5	mg/kg	
Zinc	DETSC 2301#	1	mg/kg	
Inorganics				
pH	DETSC 2008#		pH	6.3
Cyanide, Total	DETSC 2130#	0.1	mg/kg	
Total Organic Carbon	DETSC 2084#	0.5	%	
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	< 10
PAHs				
Naphthalene	DETSC 3301	0.1	mg/kg	
Acenaphthylene	DETSC 3301	0.1	mg/kg	
Acenaphthene	DETSC 3301	0.1	mg/kg	
Fluorene	DETSC 3301	0.1	mg/kg	
Phenanthrene	DETSC 3301	0.1	mg/kg	
Anthracene	DETSC 3301	0.1	mg/kg	
Fluoranthene	DETSC 3301	0.1	mg/kg	
Pyrene	DETSC 3301	0.1	mg/kg	
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	
Chrysene	DETSC 3301	0.1	mg/kg	
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	
PAH 16 Total	DETSC 3301	1.6	mg/kg	

Summary of Asbestos Analysis Soil Samples

Our Ref 24-00866

Client Ref GEO2023-6111

Contract Title RHEDA, FRIZINGTON

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2286996	BH01 0.20	SOIL	NAD	none	Lee Kerridge
2286997	BH02 0.20	SOIL	NAD	none	Lee Kerridge
2286998	BH03 0.20	SOIL	NAD	none	Lee Kerridge
2286999	BH04 0.20	SOIL	NAD	none	Lee Kerridge
2287000	BH05 0.20	SOIL	NAD	none	Lee Kerridge
2287001	TP01 0.20	SOIL	NAD	none	Lee Kerridge
2287002	TP05 0.20	SOIL	NAD	none	Lee Kerridge
2287003	TP09 0.20	SOIL	NAD	none	Lee Kerridge

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 24-00866
 Client Ref GEO2023-6111
 Contract RHEDA, FRIZINGTON

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2286996	BH01 0.20 SOIL	08/01/24	GJ 250ml	pH + Conductivity (7 days)	
2286997	BH02 0.20 SOIL	08/01/24	GJ 250ml	pH + Conductivity (7 days)	
2286998	BH03 0.20 SOIL	08/01/24	GJ 250ml	pH + Conductivity (7 days)	
2286999	BH04 0.20 SOIL	08/01/24	GJ 250ml	pH + Conductivity (7 days)	
2287000	BH05 0.20 SOIL	08/01/24	GJ 250ml x2	pH + Conductivity (7 days)	
2287001	TP01 0.20 SOIL	08/01/24	GJ 250ml	pH + Conductivity (7 days)	
2287002	TP05 0.20 SOIL	08/01/24	GJ 250ml	pH + Conductivity (7 days)	
2287003	TP09 0.20 SOIL	08/01/24	GJ 250ml	pH + Conductivity (7 days)	
2287004	BH02 1.20 SOIL	08/01/24	PT 500ml	pH + Conductivity (7 days)	
2287005	BH04 0.90 SOIL	08/01/24	PT 500ml	pH + Conductivity (7 days)	
2287006	BH05 0.80 SOIL	08/01/24	PT 500ml	pH + Conductivity (7 days)	
2287007	TP03 1.30 SOIL	08/01/24	PT 500ml	pH + Conductivity (7 days)	
2287008	TP06 0.80 SOIL	08/01/24	PT 500ml	pH + Conductivity (7 days)	

Key: G-Glass J-Jar P-Plastic T-Tub

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

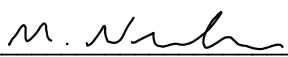
End of Report



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TEST REPORT

Client: **GEO Environmental Engineering Ltd, 4 Culgarth Avenue, Cockermouth, CA13**
Engineer: **James Brock / Curtis Evans**
Project: **GEO2023-6111 - Rheda, Frizington**
Supplier/Source: **Site**
Date Sampled: **08/01/2024**
Date Received: **01/02/2024**
Sampled By: **Clients Staff**
SampleSpec: **Sampled by Site Staff/Client**
Remarks: **None**

Signed:  ☒ M. Newton, Laboratory Manager
[] P. Fletcher, Senior Technician

ADDITIONAL INFORMATION

Notes:

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

If Northumberland County Council carried out the sampling then all sampling was carried out at the named project above. All testing is carried out at Northumberland County Council Laboratory, testing is carried out to the specification stated in this report, except for subcontracted testing.

Uncertainty of measurement available on request..

Results reported herein relate only to the material supplied to the laboratory.

No decision rule will be given

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

Samples will be disposed of 4 weeks from initial receipt unless otherwise instructed.



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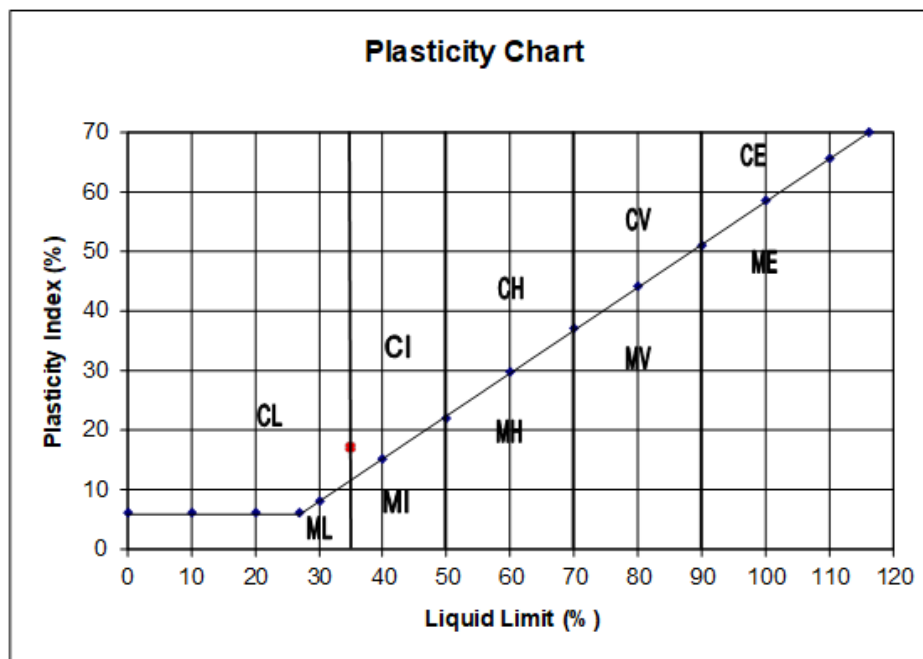
CLASSIFICATION OF SOILS

Tests according to B.S. 1377 : 1990

Location: **BH01 at 0.8m**

Material Type: **Red, brown sandy CLAY with gravel.**

	<u>Test Results</u>	<u>Specification</u>
Water Content (%)	18.4	BS EN ISO 17892-1;2014
Liquid and Plastic Limit Tests Carried out in Accordance with BS 1377-Part 2:1990		
	<u>Test Results</u>	<u>Specification</u>
Liquid Limit (%):	35	Part 2 Clause 4.4 (One point method)
Plastic Limit (%):	18	Part 2 Clause 5.3
Plasticity Index (%):	17	Part 2 Clause 5.4
Passing 425mic (%):	75	
Soil Classification:	CL/CI	



Remarks: **None**

Start of Test Date: **06/02/2024**

End of Test Date: **09/02/2024**

Report Date: **09/02/2024**



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CLASSIFICATION OF SOILS

Tests according to B.S. 1377 : 1990

Location: **BH02 at 0.4m**

Material Type: **Brown clayey SAND and GRAVEL**

	<u>Test Results</u>	<u>Specification</u>
Water Content (%)	23.5	BS EN ISO 17892-1;2014
Liquid and Plastic Limit Tests Carried out in Accordance with BS 1377-Part 2:1990		
	<u>Test Results</u>	<u>Specification</u>

Passing 425mic (%):	54
Soil Classification:	NP

Remarks: **Material found to be non-plastic.**

Start of Test Date: **06/02/2024**

End of Test Date: **09/02/2024**

Report Date: **09/02/2024**



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CLASSIFICATION OF SOILS

Tests according to B.S. 1377 : 1990

Location: **BH04 at 0.9m**

Material Type: **Red, brown very sandy CLAY with gravel.**

	<u>Test Results</u>	<u>Specification</u>
Water Content (%)	19.7	BS EN ISO 17892-1;2014
Liquid and Plastic Limit Tests Carried out in Accordance with BS 1377-Part 2:1990		
	<u>Test Results</u>	<u>Specification</u>

Passing 425mic (%):	47
Soil Classification:	NP

Remarks: **Material found to be non-plastic.**

Start of Test Date: **06/02/2024**

End of Test Date: **09/02/2024**

Report Date: **09/02/2024**



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CLASSIFICATION OF SOILS

Tests according to B.S. 1377 : 1990

Location: **TP01 at 0.7m**

Material Type: **Red, brown very sandy CLAY with gravel.**

	<u>Test Results</u>	<u>Specification</u>
Water Content (%)	14.9	BS EN ISO 17892-1;2014
Liquid and Plastic Limit Tests Carried out in Accordance with BS 1377-Part 2:1990		
	<u>Test Results</u>	<u>Specification</u>

Passing 425mic (%):	74
Soil Classification:	NP

Remarks: **None**

Start of Test Date: **06/02/2024**

End of Test Date: **09/02/2024**

Report Date: **09/02/2024**



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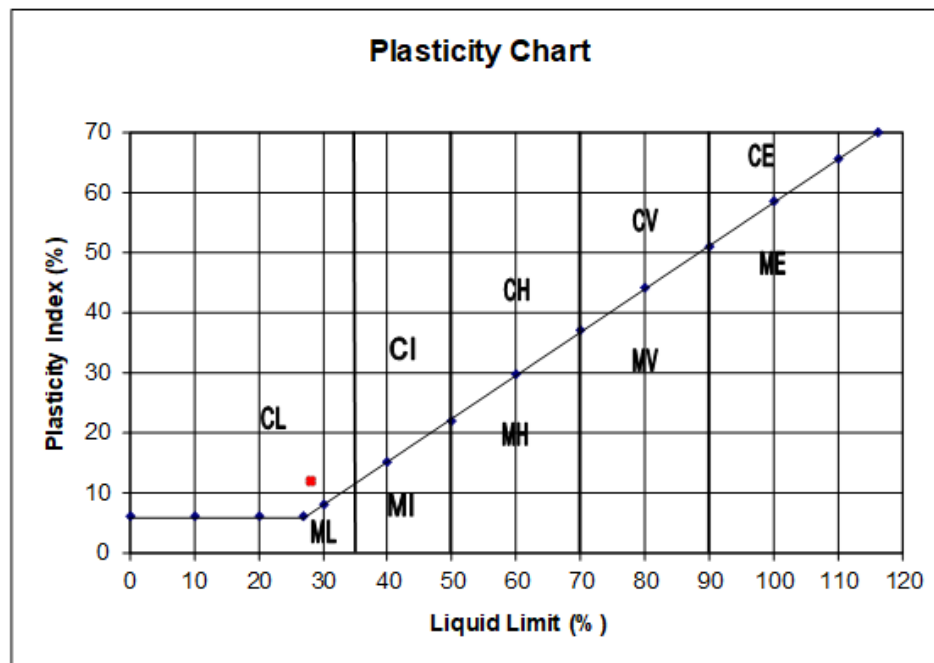
CLASSIFICATION OF SOILS

Tests according to B.S. 1377 : 1990

Location: **TP01 at 1.3m**

Material Type: **Red, brown sandy CLAY with occasional gravel.**

	<u>Test Results</u>	<u>Specification</u>
Water Content (%)	20.1	BS EN ISO 17892-1;2014
Liquid and Plastic Limit Tests Carried out in Accordance with BS 1377-Part 2:1990		
	<u>Test Results</u>	<u>Specification</u>
Liquid Limit (%):	28	Part 2 Clause 4.4 (One point method)
Plastic Limit (%):	16	Part 2 Clause 5.3
Plasticity Index (%):	12	Part 2 Clause 5.4
Passing 425mic (%):	79	
Soil Classification:	CL	



Remarks: **None**

Start of Test Date: **06/02/2024**

End of Test Date: **09/02/2024**

Report Date: **09/02/2024**



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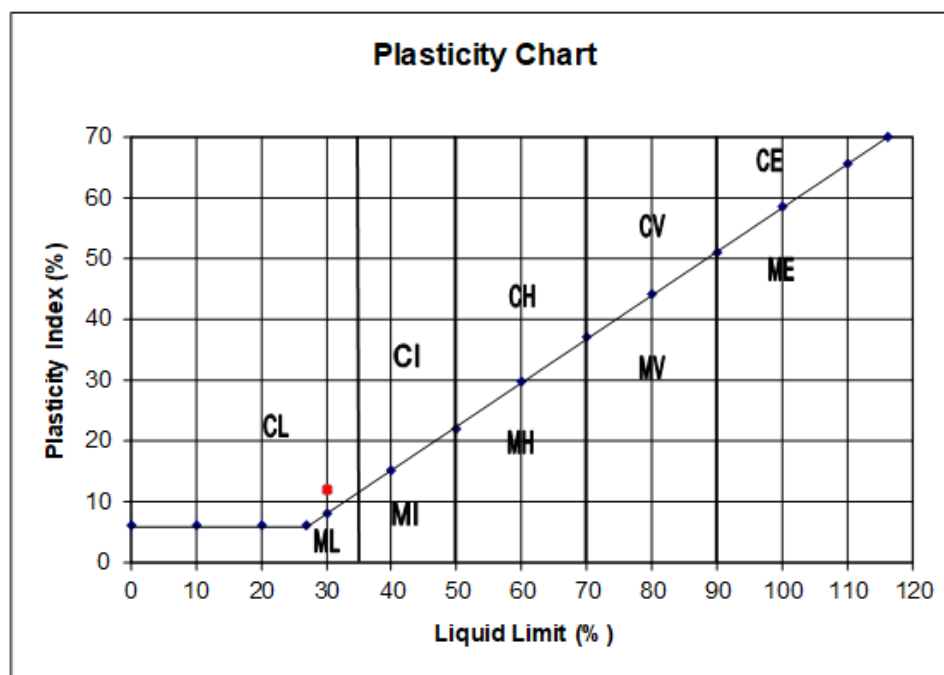
CLASSIFICATION OF SOILS

Tests according to B.S. 1377 : 1990

Location: **TP03 at 0.8m**

Material Type: **Red, brown sandy CLAY with occasional gravel.**

	<u>Test Results</u>	<u>Specification</u>
Water Content (%)	17.0	BS EN ISO 17892-1;2014
Liquid and Plastic Limit Tests Carried out in Accordance with BS 1377-Part 2:1990		
	<u>Test Results</u>	<u>Specification</u>
Liquid Limit (%):	30	Part 2 Clause 4.4 (One point method)
Plastic Limit (%):	18	Part 2 Clause 5.3
Plasticity Index (%):	12	Part 2 Clause 5.4
Passing 425mic (%):	76	
Soil Classification:	NP	



Remarks: **None**

Start of Test Date: **06/02/2024**

End of Test Date: **09/02/2024**

Report Date: **09/02/2024**



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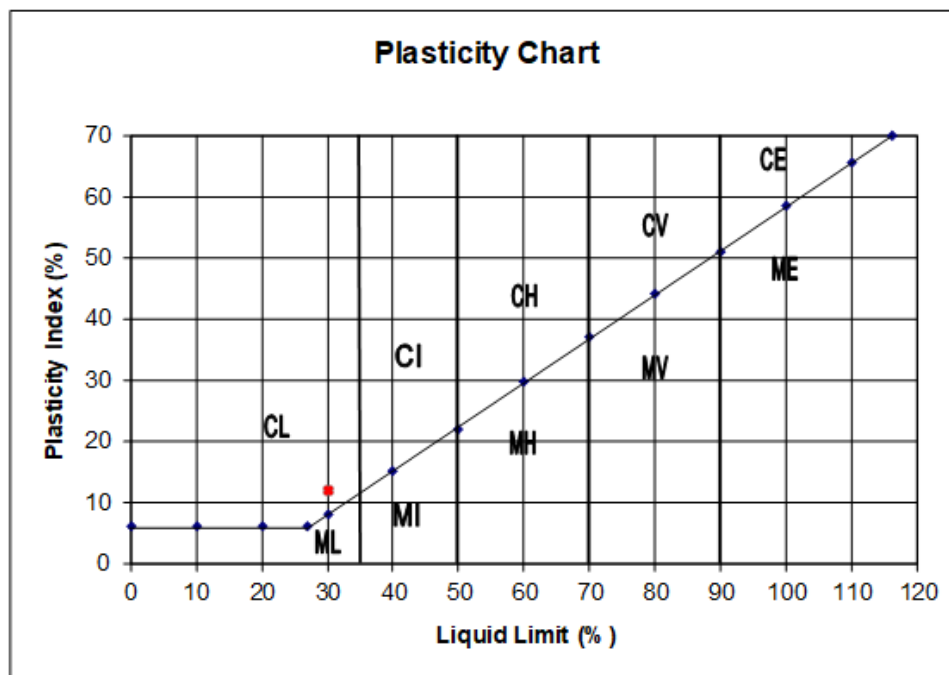
CLASSIFICATION OF SOILS

Tests according to B.S. 1377 : 1990

Location: **TP07 at 1.0m**

Material Type: **Red, brown sandy CLAY with occasional gravel.**

	<u>Test Results</u>	<u>Specification</u>
Water Content (%)	18.0	BS EN ISO 17892-1;2014
Liquid and Plastic Limit Tests Carried out in Accordance with BS 1377-Part 2:1990		
	<u>Test Results</u>	<u>Specification</u>
Liquid Limit (%):	30	Part 2 Clause 4.4 (One point method)
Plastic Limit (%):	18	Part 2 Clause 5.3
Plasticity Index (%):	12	Part 2 Clause 5.4
Passing 425mic (%):	72	
Soil Classification:	CL	



Remarks: **None**

Start of Test Date: **06/02/2024**

End of Test Date: **09/02/2024**

Report Date: **09/02/2024**



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DEVIATING SAMPLE INFORMATION

Comments:

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards. For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling. If Northumberland County Council Laboratory did not undertake the sampling. Such samples may be deviating.

Appendix IV

- GEO Chemical Assessment Sheet

Geo Environmental Engineering Ltd

Chemical Assessment Sheet - Soils

DETS Ref 24-00866

GEO Ref GEO2023-6111

Contract Title RHEDA, FRIZINGTON



Generic Assessment Criteria
Residential With Plant Uptake
2.5% SOM

Lab No	2286996	2286997	2286998	2286999	2287000	2287001	2287002	2287003	2287004	2287005	2287006	2287007	2287008
Sample ID	BH01	BH02	BH03	BH04	BH05	TP01	TP05	TP09	BH02	BH04	BH05	TP03	TP06
Depth	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	1.20	0.90	0.80	1.30	0.80
Soil Type	TOPSOIL	TOPSOIL	TOPSOIL	TOPSOIL	TOPSOIL	TOPSOIL	TOPSOIL	TOPSOIL	W.'ROCK	W.'ROCK	W.'ROCK	W.'ROCK	W.'ROCK

Metals	Method	LOD	Units	TOPSOIL	TOPSOIL	TOPSOIL	TOPSOIL	TOPSOIL	TOPSOIL	TOPSOIL	TOPSOIL	TOPSOIL	W.'ROCK	W.'ROCK	W.'ROCK	W.'ROCK	W.'ROCK	GAC	GAC Exceeded?	GAC Ref:
Arsenic	DETSC 2301#	0.2	mg/kg	10	10	12	12	11	12	10	11							37	No	LQM S4UL
Cadmium	DETSC 2301#	0.1	mg/kg	< 0.1	0.1	< 0.1	0.1	0.1	0.1	0.1	0.1							11	No	LQM S4UL
Chromium III	DETSC 2301*	0.15	mg/kg	16	15	18	20	14	16	16	16							910	No	LQM S4UL
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0							6	No	LQM S4UL
Copper	DETSC 2301#	0.2	mg/kg	15	12	12	12	11	11	12	13							2400	No	LQM S4UL
Lead	DETSC 2301#	0.3	mg/kg	35	31	31	28	34	45	31	30							200	No	CL:AIRE C4SL
Mercury	DETSC 2325#	0.05	mg/kg	0.08	0.05	0.06	0.05	0.06	< 0.05	0.06	0.05							40	No	LQM S4UL
Nickel	DETSC 2301#	1	mg/kg	7.7	5.6	7.4	7.2	7.3	6.1	6.0	5.7							130	No	LQM S4UL
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	0.7	< 0.5	1.0	< 0.5	0.6	< 0.5	< 0.5							250	No	LQM S4UL
Zinc	DETSC 2301#	1	mg/kg	39	36	35	39	37	32	38	75							3700	No	LQM S4UL
Inorganics																				
pH	DETSC 2008#		pH	6.2	6.5	5.4	6.4	5.6	5.7	6.8	4.8	6.5	5.3	6.0	6.2	6.3		N/A	N/A	N/A
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.3	0.4	0.4	0.4	0.5	0.3	0.5	0.4							34	No	ATRISK SSV
Total Organic Carbon	DETSC 2084#	0.5	%	2.7	2.4	2.6	2.0	3.4	1.8	2.6	2.3							-	-	-
Sulphate Aq's Ext' as SO4 (2:1)	DETSC 2076#	10	mg/l	30	17	14	28	24	14	15	12	< 10	< 10	< 10	< 10	< 10		>500	No	BRE
PAHs																				
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1							5.6	No	LQM S4UL
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1							420	No	LQM S4UL
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1							510	No	LQM S4UL
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1							400	No	LQM S4UL
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1							220	No	LQM S4UL
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1							5400	No	LQM S4UL
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	0.2	< 0.1	< 0.1	< 0.1							560	No	LQM S4UL
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	0.2	< 0.1	< 0.1	< 0.1							1200	No	LQM S4UL
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1							11	No	LQM S4UL
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1							22	No	LQM S4UL
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1							3.3	No	LQM S4UL
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1							93	No	LQM S4UL
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1							2.7	No	LQM S4UL
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1							36	No	LQM S4UL
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1							0.28	No	LQM S4UL
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1							340	No	LQM S4UL
PAH 16 Total	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6							-	-	-
Asbestos				NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD							Presence	No	-

Notes:

GAC = Generic Assessment Criteria

YES = GAC Exceeded

CLEA SGV = Clea Soil Guideline Value (Residential with Plant Uptake End Use based on 2.5% SOM)

LQM S4UL = LQM/CIEH 'Suitable 4 Use Levels' S4ULs (Residential with Plant Uptake End Use based on 2.5% SOM)

CL:AIRE C4SL = Category 4 Screening Levels (Residential with Plant Uptake End Use based on 2.5% SOM)

ATRISK SSV = Atkins Soil Screening Values (Residential with Consumption of Home Grown Produce at 2.5% SOM)



GEO Environmental Engineering Ltd

Geotechnical and Environmental
Consultants
&
Drilling Experts

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