



Geotechnical Letter Report

Site: Heolgerrig Garage

Prepared For: Utopia Design Architectural Services

Issue Date: October 2025

Job No: TF-25-318-CA

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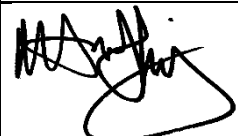
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SECTION 1 Introduction & Proposed Development

1.1 Background

Steven Budding (the client) is proposing the development of a home garage at Lle Hyfryd, Mount Pleasant, Heolgerrig, Merthyr Tydfil, CF48 1RY. Terra Irma were appointed by the Client to undertake a Geotechnical Investigation of the site. The purpose of the investigation was to:

- Investigated the type, strength and bearing characteristics of the shallow superficial and underlying solid geology
- Provide engineering foundation and floor slab recommendations for the proposed development

The proposed development is shown below in **Figure 1.1**.

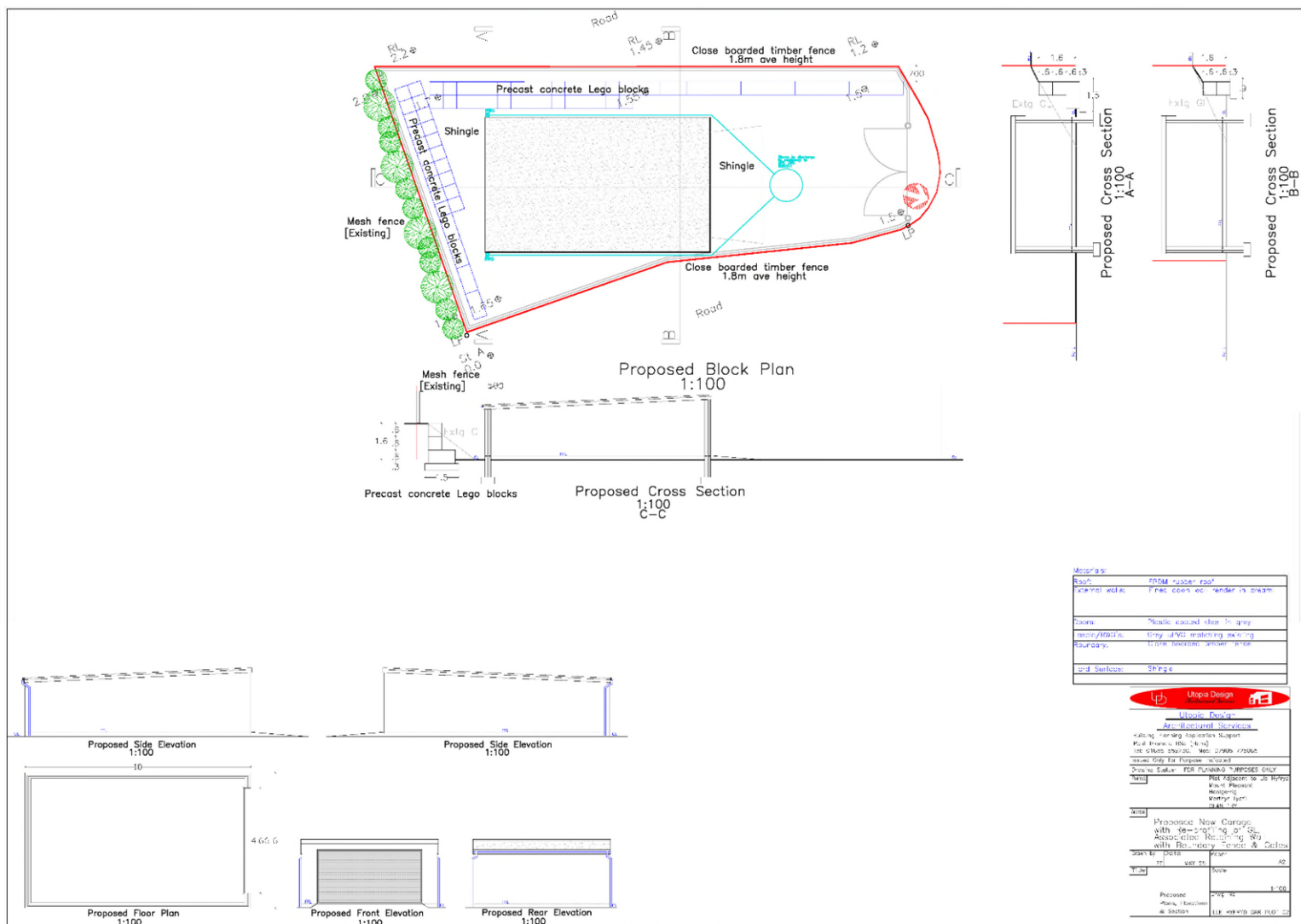


Figure 1.1 Proposed Site Layout

Utopia Design Architectural Services are the Consulting Architects on the project.

TFW Group Ltd (Terra Firma) have been commissioned by Utopia Design Architectural Services on behalf of the Client to undertake a Geotechnical recommendation, not including a Tier 1

Environmental and Geotechnical Desk Study + Coal Mining Risk Assessment, and not including a Tier 2 Environmental and Geotechnical Investigation.

This report contains a Geotechnical Report

In accordance with BS EN 1997-1:2004+A1:2013, the proposed development comprises the following geotechnical category:

Geotechnical Category 2: conventional types of structures and foundation with no exceptional risk of difficult soil or loading conditions (e.g., spread, raft & pile foundations; retaining structures; excavations; earthworks and ground anchors).

1.2 Information Sources

The following sources of information have been referenced in support of this assessment:

- British Geological Map Sheet (**Ref. SO00NW0 1972**)
- Client provided information, plans etc. (**Drawing 01**); and

1.3 Roles & Responsibilities

Table 1.1 Roles and Responsibilities

Role	Organisation	Contact Details
Client	Steve Budding	steven.budding1@btinternet.com
Geotechnical/Geoenvironmental Engineer	TFW Group LTD	cardiff@tfwgroup.co.uk
Architect	Utopia Design Architectural Services	utopiadass@hotmail.com
Local Authority	Merthyr Tydfil County Borough Council	01685 725000

1.4 Physical Setting & Current Site Use

The development site is triangular in shape and locates just off. The site centres on an approximate Mount Pleasant, Heolgerrig, Merthyr Tydfil, CF48 1RY, National Grid Reference of SO 03340 06341 occupying a plan area of approximately 0.024 hectares.

The site outlined in red is a large irregularly shaped area with features you would expect to find at a residential estate.

The boundary on the south north and east follows that of a road with an housing estate on the other side housing estate with the boundary to the west being another housing estate.



Drawing 01 Site Location

1.5 Geological Setting

1.5.1 Geological Mapping

The 1:10,560 scale British Geological Survey maps of the area, Sheet SO00NW respectively, and the online BGS GeoIndex map viewer were consulted for geology underlying the site.

Detailed stratigraphical information beneath the site is provided in **Table 2.1**.

Table 1.1 Detailed Stratigraphical Information

Age	Formation	Description
Carboniferous period	South Wales Lower Coal Measures Formation	Grey, (productive) coal-bearing mudstones/siltstones, with seatearths and minor sandstones. The base is taken at the base of the Subcrenatum Marine Band (as defined by Stubblefield and Trotter, 1957), where marine, fossiliferous mudstones at the base of the marine band conformably overlie the topmost mudstones or sandstones of the Marros Group. The Formation rests unconformably on Dinantian or Devonian strata in the Berkshire and Kent coalfields. The top is taken at the base of the Vanderbeckei (Amman) Marine Band (as defined by Stubblefield and Trotter, 1957), where basal fossiliferous, marine mudstone of the marine band conformably overlies the top of the Amman Rider Coal (and its equivalents).

Superficial deposits are recorded as, Quaternary Till is unsorted and unstratified drift, generally overconsolidated, deposited directly by and underneath a glacier without subsequent reworking by water from the glacier. It consists of a heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape (diamicton). Synonym: boulder clay. Obsolete: pinnel.

Given the proximity of a substantial colliery spoil heap situated less than 20 m from the site (referenced on Sheet SO00NW), it is anticipated that some degree of additional made ground and associated overfill material may be present across the site

An extract of the geological map is presented on **Figure 2.2 (Below)**

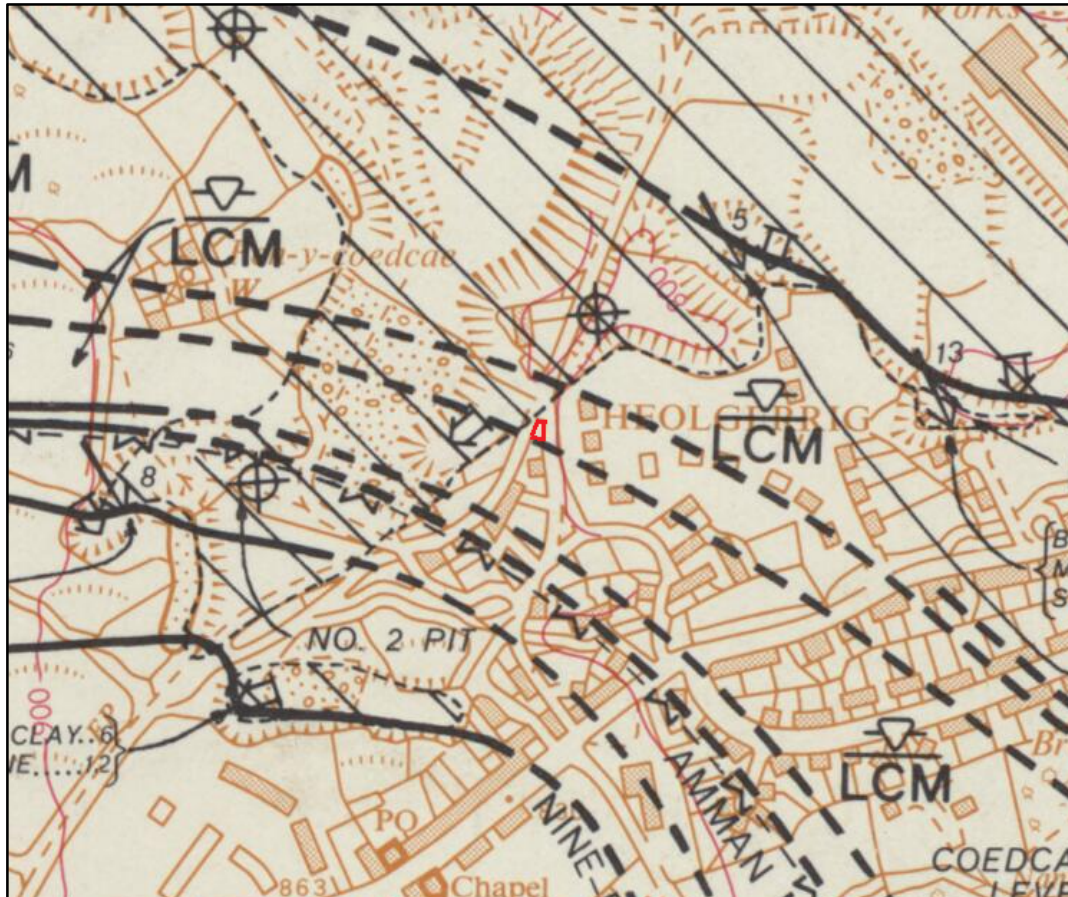


Figure 1.1 Geological Map Extract (Reference SO00NW)

1.5.2 BGS Borehole Information

A search of the British Geological Survey (BGS) GeoIndex has been undertaken for available borehole records on, or in proximity to the site.

BGS does not hold any relevant borehole logs within 200m of the site.

SECTION 2 Field Investigation

2.1 Site Works

A supplementary geoenvironmental site investigation comprising 3 trial pits was undertaken on the 22nd of August.

The fieldwork was supervised by Terra Firma, who logged the exploratory holes to the requirements of BS 5930:2015+A1:2020. The proposed locations of the exploratory holes were determined by Terra Firma in general accordance with BS 10175:2011+A2:2017.

The supplementary exploratory hole locations are presented on **Drawing 02**.



The Trial pit logs are presented in **Annex A**.

2.2 Ground Conditions

The ground conditions encountered by the exploratory holes can in general be summarised as shown in **Table 3.1**.

Table 2.1 Summary of Typical Ground Conditions

Depth (m)			Thickness (m)	Stratum
0.00	-	0.70/1.10	0.70/1.10	Medium dense blackish mottled blueish grey very silty sandy GRAVEL . Gravel is fine to coarse subangular laminated of mudstone. and siltstone.(Made Ground)
0.70/1.10	-	0.92/1.80	0.22/0.70	Soft light greyish brown mottled white silty sandy slightly gravelly CLAY . Gravel is fine and medium subangular of mudstone and siltstone. (Made Ground)
0.92/1.80	-	1.88/2.07	0.96/0.27	Soft light greyish brown mottled white silty sandy slightly gravelly CLAY . Gravel is fine and medium subangular of sandstone with frequent subangular cobble of sandstone

2.3 Groundwater

Groundwater was not encountered in any of the exploratory holes.

2.4 Stability and Obstructions

Trial pits remained stable and vertical during excavation

2.4.1 Sampling Strategy

Soil sampling locations were selected on a non-targeted basis to characterise the geotechnical status of a defined area of a site. A triangular sampling pattern was adopted.

Sample locations and depths are summarised in **Table 3.2**:

Table 2.2 Sample Locations, Depths and Targets

Location	Depth (m)	Targets
TP01	0.20	BRE SD1 Suites
TP01	1.80	Atterberg Limit 1 Point Method
TP02	0.70	BRE SD1 Suites
TP03	1.80	Atterberg Limit 1 Point Method

SECTION 3 Laboratory Geotechnical Testing

3.1.1 Laboratory Geotechnical Testing

A schedule of laboratory tests was prepared by Terra Firma, and samples were despatched to the accredited laboratories of GSTL/Apex Testing Solutions*. A summary of the testing carried out is presented in **Table 3.1**.

Table 3.1 Summary of Geotechnical Testing

Geotechnical Test	No. Samples Tested
Moisture Content	2
4 Point Liquid and Plastic Limit	2
BRE SD1 (Concrete classification)	2

The geotechnical test results are presented in **Annex B**.



SECTION 4 Laboratory Geotechnical Testing Results Analysis

Laboratory geotechnical testing results are summarised in the following sections and presented in their entirety in **Annex B**.

4.1 Soil Testing

4.1.1 Plasticity & Moisture Content Testing

During the investigation two samples of the shallow cohesive material was obtained and submitted for plasticity and moisture content testing. The test results are summarised in Error! Reference source not found..

Table 4.1 Plasticity & Moisture Content Test Results

Location	Depth (m)	Geological Description	Moisture Content (%)	Plasticity Index (%)	Passing 425µm Sieve (%)	Modified Plasticity Index (%)	Volume Change Potential
TP01	1.80	Soft light greyish brown mottled white silty sandy slightly gravelly CLAY . Gravel is fine and medium subangular of sandstone with frequent subangular cobble of sandstone	32.0	29.0	90	25.2	Medium
TP02	1.80	Soft light greyish brown mottled white silty sandy slightly gravelly CLAY . Gravel is fine and medium subangular of sandstone with frequent subangular cobble of sandstone	28.0	25.0	99	24.75	Medium

In line with the NHBC:2024 (Chapter 4.2), the modified plasticity index for each sample was calculated.

For design purposes the shallow soils on site must be considered to have a medium volume change potential.

4.1.2 Concrete Classification Testing

Two samples were subject to testing for concrete classification in accordance with BRE SD1:2015. The results are summarised in Error! Reference source not found.

Table 4.2 BRE SD1 Testing Summary

Location	Depth (m)	2:1 Water/Soil Extract	Total Sulphur (%)	pH	Total Potential Sulphate (%)	Oxidisable Sulphides (%)
		SO ₄ (mg/l)				
TP01	0.20	10	0.39	6.1	1.170	1.140
TP02	0.70	32	0.40	6.1	1.200	1.00

Notes:

The following stoichiometric equation was employed to determine the Total Potential Sulphate (TPS). $TPS (\% \text{ as } SO_4) = 3.0 \times \text{Total Sulphur (TS \% as S)}$.

The amount of Oxidisable Sulphides (OS as %SO₄) has been conservatively calculated by the following equation. $OS = TPS - \text{Acid Soluble Sulphate (AS)}$.

Based on results obtained, the characteristic values are provided below.

Sulphate (2:1 Water Soluble) as SO₄: 32mg/l
pH: 6.1

Total Potential Sulphate (TPS): 1.2%

The initial classification for the site based on sulphate (2:1 Water Soluble) as SO₄ is Design Sulphate (DS) Class DS-1. The Aggressive Chemical Environment for Concrete (ACEC) Class for the site based on sulphate (2:1 Water Soluble) as SO₄, mobile water and pH is AC-1.

However, due to the potential presence of sulphides (eg, pyrite/ gypsum) additional consideration is required.

A significant number of samples contained oxidisable sulphides of greater than 0.3%, signifying the likely presence of sulphides. Therefore, the TPS concentrations need to be considered in this assessment.

The DS class for the site base on the TPS is DS-1.

Based on the above assessment the DS Class for the site is determined as DS-1, and the ACEC Class is AC-1.

The test results can be found in **Annex B**.



SECTION 5 Geotechnical Recommendations

5.1 Foundation Recommendations

RAFT

Due to the variable nature and depth of the made ground, mass concrete strip or pad foundations are not considered feasible for the development, where unfavourable differential settlements between foundations are anticipated.

It is therefore recommended that a raft foundation is adopted for the proposed development.

An allowable bearing pressure of 50kN/m² may be used for design purposes. For the given foundation solution founded within the above materials, a maximum total settlement of <25mm can be expected. Differential settlement of foundations should not lead to structural distortion of more than 1:750. In order to protect the formations from the effect of frost heave and or thermal shrinkage the edge beams should extend down to 750mm. Alternatively the non frost susceptible materials should extend down to the above quoted depth.

Any soft spots/areas should be removed from beneath the proposed raft foundation and replaced with well compacted imported granular materials as previously described.

The raft should be founded on a 200mm layer of well compacted imported granular material. DTp Type 1 or 2 granular sub-base should be used for this purpose, compacted in layers in accordance with the Specification for Highway Works.

Suitability of the compaction should be confirmed by in-situ plate load and density testing.

5.2 Retaining Walls

Due to the sloping nature of the site, retaining walls may be required. The existing steepness of any embankments should not be increased. Any cuts should be undertaken in small sections and in such a way so as not to induce any instability to the ground.

Effective shear parameters for retaining wall design are presented in **Table 5.1**.

Table 5.1 Effective Shear Stress Parameters

Stratum Description	Bulk Unit Weight (γ) kN/m ³	Effective Cohesion (c') kN/m ²	Effective Angle of Shearing Resistance (ϕ') degrees
Granular Made Ground	18	0	28
Soft cohesive Made Ground	18	0	23
Soft cohesive soils	18	0	25
Well compacted, granular materials, compacted as per Specification for Highway Works and other relevant guidance such as British Standards (BS) 6031: 1981. Code of Practice for Earthworks.	19 – 20	0	30 - 35

The parameters are based on experience in similar ground conditions.

The materials to be in-filled behind the retaining wall must be placed at or close to its optimum moisture content/maximum dry density and compacted in layers as per the requirements of the Specification for Highway Works. During the earthworks suitable in-situ testing must be carried out to ensure that the compaction process is achieving the required maximum dry density to achieve at least 95% compaction.

The acceptability of the filling works must be verified by appropriate on site testing. A certification report must also be prepared on the earthworks by a suitably qualified Geotechnical Engineer.

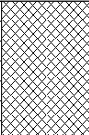
Appropriate drainage must be incorporated in the design to prevent the build-up of hydrostatic pressure.

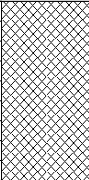
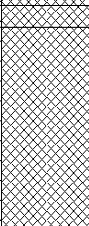
Appropriate cutting and benching of the existing slope must be conducted prior to the replacement of any imported fill to minimise the risk of any slip surfaces forming on the interface between the existing imported materials.

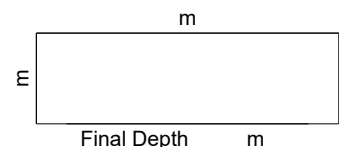


ANNEX A
Trial Pit Logs



			Consulting Geotechnical, Geo-Environmental Engineers & Site Investigation Contractors Phone: 033 022 36380 Email: hello@tfwgroup.co.uk			Cardiff Office 5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA			Exeter Office The Slate Barn Lower Lowley Dunsford Exeter EX6 7BP			Portsmouth Office Technopole Kingston Crescent North End Portsmouth PO2 8FA			Borehole No. TP01 Sheet 1 of 1		
Project Name Mount Pleasant Garage						Project No. TF-25-318-CA			Date 22/08/2025 to 22/08/2025						Hole Type TP		
Client						Co-ords E: 303353.54 N: 206346.87 L:			Water Strike Details						Logged By		
									Depth Strike			Remarks					
Contractor				Plant Used								Approved By					
															Scale 1:50		
Samples and Results			Depth, (Thickness)	Level	Stratum Description								Legend				
Results	Type	Depth															
			(0.70)	1	Medium dense blackish mottled blueish grey very silty sandy GRAVEL. Gravel is fine to coarse subangular laminated of mudstone. and siltstone.												
			0.70		Medium dense greyish blue occasionally mottled brown silty slightly sandy subangular laminated friable siltstone and mudstone GRAVEL.												
			(0.71)														
			1.41 (0.23)		Dense black mottled greyish blue slightly clayey silty gravelly fine and medium SAND. Gravel is fine to coarse subangular of laminated friable mudstone and siltstone.												
			1.64 (0.24)	2	Soft light greyish brown mottled white silty sandy slightly gravelly CLAY. Gravel is fine and medium subangular of sandstone.												
			1.88														
				3													
				4													
Remarks															m E Final Depth m		
Pit Stability:																	
Notes: For all symbols and abbreviations please see key sheet. All depths and measurements in metres. Stratum thicknesses given in brackets.																	

			Consulting Geotechnical, Geo-Environmental Engineers & Site Investigation Contractors Phone: 033 022 36380 Email: hello@tfwggroup.co.uk			Cardiff Office 5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA			Exeter Office The Slate Barn Lower Lowley Dunsford Exeter EX6 7BP			Portsmouth Office Technopole Kingston Crescent North End Portsmouth PO2 8FA			Borehole No. TP02 Sheet 1 of 1			
Project Name Mount Pleasant Garage							Project No. TF-25-318-CA			Date 22/08/2025 to 22/08/2025						Hole Type TP		
Client							Co-ords E: 303341.83 N: 206354.36 L:			Water Strike Details						Logged By		
										Depth Strike			Remarks					
Contractor				Plant Used									Approved By					
																Scale 1:50		
Samples and Results			Depth, (Thickness)	Level	Stratum Description								Legend					
Results	Type	Depth																
					Medium dense blackish mottled blueish grey very silty sandy GRAVEL. Gravel is fine to coarse subangular laminated of mudstone.													
			1	0.92 (0.11) 1.03	Soft light greyish brown mottled white silty sandy slightly gravelly CLAY. Gravel is fine and medium subangular of mudstone and siltstone. Dense black mottled greyish blue slightly clayey silty gravelley fine and medium SAND. Gravel is fine to coarse subangular of laminated friable mudstone and siltstone.													
			2	2.04														
			3															
			4															
Remarks															m E Final Depth m			
Pit Stability:																		
Notes: For all symbols and abbreviations please see key sheet. All depths and measurements in metres. Stratum thicknesses given in brackets.																		



ANNEX B
Laboratory Soil Geotechnical Test
Results





Laboratory Report



Contract Number: 80544

Client Ref: **25-318**

Client PO: **25-318**

Date Received: **01-09-2025**

Date Completed: **16-09-2025**

Report Date: **16-09-2025**

Client: **Terrafirma Wales Ltd**

This report has been checked and approved by:

Contract Title: **25-318**

For the attention of: **Sam Williams**

Darren Bourne
Quality Senior Technician

Description	Qty
Determination of water content BS EN ISO 17892-1:2014 - @ Non Accredited Test	2
1 point Liquid & Plastic Limit.. BS EN ISO 17892-12 - * UKAS	2
BRE Reduced Suite includes pH, water & acid soluble sulphate and total sulphur Sub-contracted Test#	2

Notes: Observations and Interpretations are outside the UKAS Accreditation

* - denotes test included in laboratory scope of accreditation

- denotes test carried out by approved contractor

@ - denotes non accredited tests

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 test report/certificate shall not be reproduced except in full, without the approval of GEO Site & Testing Services Ltd. Any opinions or interpretations stated - within this report/certificate are excluded from the laboratories UKAS accreditation.

Approved Signatories:

Brendan Evans (Senior Office Administrator) - Brendan Evans (Business Support Co-ordinator) - Darren Bourne (Quality Senior Technician)

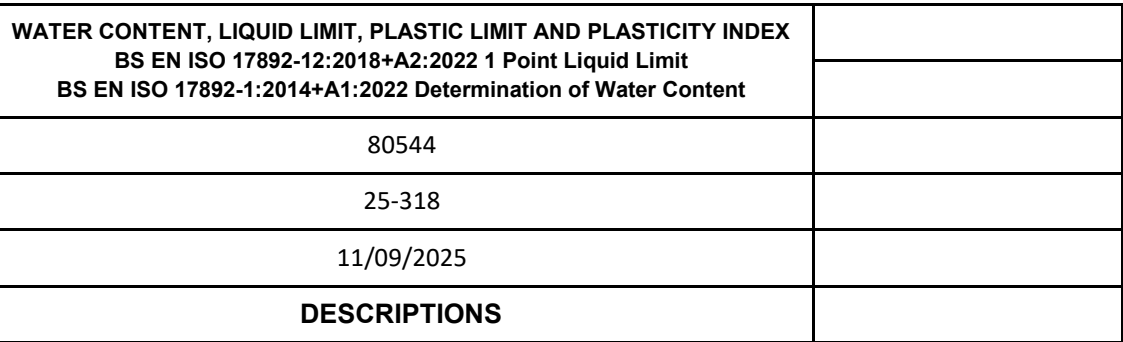
Luke Williams (Laboratory Technician) - Paul Evans (Director) - Richard John (Quality/Technical Manager)

Shaun Jones (Laboratory manager) - Shaun Thomas (Site Manager) - Wayne Honey (HR & HSE Manager)

GEO Site & Testing Services Ltd

Unit 3-4 Heol Aur, Dafen Ind Est, Llanelli, Carmarthenshire SA14 8QN

Tel: 01554 784 040 Fax: 01554 784 040 info@gstl.co.uk https://gstl.co.uk

[illegible]

Operator
Clayton Jenkins



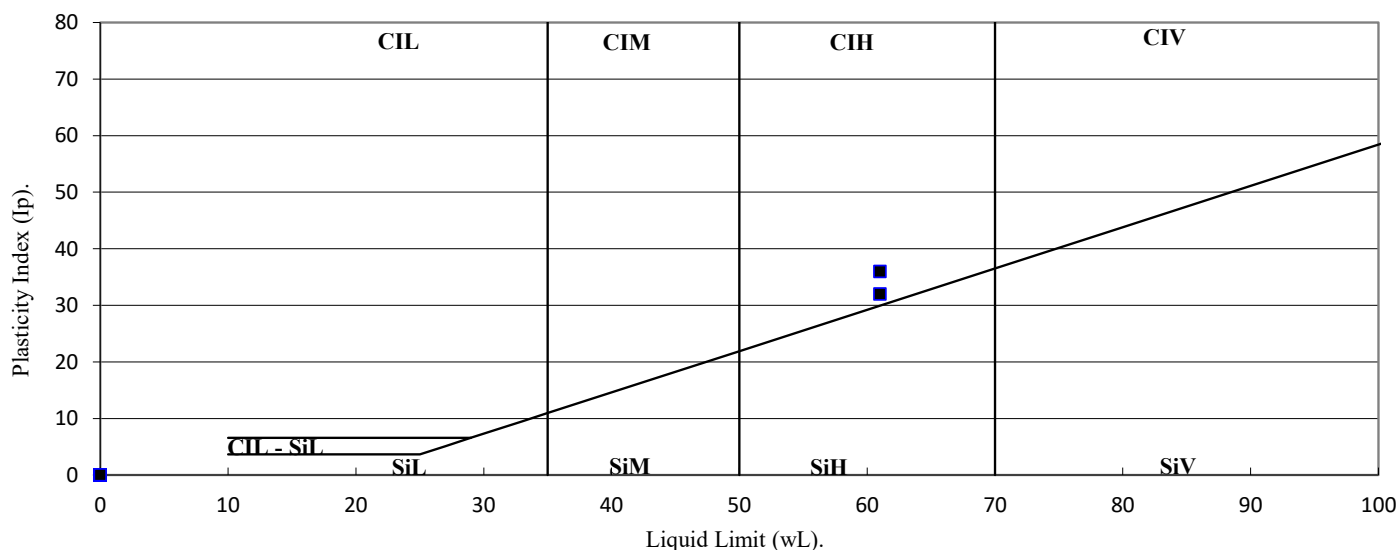
Contract Number	80544	
Project Name	25-318	
Date Tested	11/09/2025	
Test Comments	80g/30° Fall cone used	

[illegible]

SYMBOLS : NP = Non Plastic

PLASTICITY CHART

BS EN ISO 14688-2:2018 Clause 4.4



***For sample descriptions please see sample descriptions sheet**

Operator
Clayton Jenkins

Analytical Test Report **L25/09172/GSL/25-80460**

Clients Project Reference 25-318

Clients Order Number 80544

Sample(s) Analysed 2

Sample(s) received / instructed 04/09/2025 / 04/09/2025

Sample(s) Tested 05/09/2025 to 11/09/2025

Report issued 12/09/2025

Report issue number 1

Tested on Behalf of

GSTL

Unit 3-4 Heol Aur

Dafen Ind Estate

Dafen

SA14 8QN

Signed



James Gane
Analytical Services Manager

Notes:

General

This report shall not be reproduce except in full

Please refer to Methodologies page for details pertaining to the analytical methods undertaken.

Samples were supplied by customer, results apply to the samples as received.

Samples will be retained for 14 days after issue of this report unless otherwise requested.

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Uncertainty of measurement values are available on request.

Moisture Content was determined in accordance with CTS method statement MS - CL - Sample Prep, oven dried at <30°C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Stone Content was determined in accordance with CTS method statement MS - CL - Sample Prep and refers to the percentage of stones retained on a 10mm BS test sieve.

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Deviating Samples

On receipt samples are compared against our sample holding and handling protocols, where any deviations have been noted these are reported on our deviating sample page (if present)

Accreditation Key

U = UKAS Accreditation, M = MCERTS Accreditation, N = Unaccredited, SC = Subcontracted

L25/09172/GSL/25-80460

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Analytical Test Results - ENV Analysis Soils

Lab Reference				585321	585322
Client Sample ID				-	-
Client Sample Location				TP01	TP02
Client Sample Type				-	-
Client Sample Number				-	-
Depth - Top (m)				0.2	0.7
Depth - Bottom (m)				0.2	0.7
Date of Sampling				-	-
Time of Sampling				-	-
Sample Matrix				Sand	Sand
Determinant	Units	LOD	Accreditation		
pH	pH units	1	M	6.1	6.1
Water Soluble Sulphate (as SO ₄)	mg/L	10	N	< 10	32
Total Sulphur Content (as S)	%	0.01	U	0.39	0.40
Acid Soluble Sulphate	%	0.01	N	0.03	0.20

L25/09172/GSL/25-80460

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Sample Descriptions

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
585321	-	TP01	SOIL	-	Black gravelly slightly clayey silty sand with occasional mudstone	-	-	93
585322	-	TP02	SOIL	-	Black gravelly slightly clayey silty sand with occasional mudstone	-	-	78

L25/09172/GSL/25-80460

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Analysis Methodologies - Please refer to sample comments page (if present) for any changes to methods Methods

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preparation	Test Details
1377PREP	BS1377 Prep			Sample preparation of Soil for testing in accordance with BS1377:Part 3
1377TS-ELT	BS1377 Total Sulphur Content by HTC	Oven dried	BS1377 : Part 1 : 2016	Total Sulphur Content testing of Soil in accordance with BS 1377 : Part 3 : 2018 + A1 : 2021 Clause 7.10 (using Eltra CS-800 Analyser)
ANIONSEXS	MS - CL - Anions by Aquakem (E)		Passing 2mm test sieve	Extraction of soils for Anions analysis in accordance with MS - CL - Anions by Aquakem
ANIONSS	MS - CL - Anions by Aquakem (2:1Extract)	Oven dried	Passing 2mm test sieve	Determination of Anions (inc Sulphate, chloride etc.) in soils by Aquakem. Analysis is based on a 2:1 water to soil extraction ratio
ASSO4EXS	MS - CL - Acid Soluble Sulphate (E)			Extraction of soil for total sulphate in accordance with MS - CL - Acid Soluble Sulphate
ASSO4S	MS - CL - Acid Soluble Sulphate	Oven Dried	Passing 2mm test sieve	Determination of total sulphate in soils by acid extraction followed by ICP analysis
PHS	MS - CL - pH in Soils	As received	Passing 10mm test sieve	Determination of pH in soils using a pH probe (using a 1:3 soil to water extraction)
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis

L25/09172/GSL/25-80460

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Sample Deviations

Deviations are listed below against each sample and associated test method, where deviation(s) are noted it means data may not be representative of the sample at the time of sampling and it is possible that results provided may be compromised.

Observations on receipt

A - No date of sampling provided

No time of sampling provided

C - Received in inappropriate container

H - Contains headspace

T - Temperature on receipt exceeds storage temperature

R - Sample(s) received with less than 2 hours for testing to commence/complete, any result formally classed as deviating will be marked with an X against the applicable test (i.e. RX)

Observations

X - Exceeds

whilst in laboratory

sampling to extraction or analysis timescales

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Test	Deviations
585321		TP01	SOIL			A
585322		TP02	SOIL			A

**ANNEX C Site
Photographs**





TP01





TP02





TP03





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