



Colomendy Industrial Estate Depot

Geotechnical Report

Cyngor Sir Ddinbych

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CONTENTS

1.0	INTRODUCTION	1
2.0	THE SITE	2
2.1	Site Location and Description	2
2.2	Geology and Hydrogeology	3
2.3	History	3
2.4	Radon	4
2.5	Potential Contamination	4
3.0	PROPOSED DEVELOPMENT	5
4.0	SITE INVESTIGATION	6
4.1	Previous Site Investigations	6
4.2	This Investigation	6
4.3	Laboratory Testing	7
5.0	GROUND CONDITIONS	9
5.1	General Stratigraphy	9
5.2	Made Ground	9
5.3	Topsoil	10
5.4	Cohesive Superficial Deposits	10
5.5	Granular Horizons	12
5.6	Bedrock	13
5.7	Groundwater	13
5.8	Ground Conditions; Western Road Widening	13
6.0	RESULTS OF CHEMICAL TESTING	15
7.0	GEOTECHNICAL RECOMMENDATIONS	16
7.1	EXCAVATIONS AND SITE PREPARATIONS	16
7.2	EARTHWORKS CONSIDERATIONS	16
7.3	FOUNDATION RECOMMENDATIONS	17
7.3.1	Proposed Structure	17
7.4	PROTECTION OF BURIED CONCRETE	18
7.5	PAVEMENT DESIGN	18
7.6	SURFACE WATER DRAINAGE	19
7.7	POTENTIAL CONTAMINATION	19
7.8	ADDITIONAL GROUND INVESTIGATION	19
	REFERENCES	20

FIGURES

- Figure 1** Exploratory Hole Location Plan – Main Site
Figure 2 Exploratory Hole Location Plan – Ffordd y Graig Road Widening

APPENDICES

- Appendix A** Site Photographs
Appendix B Window Sample Borehole Logs
Appendix C Trial Pit Logs & Photos
Appendix D CBR Charts (Main Site & Road Widening)
Appendix E Hand Pit Logs (Road Widening)
Appendix F Pavement Investigation Factual Report (Asphalt Cores)
Appendix G Geo Classification Test Results (Celtest; Trial Pit Samples)
Appendix H Geo Classification Test Results (CCG; boreholes and HP Samples)
Appendix J Chemical Test Results

1.0 INTRODUCTION

Denbighshire County Council / Cyngor Sir Ddinbych (DCC) propose to construct a new depot on undeveloped land adjacent to the Colomendy Industrial Estate in Denbigh.

Daear GeoConsulting (Daear) has been appointed to carry out a preliminary geotechnical ground investigation and interpretative report for the proposed development.

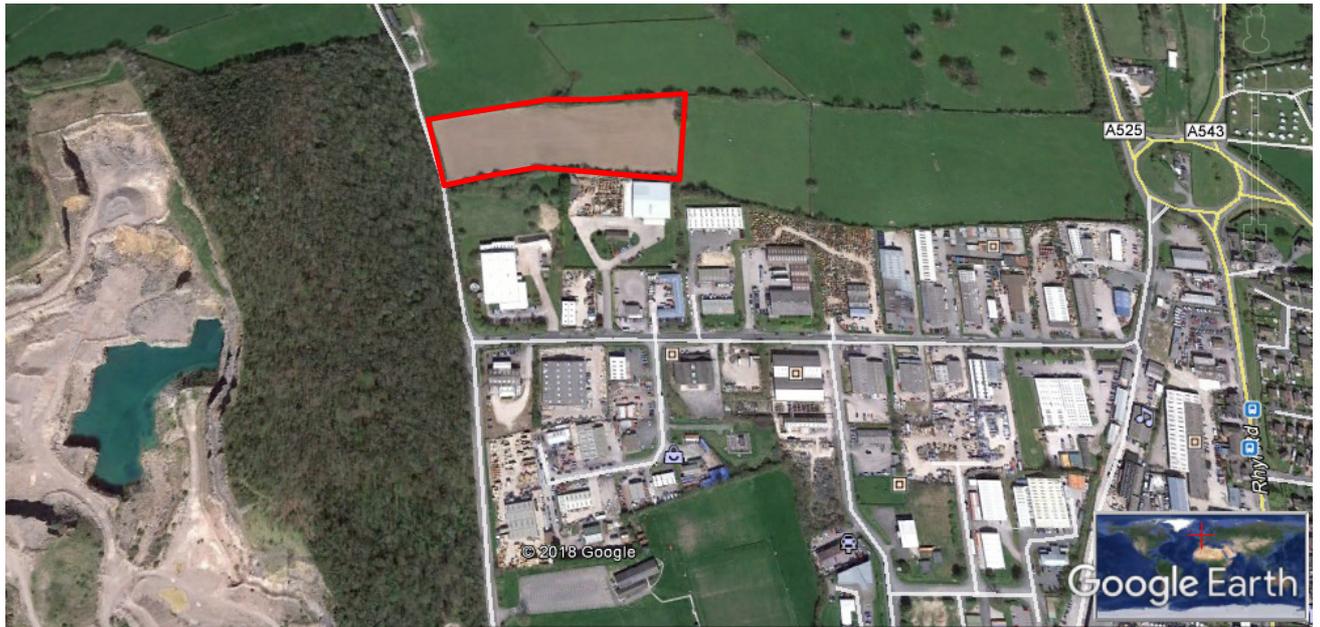
This report presents the findings of the desk study and ground investigation and provides firm geotechnical recommendations for the proposed development.

An Envirocheck report of the site has been issued under separate cover.

2.0 THE SITE

2.1 Site Location and Description

The site is located directly north, and adjacent to the Colomendy industrial estate, on the northern fringe of the Town of Denbigh, at approximate national grid reference SJ053674. A small narrow field separates it from the industrial estate along the western half of the southern site boundary, see below.



The site is rectangular in shape, measuring approximately 250m E-W and 85m N-S. It is accessed from Ffordd y Graig road, which runs along the western site boundary. Agricultural fields lie to the north and east, and the industrial estate to the south; a limestone quarry lies approximately 250m west of the site, separated by a densely wooded slope.

Ffordd y Graig road is at an elevation of approximately 94mAD adjacent to the NW site boundary, falling to approximately 90.5mAD by the SW boundary, and is on a slight embankment, 0.5m – 1.0m above the site level.

The gradient of the site generally falls from west to east, with ground levels (mAD) falling from approximately 92.5m (NW) to 90.5m (SW) along the western boundary to between 81.5m (NE) and 80m (SE) at the eastern site boundary. The gradient in the western third of the site is slightly steeper at approximately 1:15, reducing to approximately 1:30 in the East.

Overhead electricity cables cross the eastern site area, and a high pressure gas main cross the center of the site.

There is a small ditch running along the southern site boundary and a small stream, likely seasonal, originating from a pond mid way along the northern site boundary and running adjacent to the northern site boundary.

Photographs of the site are presented in Appendix A.

It is also proposed to widen Ffordd y Graig road to the west to form a new entrance into the site. The western edge of the road is in a slight cutting, which is approximately 1.1m high and at a gradient of approximately 35 to 40°. The land to the west of the cutting rises at a gentle gradient for approximately 20m or so before rising steeply as the limestone bedrock is exposed.

2.2 Geology and Hydrogeology

The geology of the site has been studied on the BGS geindex online database using the 1:50,000 scale coverage, Ref. 1.

Superficial deposits are shown to comprise glacial till which are likely to be present beneath the entire site area.

The bedrock is shown to comprise Carboniferous Limestone beneath the west of the site and Kinnerton Sandstone beneath the west of the site. A fault separates the two rock types, which runs across the site in a N-S direction.

The limestone is quarried approximately 250m west of the site.

Groundwater and surface water flows are likely to be to the east, following the local topography.

The glacial till is likely to be a low permeability stratum, with groundwater flows limited to the near surface topsoil and subsoils and any granular horizons within the strata.

Groundwater flows are likely to be controlled by fissure flows within the limestone and intergranular flows within the sandstone.

2.3 History

The history of the site has been researched from Ordnance Survey maps dating from 1880.

The historical maps do not show any evidence of development on the site itself, which has remained as agricultural land since the first edition OS map in 1879, without any significant change to the field boundaries.

The Colomendy industrial estate, which is present along the southern site boundary was first shown on OS maps in 1978, comprising a number of small units identified as small factories, engineering works, warehouses and a bakery. The industrial estate is currently made of a mixture of light industrial, commercial and retail premises.

A large limestone quarry measuring approximately 750m NS and up to 300mEW is located approximately 250m west of the site. The quarry was shown on the first OS map in 1879, when it was a small quarry approximately 600m SSW of the site. The quarry gradually

extended northwards over the years. There are no records of any landfilling at the quarry site.

2.4 Radon

The radon risk at the site has been researched from interactive maps accessed on ukradon.org. The site is shown to lie within a Radon Affected Area as defined by Public Health England.

Some parts of the 1km grid square, which covers the site are in bands of elevated radon potential, with a maximum radon potential is 10-30 %.

The grid square directly east is not radon affected. This suggests that the radon risk is associated with the Limestone, which is present in the west of the grid square and shown to be present beneath the western site area.

Further consideration of Radon will therefore be required when the layout details are being developed.

A site specific radon report may be purchased by the BGS once it is known where structures are being positioned.

2.5 Potential Contamination

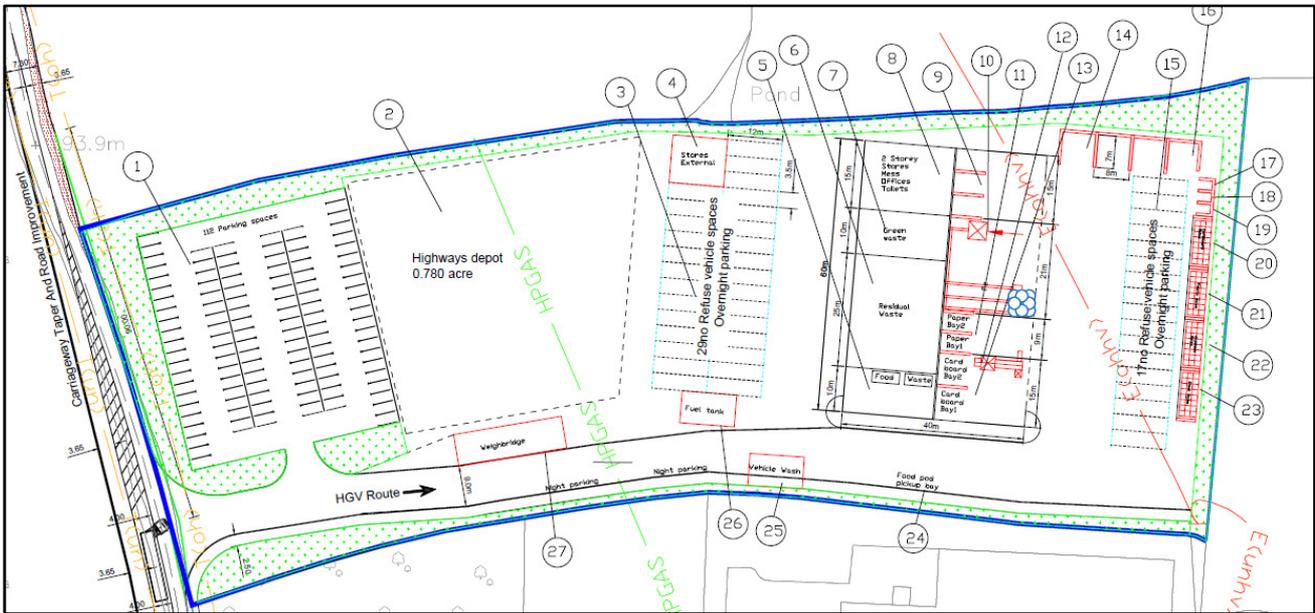
The historical review shows that the site has remained undeveloped while some light industrial development has been carried out up to the southern site boundary.

The site is therefore considered as greenfield.

It is therefore recommended that no specific targeted investigation is required in relation to potentially contaminated land, however, the ground investigation shall be extended to include a watching brief for potential contamination and selected samples shall be obtained for chemical testing of near surface made ground if encountered.

3.0 PROPOSED DEVELOPMENT

It is proposed to construct a new depot as part of the Local Authority waste re-organisation program. The proposed layout is shown of DCC drawing H4/18303/D/04, an extract of which is presented below.



The majority of the site will occupy parking areas for cars and refuse vehicles and a highways depot. A waste segregation/recycling unit, measuring approximately 40m x 60m is positioned in the east of the site, with associated storage areas. The building is likely to be a steel portal framed structure with modest column loads.

Other structures on the site include a weighbridge, fuel tanks, and a vehicle wash.

No construction details or loads are available at this stage.

Due to the sloping nature of the site it is likely that some earthworks or retaining walls will be required to accommodate the development. However, no finished levels or earthworks models have been developed at this stage, and it is not known if any retaining walls will be used, or if all level changes may be accommodated by slopes. Landscape areas are shown around the perimeter of the site, suggesting that slopes can be used to tie into adjacent ground levels.

4.0 SITE INVESTIGATION

4.1 Previous Site Investigations

No previous investigations have been carried out on the site.

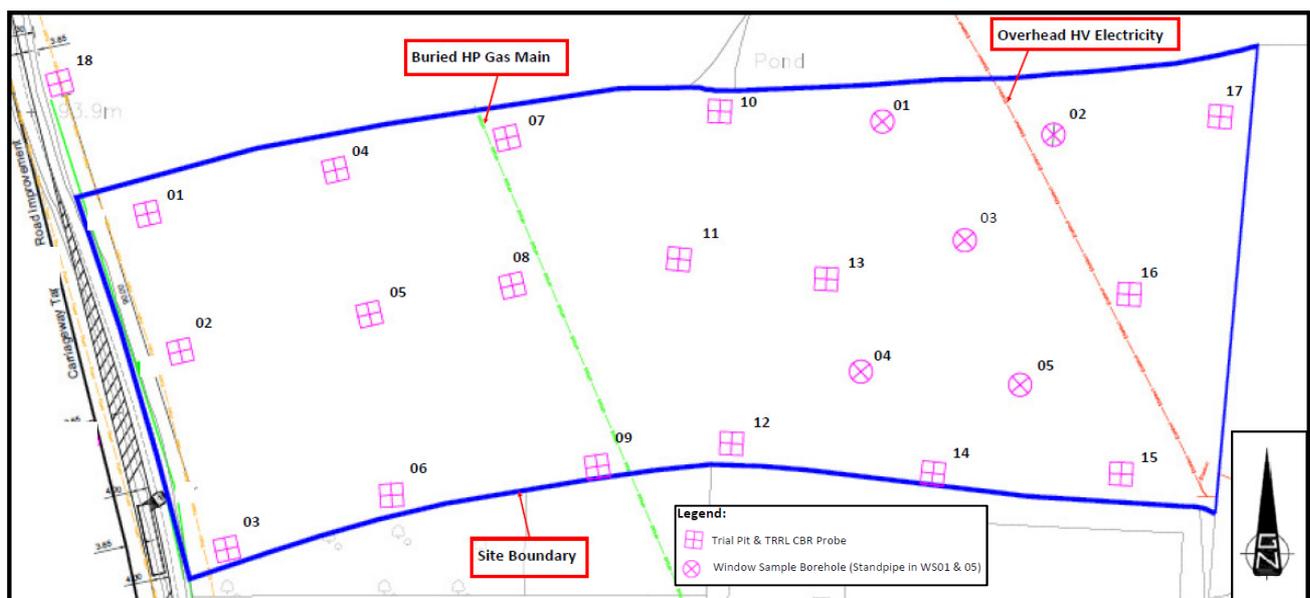
4.2 This Investigation

The investigation of the main development area, was carried out on the 24th and 25th January and comprised the following:

- 18 machine excavated trial pits to establish shallow ground conditions;
- Five window sample boreholes which were advanced to a maximum depth of 5m;
- 17 TRRL Dynamic Probe tests to provide CBR values;
- SPT test were carried out at 1m intervals in the window samples;
- One Infiltration test, which was carried out in TP07;
- Two groundwater monitoring standpipes.

The window sample boreholes were carried out and logged by CCGeotechnical Ltd. as were the CBR probes. The trial pits were excavated by Alwyn Jones Ltd., which were supervised and logged by a chartered engineering geologist from Daear, in general accordance with BS 5930, Reference 2.

The location of the exploratory holes are shown on Figure 1, the window sample borehole logs are presented in Appendix B, the trial pit logs in Appendix C and the TRRL CBR Probes in Appendix D. An Extract of Figure 1 is provided below.

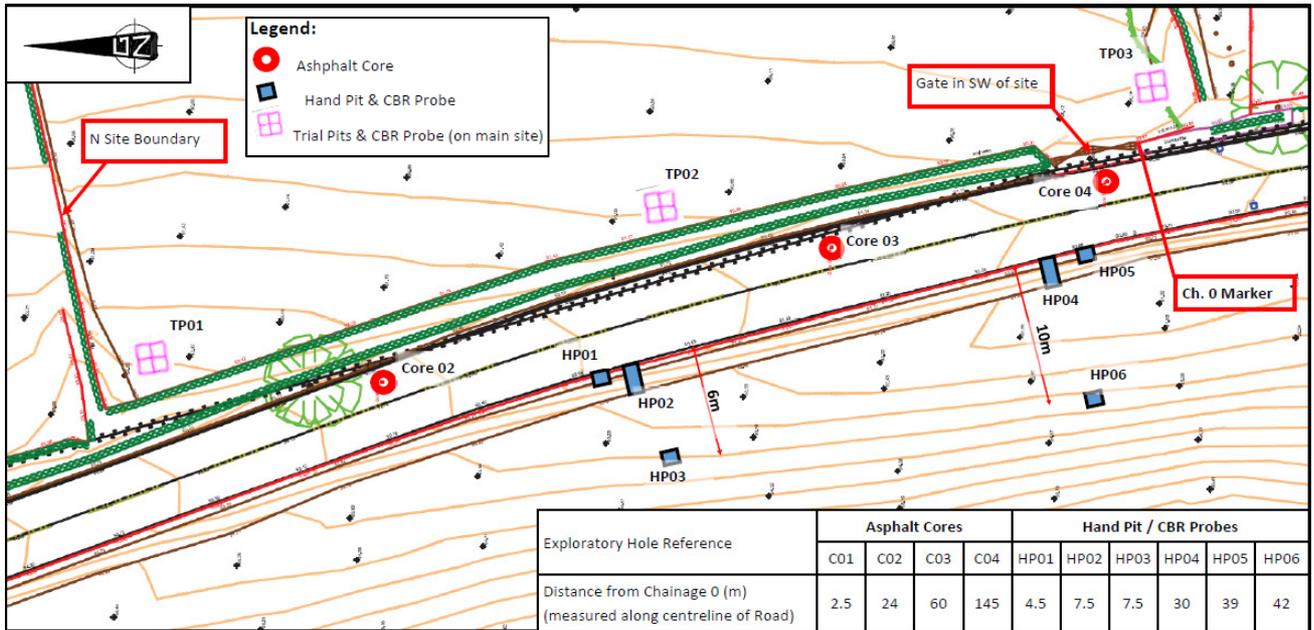


An investigation of the proposed Ffordd y Graig widening was carried out on the 24th January and on the 21st February, and comprised the following:

- 6 Hand dug pits to establish shallow ground conditions on the western side of the carriageway;
- Four tarmac cores from the highway;
- 9 TRRL Dynamic Probe tests to provide CBR values;

The hand dug pits were carried out by CCGeotechnical Ltd. as were the CBR probes. The tarmac cores were carried out by Alwyn Jones Ltd. The works were supervised and logged by a chartered engineering geologist from Daear, in general accordance with BS 5930, Reference 2.

The location of the exploratory holes are shown on Figure 2; the CBR charts, hand pit logs and the pavement investigation factual report from the road widening phase of the works are presented in Appendix D to F respectively. An extract of Figure 2 is provided below.



4.3 Laboratory Testing

The following laboratory tests were carried out as part of the investigation:

Physical testing – Samples were selected for geotechnical classification testing, which were carried out at the UKAS accredited laboratories of Celtest Ltd. (trial pit samples) and CCG Ltd. (Borehole and hand pit samples). The following tests were carried out:

Test	No.	
	TP	WSBH & HP
Moisture content	9	10
Atterberg Limits	6	5
Particle Size Distribution (PSD)	5	2
pH & Sulphate	0	7
Compaction & Particle Density	2	0

The tests were carried out in accordance with BS1377. The results are discussed in Section 5 of this report and presented in full in Appendix G and H.

Chemical testing - One sample of made ground, two samples of topsoil and two samples of natural subsoil were selected for a general suite of contamination testing. The samples were placed in the appropriate containers and in a cool box and dispatched by courier to the laboratories of ELAB.

The results are discussed in Section 6 of this report and presented in full in Appendix J.

Asphalt cores were sprayed with PAK marker as part of the reporting carried out by Celtest, which provides an indicator of coal tar content. The results are included in the pavement investigation factual report in Appendix F.

5.0 GROUND CONDITIONS

Section 5.1 to 5.7 relate to the main site area. Ground conditions for the proposed widening of Craig Road are discussed in Section 5.8.

5.1 General Stratigraphy

The ground conditions generally comprise a relatively uniform horizon of topsoil overlying cohesive glacial till with non-persistent horizons of granular soils of various thicknesses. No bedrock was encountered.

Ground Conditions are summarised in Table 5.1 and discussed in more detail below:

Ref	Depth of Stratum (m)				Ground water (m)
	Made Ground	Topsoil	Clay	Granular	
WS01	-	0.3	5*	3.0-3.4	seepage @ 2.7m; standpipe installed
WS02	-	0.4	4.1*	-	dry
WS03	-	0.3	3.6*	-	dry
WS04	-	0.4	3.9*	-	dry
WS05	-	0.4	2.5*	-	dry; standpipe installed
TP01	-	0.23	1.2*	0.6-0.9	dry
TP02	-	0.25	1.9*	0.8-1.3	local seepage 1.6m
TP03	-	0.25	1.4*	0.75-1.1	localised seepage
TP04	-	0.22	0.9	1.4*	0.9m after 3hrs
TP05	-	0.25	1.3*	-	dry
TP06	-	0.32	1.4*	-	dry
TP07	-	0.25	2*	0.9-1.7	1.4
TP08	-	0.25	1.7	0.9-1.3	seepage from base below 1.3m
TP09	-	0.2	1.1	1.3*	inflow from 1.1, standing at 0.75m
TP10	-	0.25	1.5*	-	seepage from 1.2m
TP11	-	0.23	1.3*	-	dry
TP12	-	0.25	1.2*	-	surface water from topsoil
TP13	-	0.22	1.2*	-	upwelling from base (slight) below 1.1m
TP14	-	0.22	1.2*	-	dry
TP15	-	0.2	1.1*	-	dry
TP16	-	0.2	1.3*	-	dry
TP17	-	0.18	1.3*	-	dry
TP18	0.15	-	0.6	1.3*	dry
Notes.	* Base of Stratum not proven				
Table 5.1 – Summary of Ground Conditions					

5.2 Made Ground

Made ground was only encountered in TP18, and represented hardstanding aggregate from an old farm track, which had fallen into disuse and was covered by a thin layer of topsoil and turf.

5.3 Topsoil

Topsoil was encountered in all exploratory holes.

In the trial pits the topsoil was recorded to depths of between 180mm and 320mm, averaging 230mm. In the boreholes the topsoil was recorded to between 300mm and 400mm.

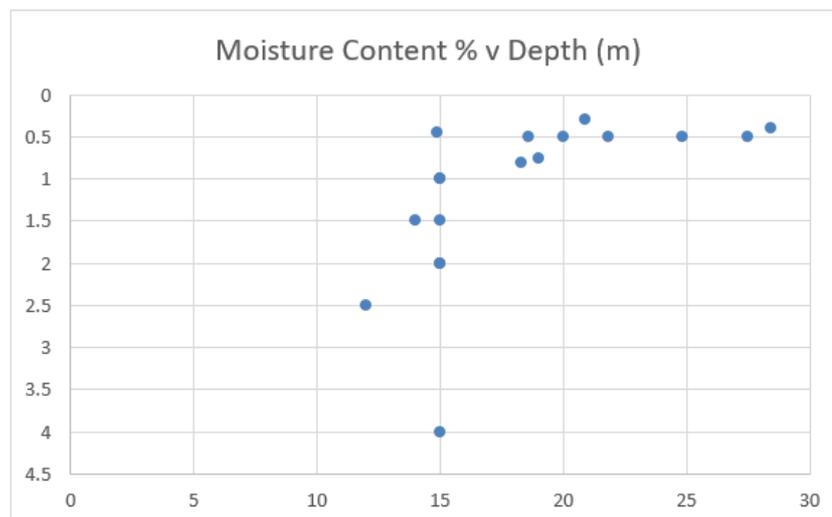
The depth variation between the trial pits and boreholes is likely to be due to varying interpretation rather than significant changes in topsoil thickness.

5.4 Cohesive Superficial Deposits

The cohesive superficial deposits typically comprised slightly sandy silty clay with discreet gravels and localised cobbles, which was generally present through the full depth of the exploratory holes, which ranged from 1.2m to 5m. Local, subordinate, granular horizons were recorded which are discussed in section 5.5 below.

The stratum was typically of stiff to very stiff consistency, with localised firm consistency noted near surface and locally with depth in the boreholes.

Eighteen (18No.) moisture content tests were carried out on the cohesive soils. The results varied between 12% and 28.4%, and are presented on the chart below, which shows that there was significant variation in the moisture content in the upper 800mm or so, with consistent readings below 1m.



Eleven (11No.) Atterberg limit tests were carried out on the cohesive soils. As part of the plasticity test, the samples are sieved to remove all particles coarser than 425microns i.e. everything coarser than a 'fine' sand. The percentage of each sample retained on the 425micron sieve was between 2% and 43%, averaging 17%; the results are summarised below.

BH/TP Ref	Depth (m)	Natural MC %	Liquid Limit%	Plastic Limit %	Plasticity index %	% passing 425mm sieve	Modified PI %	Volume Change Potential
TP4	0.5	21.8	27	17	10	71	7.1	LOW
TP6	0.4 - 0.6	18.6	31	18	13	83	10.79	LOW
TP10	0.3 - 0.5	28.4	36	19	17	57	9.69	LOW
TP11	0.5	27.5	36	22	14	88	12.32	LOW
TP13	0.4 - 0.6	24.8	29	17	12	81	9.72	LOW
TP13	0.7 - 0.9	18.3	27	16	11	77	8.47	LOW
WS1	1	15	35	17	18	88	15.84	LOW
WS1	2	15	36	16	20	85	17	LOW
WS2	4	15	33	15	18	89	16.02	LOW
WS3	0.75	19	38	15	23	98	22.54	MEDIUM
WS5	1	15	35	15	20	93	18.6	LOW

The Plastic Limit results are relatively consistent across the site, ranging between 15% and 22%, with the Liquid Limit ranging between 27% and 38%, resulting in Plasticity Index values of between 10% and 23%. The moisture content is generally above the Plastic Limit in the near surface soils (<1m or so) and at or slightly below the plastic limit below 1m depth, reflecting the increased variation in near surface soils compared to the deeper soils.

The samples were generally classed as Low plasticity clays on the Cassagrande Chart. The NHBC volume change potential (VCP) was classed as Low, with the exception of 1 sample from 0.75m in WS3, which was classed as 'medium' VCP.

Nineteen (19 No.) SPT tests were carried out in the cohesive deposits at depths between 1m and 5m. The SPT 'N' values are summarised below. SPT 'N' values may be used to derive approximate values of mass shear strength (c) = $f_1 \times N$ (kN/m^2). The recorded plasticity index values of 15% to 20% indicate that a conversion factor (f_1) of approximately 5.5 would be appropriate.

On this basis the SPT 'N' values may be used to derive mass shear strength values as indicated in the table below:

Commencement Depth	No. of tests	SPT 'N' value			Mass shear strength (kPa)		
		min	max	average	min	max	average
1m	5	15	19	16.8	83	105	92
2m	5	18	20	19.0	99	110	105
3m	4	19	50	30.3	105	275	166
4m	4	25	50	43.8	138	275	241
5m	1	29	29	29.0	160	160	160

The derived mass shear strength values indicate the cohesive deposits, based on the average values, are high strength, increasing to very high strength, which are broadly consistent with the field descriptions of stiff to very stiff consistency.

Shear strength tests using a hand shear vane (HSV) were obtained from various depths within the trial pits and boreholes, which are presented on the logs in Appendix B and C. The HSV values are broadly consistent with the mass shear strength values derived above.

Three PSD tests were carried out on cohesive soil samples and two on granular soil, which are summarised below.

TP Ref.	Depth	Granular or Cohesive	Clay %	Silt %	Sand %	Gravel %	DMRB Series 600 Class
2	0.3-0.6	Cohesive*	14	18	43	25	2C
13	0.4-0.6	Cohesive	11	57	25	7	2A
13	0.7-0.9	Cohesive	12	53	21	14	2B
TP2	0.8-1.0	Granular	10		47	37	1A
TP4	1 – 1.4	Granular	24		34	42	2C

The sample from TP2 (0.3-0.6m) is marginal between a granular and cohesive soil, but field behavior suggested mass properties were cohesive

Compaction tests were carried out on the two sample of recovered from TP2, one cohesive and one granular, the results are summarised below:

TP Ref	TP2	TP2
Depth	0.3-0.6	0.8-1.0
DMRB Series 600 Class	2A (wet cohesive)	1A (well graded granular)
Particle Density	2.67	2.68
Natural Moisture Content	14.9	7.6
Optimum Moisture Content	11	10
Air Voids at Optimum (%)	c.4%	c.4%
Air Voids at natural (%)	<1%	c.15%
Dry Density at Optimum (Mg/m ³)	2.03	2.0
Dry Density at natural (Mg/m ³)	<1.96	1.93

5.5 Granular Horizons

Granular horizons, between 200mm and 800mm thick were recorded in 9 of the 18 exploratory holes; the underlying cohesive glacial till was proven in six, while TP4, 9 and 18 all terminated in the granular soils at depths of 1.3m to 1.4m.

The granular soils were generally described as slightly silty, slightly clayey to clayey, gravelly SAND with localised cobbles and boulders. Two PSD tests were carried out on the granular soil and the results are summarised below:

TP Ref.	Depth	Granular or Cohesive	Clay %	Silt %	Sand %	Gravel %	DMRB Series 600 Class
TP2	0.8-1.0	Granular	10		47	37	1A
TP4	1 – 1.4	Granular	24		34	42	2B

A compaction test was carried out on the sample from TP2, which is discussed in Section 5.4 above.

5.6 Bedrock

No Bedrock was encountered during the ground investigation.

5.7 Groundwater

Significant groundwater inflows were recorded in a number of trial pits, coinciding with granular horizons. Groundwater observations are summarised in Section 5.1 and on the exploratory hole logs.

The granular horizons are not in continuity with each other therefore the volume of water in each horizon will be finite.

Two standpipes were installed in boreholes WS01 and WS05. The groundwater has been monitored twice following completion of site work:

BH Ref	Standpipe Depth (m)	Groundwater Depth (m)		
		20/02/2019	11/03/2019	
WS01	3.60	0.51	0.56	
WS05	2.45	1.15	1.24	

A groundwater infiltration test was carried out in TP07. The test was abandoned due to rising water levels. The results are presented on the Exploratory hole log in Appendix C.

5.8 Ground Conditions; Western Road Widening

It is proposed to widen Ffordd y Graig Road adjacent to the western site boundary. The extent of the widening has not been fully defined, however it is likely to extend approximately 5m into adjacent land.

The western edge of the road is in a cutting, approximately 1m to 1.2m high and at a gradient of approximately 35-38°. The cutting appears to be relatively modern, as there is no established growth on the cut slope.

The following ground investigation works was carried out:

- 4 x asphalt cores along centre of eastern lane;
- 2 x hand pits adjacent to western edge of road;
- 4 x hand dug pits to west of carriageway; 2 into cut slope and 2 beyond crest of cut slope;
- CBR testing with TRRL Probe at each hand pit location.

The ground conditions are summarised below:

Ffordd y Graig Road Construction:

- Cores 1-4 recorded asphalt thicknesses of between 100 and 136mm; details of the material type and conditions are presented in the Celtest 'Pavement Investigation Factual Report' presented in Appendix F.
- Hand Pits HP01 and HP04 recorded asphalt thickness of 150mm and 80mm respectively;
- The asphalt was lying on 180 mm to 230mm of slate aggregate in HP01 & HP04; the capping was not proven in the core locations.
- The subgrade comprised fine cohesive soils in HP01 and granular soils in HP04; consistent with the variation in the glacial till on the main site;
- CBR Testing in subgrade, from the base of the hand pits, recorded CBR values above 10%, although there was a thin (86mm) near surface horizon with a value of 3% in HP04.

Cut Slope

HP02 and HP05 were excavated as a wedge into the cut slopes. Ground conditions from the crest of the cut (approx. 1.1m above road level) comprised interbedded granular and cohesive glacial till. CBR Testing was carried out from slightly above road level, from the base of the hand pit, and recorded CBR values above 10%.

HP03 and HP06 were positioned between 5m and 10m from the crest of the cut slope and recorded between 300 and 450mm of topsoil overlying cohesive and granular glacial till to depths of approximately 0.9m, where they were terminated on suspected large boulders.

6.0 RESULTS OF CHEMICAL TESTING

6.1 Made Ground

One sample of made ground was recovered from TP18, comprising granular soils associated with what is considered to be a disused farm track.

The results are presented in Appendix J. All test results were at concentrations that were either below detection levels or below published guidance for residential developments.

6.2 Baseline Conditions

Four further samples were tested from topsoil and shallow soils recovered from the window samples in the area of the proposed structure to provide baseline conditions.

The results are presented in Appendix J. All test results were at concentrations that were either below detection levels or below published guidance for residential developments.

6.3 Asphalt Composition

The cores recovered from Ffordd y Graig Road were sprayed with PAK marked and observed under UV light. The results are not conclusive in relation to Coal Tar content; the near surface layers had faint markings suggesting bituminous based binder, however deeper layers had increased indicators suggesting higher concentrations of Coal Tar.

It is understood that the intention is to overlay the existing pavements insitu, therefore no further work is considered necessary. However, if it is intended to excavate and dispose of the existing pavement material, it will be necessary to investigate the Coal Tar content further.

7.0 GEOTECHNICAL RECOMMENDATIONS

At the time of writing the report, no structural design or loads have been developed for the building, and no ground levels or contours have been set. It is assumed that the site will be developed at or close to existing grade, with changes in elevation accommodated by slopes. The geotechnical recommendations should be reviewed as further information on the development becomes available

7.1 EXCAVATIONS AND SITE PREPARATIONS

Earthworks will be required to form the development platforms. The majority of the excavation will be through glacial till, which will be removed using conventional earthmoving equipment.

Bedrock is not anticipated to be encountered, however exploratory holes were relatively shallow in the western area of the site due to the stiff glacial till and near grade development, therefore there is an increased risk of encountering bedrock in the east of the site if excavations extend deeper than the trial pits.

Based on the findings of the ground investigation it is likely that groundwater will be encountered in shallow excavations from granular horizons within the glacial till. It is envisaged that pumping from sumps will be able to control groundwater as the granular horizons are not persistent over the site.

7.2 EARTHWORKS CONSIDERATIONS

The glacial till encountered at the site will be suitable for re-use as general fill in earthworks operations to re-profile the site.

Field descriptions and PSD tests have confirmed that there is some variation in the Classification of the soils. Five PSD tests were carried out and they were classed as follows in accordance with Table 6/1, Series 600 Earthworks of the DMRB:

- 1No. Class 1A General Granular Fill; Well graded material;
- 1No. Class 2A General Cohesive Fill; Wet cohesive material
- 1No. Class 2B General Cohesive Fill; Dry cohesive material
- 2No. Class 2C General Cohesive Fill; Stoney cohesive material

Two of the samples were selected for compaction tests:

- TP2, 0.3-0.6m, Class 2A wet cohesive general fill
- TP2, 0.8-1.0m Class 1A well graded granular general fill.

The results demonstrated that the cohesive fill was approximately 4% wet of optimum, however it did achieve <5% air voids at natural moisture content, therefore likely to be

suitable for re-use with a little modification of the moisture content, with air drying likely suitable if carried out during dry weather.

The granular fill was approximately 2.4% dry of optimum, which resulted in the air voids increasing from approximately 4% at optimum to over 15% at natural moisture content. The moisture content of granular soils will therefore need to be increased prior to compaction, however, depending on the depth and extent of the granular horizons, it may be impractical to separate them as part of bulk earthworks, and it is likely that mixing them together may provide mutual benefits.

There was significant variation of the moisture content in the upper 0.5-0.75m of the cohesive glacial till at the site, which ranged between 15 and 28%. This will result in variable drying times and compaction performance of the near surface soils. It is likely that this variability will reduce during drier months.

If it is proposed to carry out earthworks during wet weather, or periods when it is unlikely that air drying can be achieved, Lime Modification of the near surface soils, where there was significant variation in recorded moisture contents were recorded will be beneficial.

If soils are modified with lime and/or cement, then increased CBR values will be achieved which will result in reduced construction thicknesses for the roads and parking areas.

7.3 FOUNDATION RECOMMENDATIONS

7.3.1 Proposed Structure

Ground levels have not been set, however it is anticipated that the building floor slab will be near grade.

The ground conditions in the area of the proposed structure comprises firm glacial till, generally becoming stiff below approximately 0.6 - 1m, which is considered as a suitable bearing stratum for shallow pad and strip foundations for low to moderate loads.

The allowable bearing capacity for foundations will need to be established considering the foundation depth, structural loads, size and shape, and will need to consider the settlement. Assuming that the pads are founded on stiff glacial till at depths of approximately 1m below existing ground levels, the following allowable preliminary bearing capacities may be adopted for preliminary design:

- 1m wide – 150 to 250kPa;
- 2m wide – 125 to 175kPa.

Some mature trees are present around the perimeter of the site; foundation depths may need to be deepened based on low volume change potential.

A ground bearing slab onto the glacial till is considered suitable, however, due to the moisture content variability in the near surface soils, depending on proposed levels and the time of year that construction is carried out, it may be necessary to replace or rework the near surface soils. Alternatively, lime/cement stabilization could be considered to improve the sub-grade and reduce construction thicknesses.

7.4 PROTECTION OF BURIED CONCRETE

A total of five pH and water soluble sulphate tests were carried out on samples of natural soils recovered from the boreholes in the vicinity of the proposed building. The following range of results was recorded:

- pH 8.3 – 8.6
- Water Sol. Sulphate <20mg/l

The results have been compared to BRE SD1 (Ref 3). The site is considered as greenfield, and the groundwater conditions are considered mobile due to the water bearing granular horizons. The following design classification is recommended.

- DS-1
- AC-1

7.5 PAVEMENT DESIGN

Insitu CBR testing was carried out using handheld Dynamic Probes (TRRL probes) as part of the investigation. All tests were commenced from surface, adjacent to trial pits TP01 to TP16 and TP18.

The recorded CBR values are plotted against depths on the charts presented in Appendix D. The tests are carried out over a depth of approximately 900mm. All test results show a relatively low CBR value of between 1% and 5% corresponding to the topsoil. There is variation between each position, the recorded values at the top of the glacial till are between 3% and 14%, averaging 7%, increasing to between 10% to in excess of 20% at the base of the test, although some very high values over 50% were recorded, which are likely to represent cobbles or boulders.

Guidance on the selection of equilibrium CBR values is provided in Table 5.1 of Interim Advice Note 73/06 (2009) from the DMRB. Based on the soil descriptions and plasticity index, the estimated equilibrium CBR values for the soils encountered on site, for thin construction is 4%.

Based on the insitu CBR results and the equilibrium CBR estimation it is recommended that the design of hardstanding is based on a CBR value of 4%, which may potentially be increased following further assessment of trafficking, proposed formation levels and the completion of in-situ CBR testing of the formation level.

Any areas of made ground or soft spots at formation level should either be removed and replaced with suitable compacted granular fill, or inspected by a competent person to assess treatment requirements.

The thickness of capping and sub-base may be reduced by incorporating geogrid reinforcement, or by modifying the glacial till subgrade with lime and or cement, which may provide program and or cost savings.

7.6 SURFACE WATER DRAINAGE

Based on the findings of the ground investigation; low permeability soils and shallow groundwater in granular horizons, the of widespread soakaway drainage at the site os not considered feasible.

7.7 POTENTIAL CONTAMINATION

The desk study identified that the site is previously undeveloped.

The only made ground comprised hardstanding from a former access track, encountered in TP18, in the area of proposed widening for the new access. The contamination test results did not identify any significantly elevated concentrations.

Contamination testing was carried out on the topsoil and near surface glacial deposits in the area of the propose building to provide baseline conditions.

No particular measures are anticipated in relation to contamination, however a watching brief should be maintained for made ground during groundworks.

7.8 ADDITIONAL GROUND INVESTIGATON

It is recommended that the scheme is reviewed once the design has been further developed to assess the requirements for additional ground investigation. In particular:

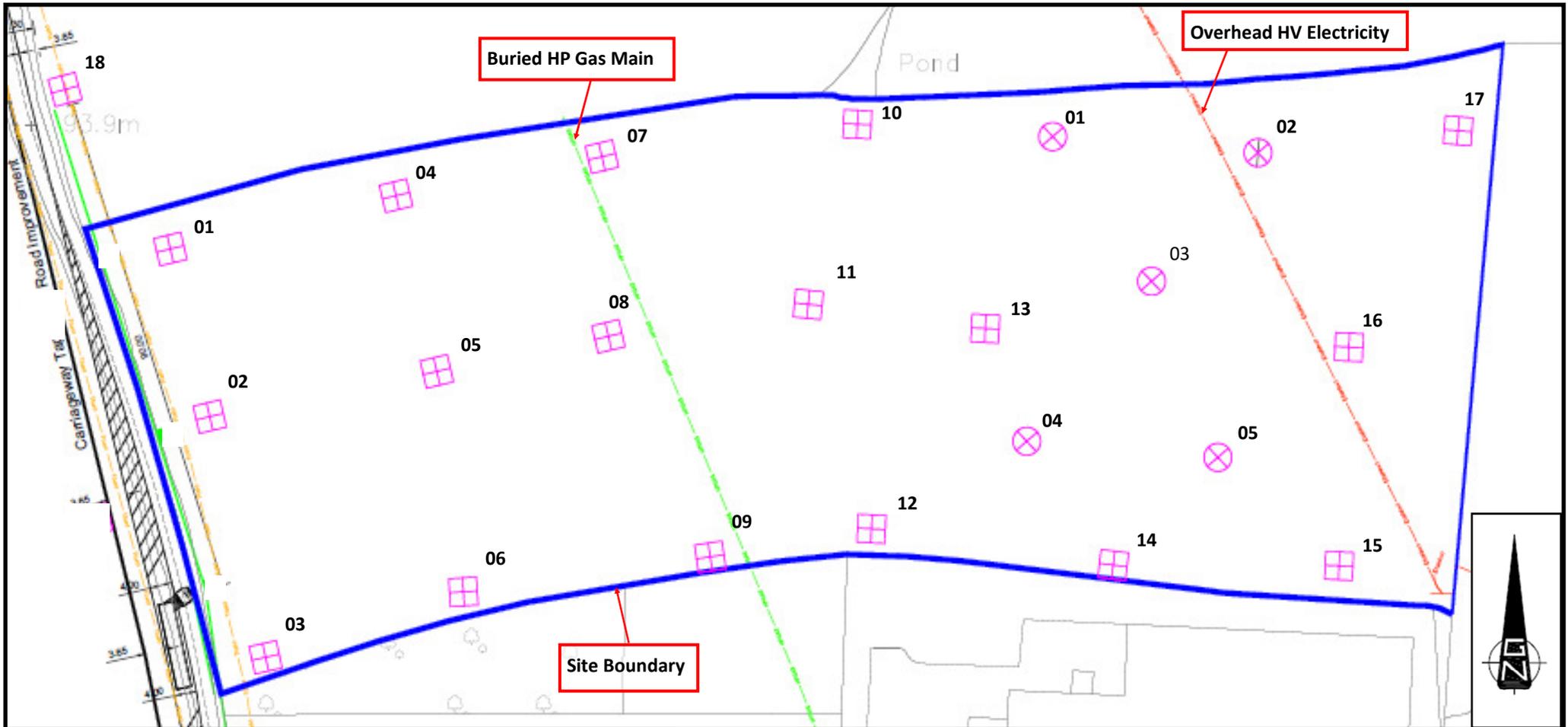
- Cut and fill platforms – to determine if the coverage of trial pits and testing is suitable for the proposed earthworks operations or any retaining walls that may be introduced;
- Slopes – to determine if there is sufficient information for any slope stability analysis that may be required;
- Proposed structure – to determine if there is sufficient information for foundation and floor slab design once construction type and loads are established;
- Ffordd y Graig Road widening – to determine if there is sufficient information for the proposed works.

REFERENCES

1. 1:50,000 scale geological map. British Geological Society,
2. BS 5930, 1999, Code of Practice for Site Investigation,
3. BRE Special Digest 1, 2005, Concrete in Aggressive Ground,

FIGURES

- Figure 1** Exploratory Hole Location Plan – Main Site
Figure 2 Exploratory Hole Location Plan – Ffordd y Graig Road Widening



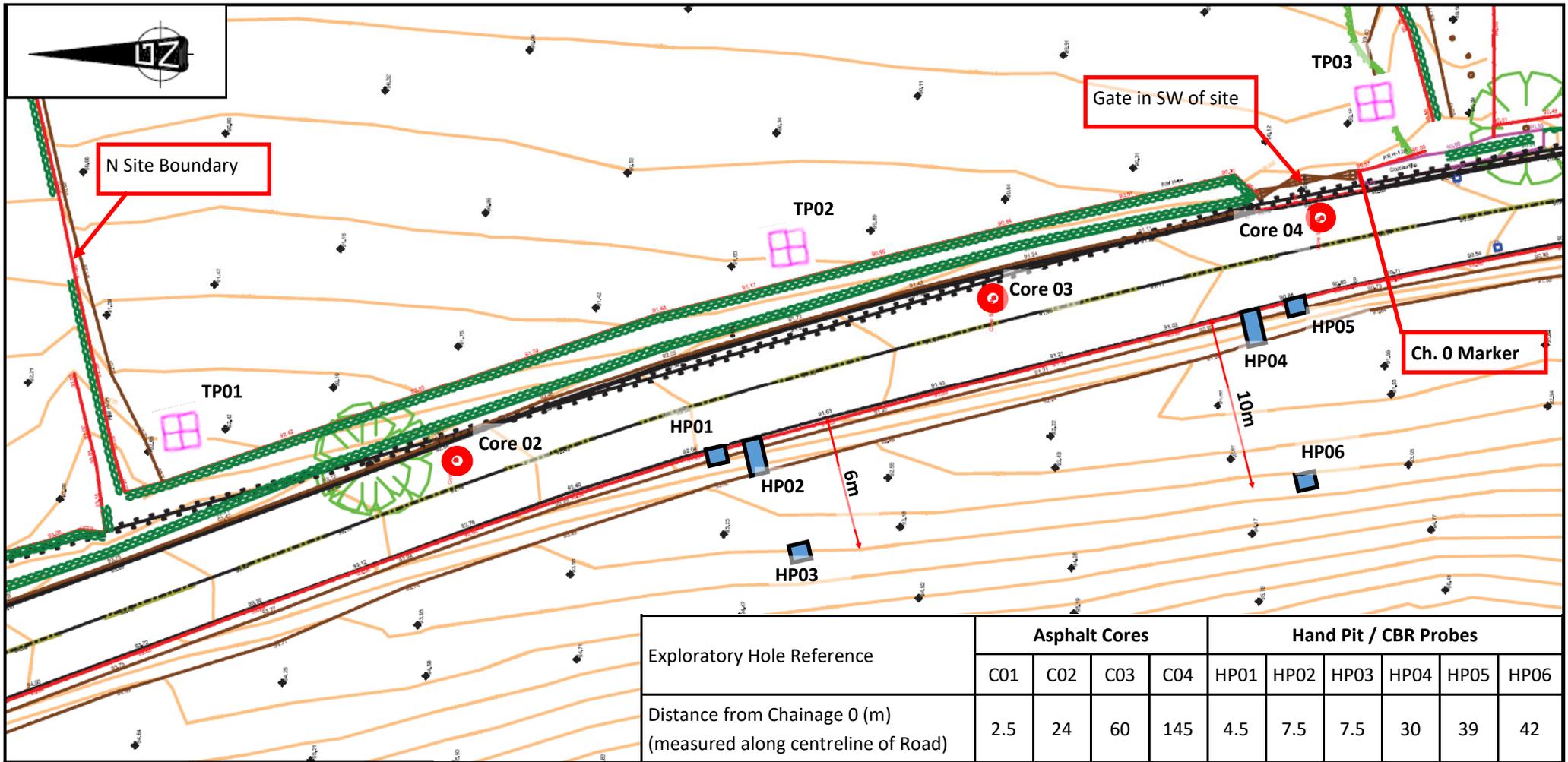
Legend:

-  Trial Pit & TRRL CBR Probe
-  Window Sample Borehole (Standpipe in WS01 & 05)

Notes.

Positions are Approximate
 TP01, 02 & 03 positioned 5m from eastern site boundary
 CBR01, 02 & 03 positioned 1m from western site boundary, in line with TPs
 Not To Scale

Exploratory Hole location Plan
 Main Site Area
Figure 1



Legend:

-  Asphalt Core
-  Hand Pit & CBR Probe
-  Trial Pits & CBR Probe (on main site)

Notes.

- Core 01 positioned off plan extent
- HP01 & 03 adjacent to road surfacing
- TP18 adjacent to road to north of plan extents

Exploratory Hole location Plan
 Road Widening Area
 Not To Scale
Figure 2

APPENDIX A

Site Photographs

Photo A – General View from NE corner



Photo B – General View along Eastern Boundary from NE corner



Photo C – General View along of southern site area from NW corner



Photo D – General View of western site from centre of site



Photo E – General view of SE site, towards SE corner



Photo F – Surface water collecting along southern boundary



Photo G – General view of cutting on western boundary of Craig Road



APPENDIX B

Window Sample Borehole Logs



Contract Name: Colomendy, Denbigh		Client: Daer Geo			Borehole ID: WS1	
Contract Number: CCG-C-19-10772	Date Started: 24-01-2019	Logged By: DO	Checked By: CB	Status: FINAL	Sheet 1 of 1	
Dynamic Sampling Borehole Log		Easting:	Northing:	Ground Level:	Plant Used: Dando Terrier Rig	Rig Crew: SG/LN
Weather: Wet		Termination:			SPT Hammer: N/R, Energy Ratio: N/R	
Scale: 1:25						

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Back-fill/Installation
0.00 - 1.00	U	HVP=110 HVP=110		(0.30) 0.30		Grassed TOPSOIL		
1.00 - 2.00	U	SPT(S)N=19 (2,2/4,5,5,5) HVP=110 HVP=110		(2.70)		Stiff brown slightly sandy slightly gravelly silty CLAY with occasional pockets of gravel. Gravel is fine to coarse angular to sub-angular limestone	1	
2.00 - 3.00	U	SPT(S)N=20 (4,5/4,6,5,5) HVP=110 HVP=110					2	
3.00 - 4.00	U	SPT(S)N=25 (3,4/5,7,6,7) HVP=50		3.00 (0.40) 3.40		Medium dense brown very silty slightly gravelly fine to medium grained SAND. Gravel is fine to medium angular to sub-angular limestone	3	
4.00 - 5.00	U	SPT(S)N=25 (4,5/6,6,7,6) HVP=80 HVP=90 SPT(S)N=29 (5,6/6,7,8,8)		(1.60) 5.00		Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to coarse angular to sub-angular limestone	4	
						End of Borehole at 5.00m	5	

Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:				
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	1 hour hand excavating 1.20mbgl service avoidance pit				
Chiselling					Installation				Water Strikes				
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)	Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
				0.00	1.00	PLAIN		2.70			0		Seepage
				1.00	5.00	SLOTTED							
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Contract Name: Colomendy, Denbigh		Client: Daer Geo			Borehole ID: WS2	
Contract Number: CCG-C-19-10772	Date Started: 24-01-2019	Logged By: DO	Checked By: CB	Status: FINAL		Sheet 1 of 1
Easting:		Northing:		Ground Level:	Plant Used: Dando Terrier Rig	Rig Crew: SG/LN
Dynamic Sampling Borehole Log						Scale: 1:25

Weather: Wet Termination: Boulder obstruction SPT Hammer: N/R, Energy Ratio: N/R

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/Installation
0.00 - 1.00	U	HVP=60 HVP=110		(0.40) 0.40		Grassed TOPSOIL		
1.00 - 2.00	U	SPT(S)N=16 (2,2/4,3,4,5) HVP=110 HVP=110				Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with frequent pockets of gravel. Gravel is fine to coarse angular to sub-angular limestone <i>POCKET OF GRAVEL - 0.80-0.90mbgl</i>	1	
2.00 - 3.00	U	SPT(S)N=20 (3,4/4,6,5,5) HVP=110 HVP=110		(3.70)		<i>POCKET OF GRAVEL - 1.30-1.40mbgl</i> <i>POCKET OF GRAVEL - 1.70-1.80mbgl</i>	2	
3.00 - 4.00	U	SPT(S)N=25 (4,6/6,7,6,6) HVP=80 HVP=90				<i>POCKET OF GRAVEL - 3.00-3.10mbgl</i>	3	
4.00 - 4.10	U	SPT(S)50 (25 for 5mm/50 for 5mm)		4.10		End of Borehole at 4.10m	4	
							5	

Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:				
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	1 hour hand excavating 1.20mbgl service avoidance pit Borehole terminated at 4.10mbgl on refusal on boulder				
Chiselling					Installation		Water Strikes						
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)	Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose (m)	Remarks
CC GEOTECHNICAL LTD 0151 545 2750 www.ccgeotechnical.com													



Contract Name: Colomendy, Denbigh		Client: Daer Geo			Borehole ID: WS3	
Contract Number: CCG-C-19-10772	Date Started: 24-01-2019	Logged By: DO	Checked By: CB	Status: FINAL		Sheet 1 of 1
Easting:		Northing:		Ground Level:	Plant Used: Dando Terrier Rig	Rig Crew: SG/LN

Weather: Wet Termination: Boulder obstruction SPT Hammer: N/R, Energy Ratio: N/R

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/Installation
0.00 - 1.00	U	HVP=80 HVP=80		(0.30) 0.30		Grassed TOPSOIL		
1.00 - 2.00	U	SPT(S)N=18 (2,2/4,5,4,5) HVP=110 HVP=110				Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with frequent pockets of gravel. Gravel is fine to coarse angular to sub-angular limestone <i>POCKET OF GRAVEL - 0.70-0.80mbgl</i>	1	
2.00 - 3.00	U	SPT(S)N=19 (4,4/5,4,5,5) HVP=110 HVP=110		(3.30)		<i>POCKET OF GRAVEL - 1.50-1.60mbgl</i>	2	
3.00 - 3.60	U	SPT(S)N=27 (3,5/6,7,7,7) HVP=110 SPT(S)50 (25 for 5mm/50 for 5mm)		3.60		End of Borehole at 3.60m	3	
							4	
							5	

Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:				
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	1 hour hand excavating 1.20mbgl service avoidance pit Borehole terminated at 3.60mbgl on refusal on boulder				
Chiselling					Installation		Water Strikes						
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)	Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose (m)	Remarks
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Contract Name: Colomendy, Denbigh		Client: Daer Geo			Borehole ID: WS4	
Contract Number: CCG-C-19-10772	Date Started: 24-01-2019	Logged By: DO	Checked By: CB	Status: FINAL		Sheet 1 of 1
Easting:		Northing:		Ground Level:	Plant Used: Dando Terrier Rig	Rig Crew: SG/LN
Dynamic Sampling Borehole Log						Scale: 1:25

Weather: Wet Termination: Boulder obstruction SPT Hammer: N/R, Energy Ratio: N/R

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/Installation
0.00 - 1.00	U	HVP=50		(0.40)		Grassed TOPSOIL		
1.00 - 2.00	U	SPT(S)N=15 (2,2/3,3,4,5) HVP=80		0.40		Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with occasional pockets of gravel. Gravel is fine to coarse angular to sub-angular limestone	1	
		HVP=70				POCKET OF GRAVEL - 1.50-1.60mbgl		
2.00 - 3.00	U	SPT(S)N=18 (3,3/4,3,5,6) HVP=110		(3.50)			2	
		HVP=110						
3.00 - 3.90	U	SPT(S)N=19 (3,4/4,5,4,6) HVP=110		3.90			3	
		HVP=110				POCKET OF GRAVEL - 3.40-3.50mbgl		
		SPT(S)50 (25 for 5mm/50 for 5mm)				End of Borehole at 3.90m	4	
							5	

Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:				
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	1 hour hand excavating 1.20mbgl service avoidance pit Borehole terminated at 3.90mbgl on refusal on boulder				
Chiselling					Installation				Water Strikes				
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)	Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
CC GEOTECHNICAL LTD 0151 545 2750 www.ccgeotechnical.com													



Contract Name: Colomendy, Denbigh		Client: Daer Geo			Borehole ID: WS5	
Contract Number: CCG-C-19-10772	Date Started: 24-01-2019	Logged By: DO	Checked By: CB	Status: FINAL		Sheet 1 of 1
Dynamic Sampling Borehole Log		Easting:	Northing:	Ground Level:	Plant Used: Dando Terrier Rig	Rig Crew: SG/LN
Weather: Wet		Termination: Boulder obstruction			SPT Hammer: N/R, Energy Ratio: N/R	

Scale: 1:25

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/Installation
0.00 - 1.00	U	HVP=50 HVP=80 HVP=110		(0.40)		Grassed TOPSOIL		
1.00 - 2.00	U	SPT(S)N=16 (3,3/3,4,5,4) HVP=110 HVP=110		(2.10)		Firm brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to coarse angular to sub-angular limestone	1	
2.00 - 2.50	U	SPT(S)N=18 (3,3/4,4,4,6) HVP=110 SPT(S)50 (25 for 5mm/50 for 5mm)		2.50		End of Borehole at 2.50m	2	
							3	
							4	
							5	

Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:				
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	1 hour hand excavating 1.20mbgl service avoidance pit Borehole terminated at 2.50mbgl on refusal on boulder				
Chiselling					Installation		Water Strikes						
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)	Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
				0.00	1.00	PLAIN							
				1.00	2.50	SLOTTED							
CC GEOTECHNICAL LTD 0151 545 2750 www.ccgeotechnical.com													

APPENDIX C

Trial Pit Logs & Photos



Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP01

Excavation date:
24th & 25th Jan 2019

Logged by:
APJ

Client:
Cyngor Sir Ddinbych

Project ID:
1639

Strata:

Depth (m)		Description	Samples
From	To		
0	0.23	Turf over topsoil	
0.23	0.57	Firm, slightly silty, slightly gravelly sandy, CLAY	
0.57	0.9	Medium Dense, silty, clayey, gravelly to very SAND with localised cobbles and rare boulder of limestone	
0.9	1.2	Firm, becoming stiff, below 1m, slightly sandy, slightly gravelly CLAY	

Excavated by – 3 ton tracked Excavator; 0.6m wide toothless digging bucket
Plan dimensions – 0.6m x 3.0m
Groundwater – Dry
Stability – slight spalling of granular horizon
Contamination – No visual or olfactory evidence of contamination
HSV – Hand Shear Vane



Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP01

Trial Pit Photographs:





Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP02

Excavation date:
24th & 25th Jan 2019

Logged by:
APJ

Client:
Cyngor Sir Ddinbych

Project ID:
1639

Strata:

Depth (m)		Description	Samples
From	To		
0	0.25	Turf over topsoil	
0.25	0.8	Loose to medium dense, clayey, silty gravelly SAND, grading into sandy gravelly CLAY	0.3-0.6m – Bulk
0.8	1.3	Medium Dense, silty, very gravelly SAND with localised cobbles and rare boulder of limestone	0.9-1.2m - Bulk
1.3	1.9	Firm, becoming stiff, below 1.5m, slightly sandy, grading to sandy locally, slightly gravelly CLAY	

Excavated by – 3 ton tracked Excavator; 0.6m wide toothless digging bucket
 Plan dimensions – 0.6m x 3.0m
 Groundwater – Dry / localised seepage from one corner @1.6m
 Stability – slight collapse/overbreak of granular horizon
 Contamination – No visual or olfactory evidence of contamination
 HSV – Hand Shear Vane



Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP02

Trial Pit Photographs:





Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP03

Excavation date:
24th & 25th Jan 2019

Logged by:
APJ

Client:
Cyngor Sir Ddinbych

Project ID:
1639

Strata:

Depth (m)		Description	Samples / Tests
From	To		
0	0.25	Turf over topsoil	
0.25	0.75 – 0.95	Stiff, slightly gravelly slightly to sandy, CLAY	0.5m, HSV – av. 147kPa
0.75 – 0.95	1.1	Medium Dense, slightly silty, gravelly SAND with localised cobbles and rare boulder of limestone	
1.1	1.4	Stiff, becoming very stiff below 1.2m, slightly sandy CLAY with localised cobbles of limestone	

Excavated by – 3 ton tracked Excavator; 0.6m wide toothless digging bucket
 Plan dimensions – 0.6m x 3.0m
 Groundwater – Trial pit initially excavated to 1.2m, water standing at 1.1m after 1.5m, no obvious seepage when excavation extended to 1.4m
 Stability – No significant instability, but localised spalling from granular horizon
 Contamination – No visual or olfactory evidence of contamination
 HSV – Hand Shear Vane



Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP03

Trial Pit Photographs:





Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP04

Excavation date:
24th & 25th Jan 2019

Logged by:
APJ

Client:
Cyngor Sir Ddinbych

Project ID:
1639

Strata:

Depth (m)		Description	Samples / Tests
From	To		
0	0.22	Turf over topsoil	
0.22	0.9	Firm stiff below 0.5m, slightly gravelly sandy, CLAY	HSV: 0.5m; 96-110kPa
0.9	1.4	Medium Dense, silty, clayey, gravelly to very gravelly SAND	Samples 0.5-0.6m – Tub 1.0-1.3m - Bulk

Excavated by – 3 ton tracked Excavator; 0.6m wide toothless digging bucket
 Plan dimensions – 0.6m x 3.0m
 Groundwater – Seepage from granular horizon, standing at 0.9m after 3 hrs
 Stability – slight collapse/overbreak of granular horizon
 Contamination – No visual or olfactory evidence of contamination
 HSV – Hand Shear Vane



Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP04

Trial Pit Photographs:





Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP05

Excavation date:
24th & 25th Jan 2019

Logged by:
APJ

Client:
Cyngor Sir Ddinbych

Project ID:
1639

Strata:

Depth (m)		Description	Samples/Tests
From	To		
0	0.25	Turf over topsoil	
0.25	1.3	Firm, becoming stiff to very stiff below 0.5m, slightly sandy, slightly gravelly silty CLAY	HSV: 0.5m; 85-99kPa 0.7m; 105-170kPa

Excavated by – 3 ton tracked Excavator; 0.6m wide toothless digging bucket
 Plan dimensions – 0.6m x 3.0m
 Groundwater – Dry no standing water after 2.5hrs
 Stability – No sidewall instability recorded in short term
 Contamination – No visual or olfactory evidence of contamination
 HSV – Hand Shear Vane



Project:
**Colomendy Industrial Estate Depot,
Denbigh**

Trial Pit:
TP05

Trial Pit Photographs:





Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP06

Excavation date:
24th & 25th Jan 2019

Logged by:
APJ

Client:
Cyngor Sir Ddinbych

Project ID:
1639

Strata:

Depth (m)		Description	Samples
From	To		
0	0.32	Turf over topsoil	
0.32	1.4	Stiff, becoming very stiff below 1.2m, slightly sandy silty CLAY with rare individual gravel fragments Hand Shear Vane Records: 0.5m – 109kPa 0.7m - 112kPa 0.9m - 133kPa 1.1m – 91/112/123kPa 1.3m – 147/160kPa	

Excavated by – 3 ton tracked Excavator; 0.6m wide toothless digging bucket
 Plan dimensions – 0.6m x 3.0m
 Groundwater – Dry
 Stability – No sidewall instability recorded in short term
 Contamination – No visual or olfactory evidence of contamination
 HSV – Hand Shear Vane



Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP06

Trial Pit Photographs:





Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP07

Excavation date:
24th & 25th Jan 2019

Logged by:
APJ

Client:
Cyngor Sir Ddinbych

Project ID:
1639

Strata:

Depth (m)		Description	Samples																
From	To																		
0	0.25	Turf over topsoil	HSV: 0.5m; 67kPa																
0.25	0.9	Firm, slightly sandy, slightly silty CLAY with localised discreet fine to medium sub rounded gravel																	
0.9	1.7	Medium Dense, silty, clayey to very clayey, gravelly to very gravelly SAND. Gravel is fine to coarse, sub rounded to sub angular of mudstone and limestone																	
1.7	2.0	Stiff, becoming very stiff below 1.9m, reddish brown, slightly sandy, silty, CLAY with localised discreet fine to medium sub rounded gravel																	
<p>Soakaway Test Carried out when pit at 1.5m, see below for results. Pit extended to 2.0m after test</p> <table border="1"> <thead> <tr> <th>Time (mins)</th> <th>Depth to Water (mBGL)</th> </tr> </thead> <tbody> <tr><td>0</td><td>1.12</td></tr> <tr><td>5</td><td>1.11</td></tr> <tr><td>10</td><td>1.10</td></tr> <tr><td>15</td><td>1.10</td></tr> <tr><td>20</td><td>1.09</td></tr> <tr><td>25</td><td>1.09</td></tr> <tr><td>68</td><td>1.08</td></tr> </tbody> </table> <p>Test abandoned as water level rising, due to groundwater inflow</p>			Time (mins)	Depth to Water (mBGL)	0	1.12	5	1.11	10	1.10	15	1.10	20	1.09	25	1.09	68	1.08	
Time (mins)	Depth to Water (mBGL)																		
0	1.12																		
5	1.11																		
10	1.10																		
15	1.10																		
20	1.09																		
25	1.09																		
68	1.08																		

Excavated by – 3 ton tracked Excavator; 0.6m wide toothless digging bucket
 Plan dimensions – 0.6m x 3.0m
 Groundwater – No seepage noted during excavation. TP terminated at 1.5m to carry out soakaway test. Water had equalised at 1.4m after 1hr, prior to soakaway test. Trial pit extended to 2.0 after soakaway test
 Stability – no sidewall instability recorded in short term
 Contamination – No visual or olfactory evidence of contamination
 HSV – Hand Shear Vane



Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP07

Trial Pit Photographs:





Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP08

Excavation date:
24th & 25th Jan 2019

Logged by:
APJ

Client:
Cyngor Sir Ddinbych

Project ID:
1639

Strata:

Depth (m)		Description	Samples
From	To		
0	0.25	Turf over topsoil	HSV: 0.5m; 53-59kPa 0.7m; >180kPa 1.2m; >180kPa
0.25	0.9	Firm, slightly gravelly, slightly sandy to sandy CLAY	
0.9	1.3	Medium Dense, slightly silty, slightly clayey to clayey, sandy GRAVEL	
1.3	1.7	Stiff, becoming very stiff below 1.6m, reddish brown, slightly sandy, silty, CLAY with localised discreet fine to medium sub rounded gravel and sub angular cobbles.	

Excavated by – 3 ton tracked Excavator; 0.6m wide toothless digging bucket
 Plan dimensions – 0.6m x 3.0m
 Groundwater – Seepage from base of granular horizon @ 1.3m
 Stability – slight collapse of granular horizon
 Contamination – No visual or olfactory evidence of contamination
 HSV – Hand Shear Vane



Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP08

Trial Pit Photographs:





Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP09

Excavation date:
24th & 25th Jan 2019

Logged by:
APJ

Client:
Cyngor Sir Ddinbych

Project ID:
1639

Strata:

Depth (m)		Description	Samples / Tests
From	To		
0	0.2	Turf over topsoil	
0.2	1.1	Firm to Stiff, light brown slightly sandy, slightly silty CLAY with localised discreet gravel	0.5m, HSV – 85/109/125kPa
1.1	1.3	Medium Dense, slightly silty, clayey, gravelly to very gravelly SAND with localised cobbles and rare boulder of limestone	

Excavated by – 3 ton tracked Excavator; 0.6m wide toothless digging bucket
 Plan dimensions – 0.6m x 3.0m
 Groundwater – Water inflow from 1.1m, equalised at 0.75m after 2hrs
 Stability – no sidewall instability recorded in short term
 Contamination – No visual or olfactory evidence of contamination
 HSV – Hand Shear Vane



Project:
Colomendy Industrial Estate Depot,
Denbigh

Trial Pit:
TP09

Trial Pit Photographs:





Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP10

Excavation date:
24th & 25th Jan 2019

Logged by:
APJ

Client:
Cyngor Sir Ddinbych

Project ID:
1639

Strata:

Depth (m)		Description	Samples
From	To		
0	0.25	Turf over topsoil	
0.25	1.2	Firm, becoming stiff below 0.5m, light brown, slightly sandy, silty CLAY with discreet individual gravel fragments, locally grading into clayey SAND	Tub – 0.3-0.5 HSV: 0.3m; 75-80kPa 0.6m; 104-110kPa
1.2	1.5	Stiff, becoming very stiff below 1.3m, reddish brown, slightly sandy, silty, CLAY with localised discreet fine to medium sub rounded gravel and sub angular cobbles. Localised pockets (<300mm) of water bearing clayey gravelly sand.	0.9m; 77-83kPa 1.2m; 104-123kPa 1.4m; >180kPa

Excavated by – 3 ton tracked Excavator; 0.6m wide toothless digging bucket
 Plan dimensions – 0.6m x 3.0m
 Groundwater – Localised/discreet seepage from 1.2m
 Stability – No sidewall instability recorded in short term
 Contamination – No visual or olfactory evidence of contamination
 HSV – Hand Shear Vane



Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP10

Trial Pit Photographs:





Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP11

Excavation date:
24th & 25th Jan 2019

Logged by:
APJ

Client:
Cyngor Sir Ddinbych

Project ID:
1639

Strata:

Depth (m)		Description	Samples/Tests
From	To		
0	0.23	Turf over topsoil	
0.23	0.8	Firm, becoming stiff below 0.5m, light brown, slightly sandy, CLAY with discreet individual gravel fragments	HSV: 0.5m; 72-85kPa 0.7m; 93-99kPa
0.8	1.3	Stiff, becoming very stiff below 1.2m, reddish brown, slightly sandy, silty, CLAY with localised discreet fine to medium sub rounded gravel and sub angular cobbles. Localised pockets (<300mm) of water bearing clayey gravelly sand.	

Excavated by – 3 ton tracked Excavator; 0.6m wide toothless digging bucket
 Plan dimensions – 0.6m x 3.0m
 Groundwater – Dry but discreet, short lived seepage from granular pockets
 Stability – No sidewall instability recorded in short term
 Contamination – No visual or olfactory evidence of contamination
 HSV – Hand Shear Vane



Project:
**Colomendy Industrial Estate Depot,
Denbigh**

Trial Pit:
TP11

Trial Pit Photographs:





Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP12

Excavation date:
24th & 25th Jan 2019

Logged by:
APJ

Client:
Cyngor Sir Ddinbych

Project ID:
1639

Strata:

Depth (m)		Description	Samples
From	To		
0	0.25	Turf over topsoil	
0.25	1.2	Firm, becoming stiff and very stiff below 0.6m, reddish brown, slightly sandy, silty, CLAY with localised discreet fine to medium sub rounded gravel.	HSV: 0.5m; 53-59kPa 0.7m; >180kPa 1.2m; >180kPa
0		Localised, relatively small pockets (<300mm) of gravelly sand	

Excavated by – 3 ton tracked Excavator; 0.6m wide toothless digging bucket
 Plan dimensions – 0.6m x 3.0m
 Groundwater – Surface water seepage from Topsoil, standing at 0.8m after 1hr. Localised seepage from granular pockets
 Stability – No sidewall instability recorded in short term
 Contamination – No visual or olfactory evidence of contamination
 HSV – Hand Shear Vane



Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP12

Trial Pit Photographs:





Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP13

Excavation date:
24th & 25th Jan 2019

Logged by:
APJ

Client:
Cyngor Sir Ddinbych

Project ID:
1639

Strata:

Depth (m)		Description	Samples
From	To		
0	0.22	Turf over topsoil	
0.22	0.65	Stiff, light brown, slightly sandy, CLAY with discreet individual gravel fragments	HSV: 0.3m; 80-99kPa 0.5m; 77-91kPa Bulk; 0.4-0.6m
0.65	1.2	Stiff, becoming very stiff below 0.9m, reddish brown, slightly sandy, silty, CLAY with localised discreet fine to medium sub rounded gravel and sub angular cobbles	HSV: 0.7m; 120-130kPa 1.1m; >187kPa Bulk; 0.7-0.9

Excavated by – 3 ton tracked Excavator; 0.6m wide toothless digging bucket
 Plan dimensions – 0.6m x 3.0m
 Groundwater –Groundwater upwelling locally from base of pit below 1.1m depth
 Stability – No sidewall instability recorded in short term
 Contamination – No visual or olfactory evidence of contamination
 HSV – Hand Shear Vane



Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP13

Trial Pit Photographs:





Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP14

Excavation date:
24th & 25th Jan 2019

Logged by:
APJ

Client:
Cyngor Sir Ddinbych

Project ID:
1639

Strata:

Depth (m)		Description	Samples/Tests
From	To		
0	0.22	Turf over topsoil	
0.22	1.2	Firm to stiff, becoming very stiff below 0.6m, reddish brown, slightly sandy, silty CLAY with localised discreet fine to medium sub rounded gravel and cobbles.	HSV: 0.4m; 85-107kPa 0.6m; >180kPa 1.0m; >180kPa
0			

Excavated by – 3 ton tracked Excavator; 0.6m wide toothless digging bucket
 Plan dimensions – 0.6m x 3.0m
 Groundwater – Dry
 Stability – No sidewall instability recorded in short term
 Contamination – No visual or olfactory evidence of contamination
 HSV – Hand Shear Vane



Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP14

Trial Pit Photographs:



Project:

Trial Pit:



Colomendy Industrial Estate
Depot, Denbigh

TP15

Excavation date:
24th & 25th Jan 2019

Logged by:
APJ

Client:
Cyngor Sir Ddinbych

Project ID:
1639

Strata:

Depth (m)		Description	Samples
From	To		
0	0.2	Turf over topsoil	
0.2	0.45	Firm, light brown, sandy to very sandy, silty CLAY with discreet individual fine to medium rounded gravel fragments	
0.45	1.1	Stiff, becoming very stiff below 0.6m, reddish brown, slightly sandy, silty, CLAY with localised discreet fine to medium sub rounded gravel and sub angular cobbles. One boulder measuring 0.3*0.3*0.5m encountered.	HSV: 0.5m; 99-107kPa 0.7m; >180kPa

Excavated by – 3 ton tracked Excavator; 0.6m wide toothless digging bucket
 Plan dimensions – 0.6m x 3.0m
 Groundwater – No noticeable seepage however 5mm water standing on base of pit after 1hr
 Stability – No sidewall instability recorded in short term
 Contamination – No visual or olfactory evidence of contamination
 HSV – Hand Shear Vane



Project:
Colomendy Industrial Estate Depot,
Denbigh

Trial Pit:
TP15

Trial Pit Photographs:





Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP16

Excavation date:
24th & 25th Jan 2019

Logged by:
APJ

Client:
Cyngor Sir Ddinbych

Project ID:
1639

Strata:

Depth (m)		Description	Samples
From	To		
0	0.2	Turf over topsoil	
0.2	0.4	Firm to stiff, light brown, slightly sandy to sandy, silty CLAY with discreet individual fine to medium rounded gravel fragments	HSV: 0.3m; 72-104kPa 0.5m; 112-140kPa 0.8m; >180kPa
0.4	1.3	Stiff, becoming very stiff below 0.6m, reddish brown, slightly sandy, silty, CLAY with localised discreet fine to medium sub rounded gravel and sub angular cobbles. One boulder measuring 0.3*0.3*0.5m encountered.	

Excavated by – 3 ton tracked Excavator; 0.6m wide toothless digging bucket
 Plan dimensions – 0.6m x 3.0m
 Groundwater – No noticeable seepage however 10mm water standing on base of pit after 1hr
 Stability – no sidewall instability recorded in short term
 Contamination – No visual or olfactory evidence of contamination
 HSV – Hand Shear Vane



Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP16

Trial Pit Photographs:





Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP17

Excavation date:
24th & 25th Jan 2019

Logged by:
APJ

Client:
Cyngor Sir Ddinbych

Project ID:
1639

Strata:

Depth (m)		Description	Samples
From	To		
0	0.18	Turf over topsoil	
0.18	0.4	Firm, light brown, slightly sandy to sandy, silty CLAY with discreet individual fine to medium rounded gravel fragments	
0.4	1.3	Stiff, becoming very stiff below 0.6m, reddish brown occasionally mottled grey, slightly sandy, silty, CLAY with localised discreet fine to medium sub rounded gravel and sub angular cobbles. One boulder measuring 0.3*0.3*0.5m encountered. Roots from adjacent oak trees recorded to full depth.	HSV: 0.4m; 104-110kPa 0.5m; 160-170kPa 0.8m; >180kPa

Excavated by – 3 ton tracked Excavator; 0.6m wide toothless digging bucket
 Plan dimensions – 0.6m x 3.0m
 Groundwater – Dry
 Stability – No sidewall instability recorded in short term
 Contamination – No visual or olfactory evidence of contamination
 HSV – Hand Shear Vane



Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP17

Trial Pit Photographs:





Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP18

Excavation date:
24th & 25th Jan 2019

Logged by:
APJ

Client:
Cyngor Sir Ddinbych

Project ID:
1639

Strata:

Depth (m)		Description	Samples
From	To		
0	0.05	Turf over topsoil	
0.05	0.15	Limestone aggregate mixed with clayey sand matrix – probable old farm track along field boundary (Made Ground)	Tub – 0.05-0.1
0.15	0.6	Firm, stiff below 0.5m, reddish brown, slightly sandy, silty, CLAY with localised discreet fine to medium sub rounded gravel	
0.4	1.3	Medium Dense to dense, red-brown silty, clayey to very clayey, gravelly SAND with sub rounded to sub angular cobbles and localised boulders (<0.3*0.3*0.5m)	

Excavated by – 3 ton tracked Excavator; 0.6m wide toothless digging bucket
 Plan dimensions – 0.6m x 3.0m
 Groundwater – Dry
 Stability – slight collapse/overbreak of granular horizon
 Contamination – No visual or olfactory evidence of contamination
 HSV – Hand Shear Vane



Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Trial Pit:
TP18

Trial Pit Photographs:



APPENDIX D

CBR Charts (Main Site & Road Widening)



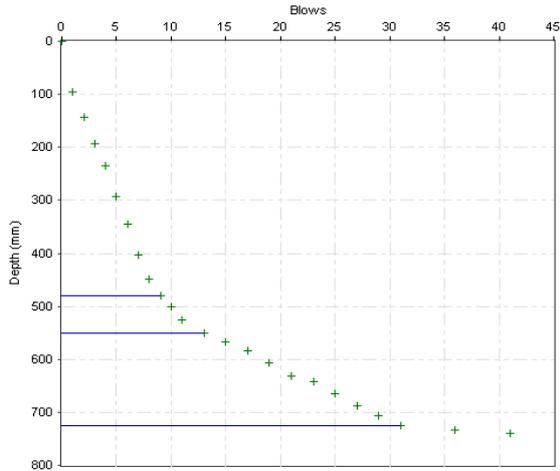
Dynamic Cone Penetrometer Strength Analysis Report

Site: COLOMENDY, DENBIGH
 Location: DCP1
 Cone Angle: 60 degrees
 Zero Error: 81
 Test Date: 24/01/2019

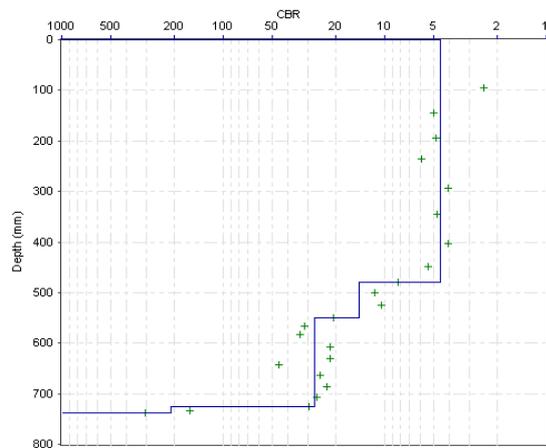
Job Number: CCG-C-19-10772
 Surface Type: -
 Thickness (mm): -

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)
1	0	0	81	0
2	1	1	176	95.0
3	1	2	225	49.0
4	1	3	275	50.0
5	1	4	316	41.0
6	1	5	375	59.0
7	1	6	426	51.0
8	1	7	485	59.0
9	1	8	530	45.0
10	1	9	560	30.0
11	1	10	582	22.0
12	1	11	606	24.0
13	2	13	631	12.5
14	2	15	648	8.5
15	2	17	664	8.0
16	2	19	688	12.0
17	2	21	712	12.0
18	2	23	724	6.0
19	2	25	745	10.5
20	2	27	768	11.5
21	2	29	788	10.0
22	2	31	806	9.0
23	5	36	815	1.8
24	5	41	820	1.0

Layer Boundaries: Chainage 1.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	CBR value	Thickness	Depth	Position	Strength Coefficient
1	5	479	479		
2	14	71	550		
3	27	175	725		
4	212	14	739		

CBR Derived by TDR equation

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{penetration rate})$$

Remarks Surface material description: Grassed TOPSOIL



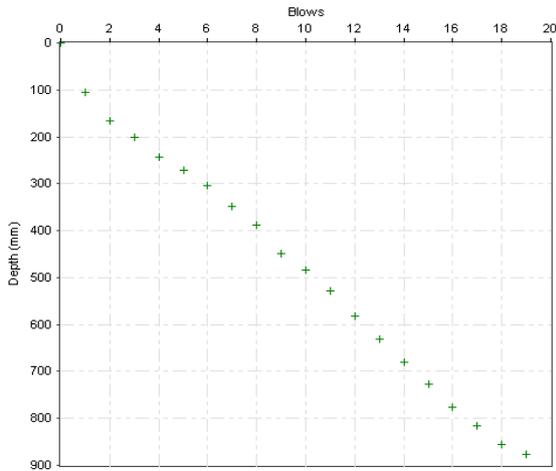
Dynamic Cone Penetrometer Strength Analysis Report

Site: COLOMENDY, DENBIGH
 Location: DCP2
 Cone Angle: 60 degrees
 Zero Error: 64
 Test Date: 24/01/2019

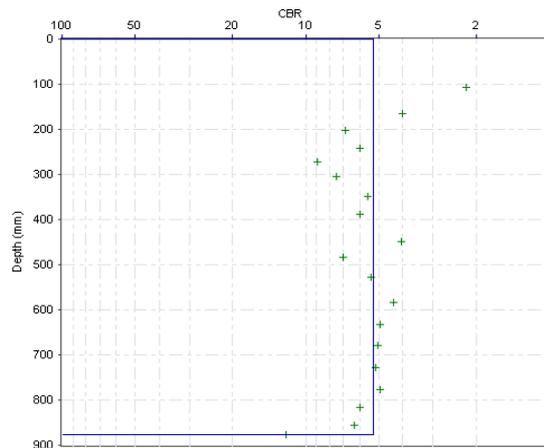
Job Number: CCG-C-19-10772
 Surface Type: -
 Thickness (mm): -

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)
1	0	0	64	0					
2	1	1	170	106.0					
3	1	2	230	60.0					
4	1	3	266	36.0					
5	1	4	307	41.0					
6	1	5	335	28.0					
7	1	6	368	33.0					
8	1	7	412	44.0					
9	1	8	453	41.0					
10	1	9	512	59.0					
11	1	10	547	35.0					
12	1	11	592	45.0					
13	1	12	647	55.0					
14	1	13	696	49.0					
15	1	14	744	48.0					
16	1	15	791	47.0					
17	1	16	840	49.0					
18	1	17	881	41.0					
19	1	18	920	39.0					
20	1	19	941	21.0					

Layer Boundaries: Chainage 2.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	CBR value	Thickness	Depth	Position	Strength Coefficient
1	5	877	877		

CBR Derived by TDR equation

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{penetration rate})$$

Remarks Surface material description: Grassed TOPSOIL



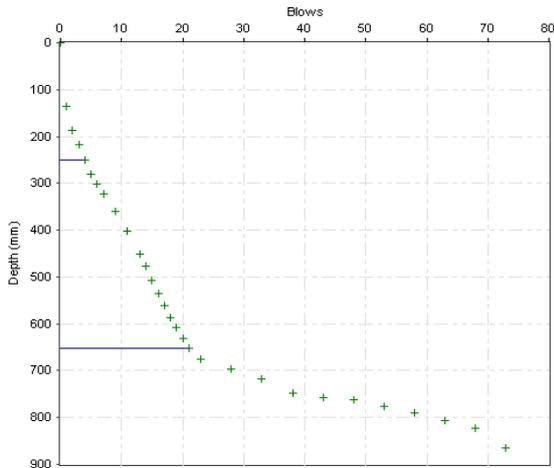
Dynamic Cone Penetrometer Strength Analysis Report

Site: COLOMENDY, DENBIGH
 Location: DCP3
 Cone Angle: 60 degrees
 Zero Error: 74
 Test Date: 24/01/2019

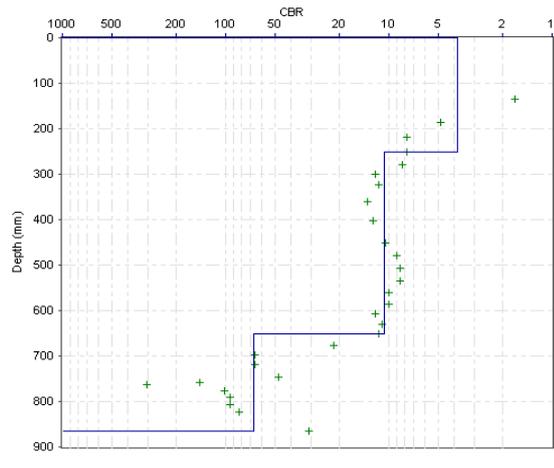
Job Number: CCG-C-19-10772
 Surface Type: -
 Thickness (mm): -

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)
1	0	0	74	0
2	1	1	210	136.0
3	1	2	260	50.0
4	1	3	292	32.0
5	1	4	324	32.0
6	1	5	354	30.0
7	1	6	375	21.0
8	1	7	397	22.0
9	2	9	435	19.0
10	2	11	476	20.5
11	2	13	524	24.0
12	1	14	552	28.0
13	1	15	581	29.0
14	1	16	610	29.0
15	1	17	635	25.0
16	1	18	660	25.0
17	1	19	681	21.0
18	1	20	704	23.0
19	1	21	726	22.0
20	2	23	750	12.0
21	5	28	771	4.2
22	5	33	792	4.2
23	5	38	821	5.8
24	5	43	831	2.0
25	5	48	836	1.0
26	5	53	850	2.8
27	5	58	865	3.0
28	5	63	880	3.0
29	5	68	897	3.4
30	5	73	940	8.6

Layer Boundaries: Chainage 3.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	CBR value	Thickness	Depth	Position	Strength Coefficient
1	4	250	250		
2	11	402	652		
3	68	214	866		

CBR Derived by TDR equation

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{penetration rate})$$

Remarks Surface material description: Grassed TOPSOIL



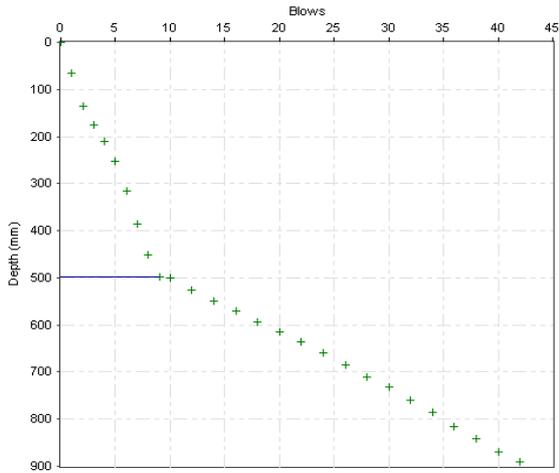
Dynamic Cone Penetrometer Strength Analysis Report

Site: COLOMENDY, DENBIGH
 Location: DCP4
 Cone Angle: 60 degrees
 Zero Error: 55
 Test Date: 24/01/2019

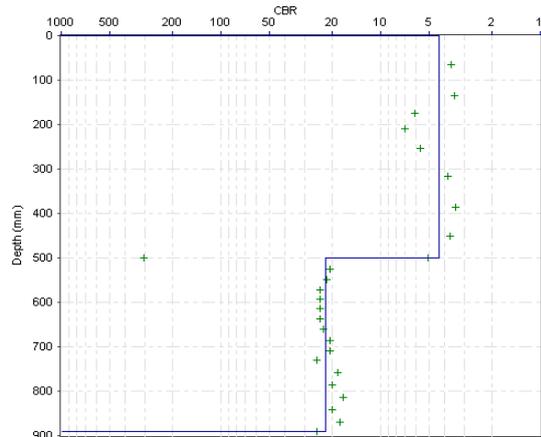
Job Number: CCG-C-19-10772
 Surface Type: -
 Thickness (mm): -

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)
1	0	0	55	0	21	2	30	786	10.5
2	1	1	121	66.0	22	2	32	814	14.0
3	1	2	190	69.0	23	2	34	840	13.0
4	1	3	230	40.0	24	2	36	870	15.0
5	1	4	265	35.0	25	2	38	896	13.0
6	1	5	308	43.0	26	2	40	925	14.5
7	1	6	371	63.0	27	2	42	946	10.5
8	1	7	441	70.0					
9	1	8	506	65.0					
10	1	9	554	48.0					
11	1	10	555	1.0					
12	2	12	580	12.5					
13	2	14	604	12.0					
14	2	16	626	11.0					
15	2	18	648	11.0					
16	2	20	670	11.0					
17	2	22	692	11.0					
18	2	24	715	11.5					
19	2	26	740	12.5					
20	2	28	765	12.5					

Layer Boundaries: Chainage 4.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	CBR value	Thickness	Depth	Position	Strength Coefficient
1	4	499	499		
2	22	392	891		

CBR Derived by TDR equation

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{penetration rate})$$

Remarks Surface material description: Grassed TOPSOIL



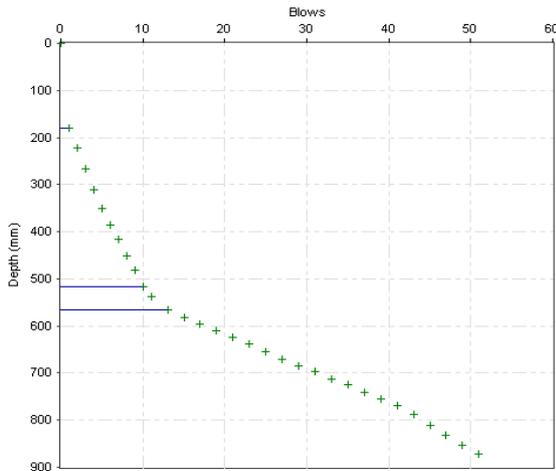
Dynamic Cone Penetrometer Strength Analysis Report

Site: COLOMENDY, DENBIGH
 Location: DCP7
 Cone Angle: 60 degrees
 Zero Error: 60
 Test Date: 24/01/2019

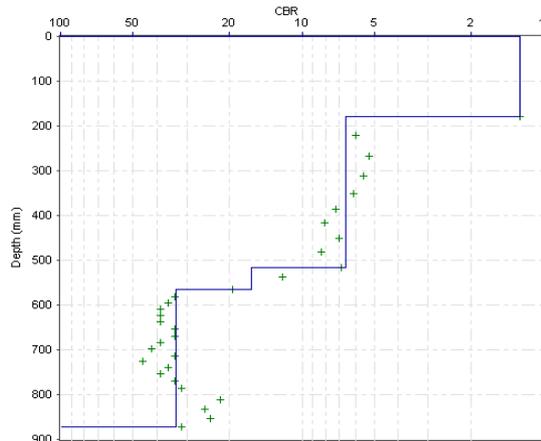
Job Number: CCG-C-19-10772
 Surface Type: -
 Thickness (mm): -

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)
1	0	0	60	0
2	1	1	240	180.0
3	1	2	281	41.0
4	1	3	327	46.0
5	1	4	371	44.0
6	1	5	411	40.0
7	1	6	445	34.0
8	1	7	476	31.0
9	1	8	511	35.0
10	1	9	541	30.0
11	1	10	577	36.0
12	1	11	598	21.0
13	2	13	625	13.5
14	2	15	641	8.0
15	2	17	656	7.5
16	2	19	670	7.0
17	2	21	684	7.0
18	2	23	698	7.0
19	2	25	714	8.0
20	2	27	730	8.0
21	2	29	744	7.0
22	2	31	757	6.5
23	2	33	773	8.0
24	2	35	785	6.0
25	2	37	800	7.5
26	2	39	814	7.0
27	2	41	830	8.0
28	2	43	847	8.5
29	2	45	871	12.0
30	2	47	892	10.5
31	2	49	914	11
32	2	51	931	8.5

Layer Boundaries: Chainage 7.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	CBR value	Thickness	Depth	Position	Strength Coefficient
1	1	180	180		
2	7	337	517		
3	16	48	565		
4	33	306	871		

CBR Derived by TDR equation

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{penetration rate})$$

Remarks Surface material description: Grassed TOPSOIL



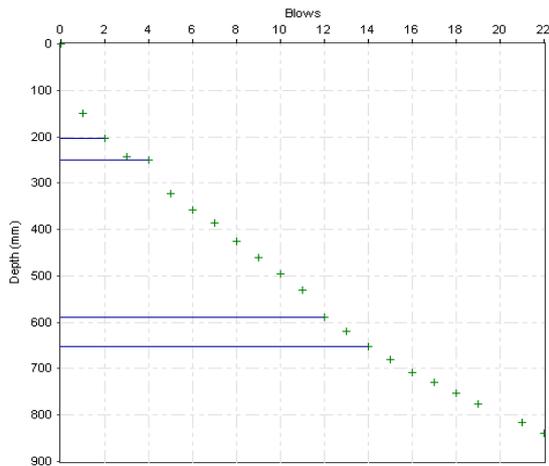
Dynamic Cone Penetrometer Strength Analysis Report

Site: COLOMENDY, DENBIGH
 Location: DCP8
 Cone Angle: 60 degrees
 Zero Error: 101
 Test Date: 24/01/2019

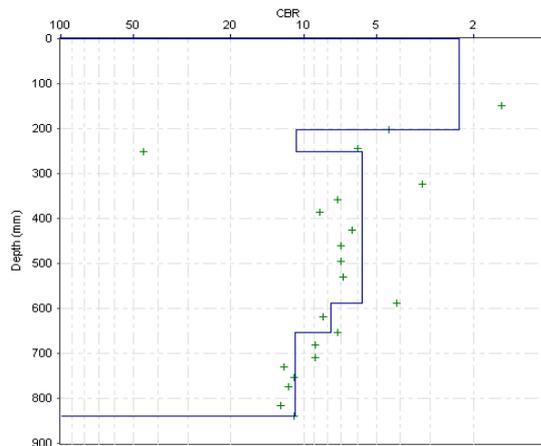
Job Number: CCG-C-19-10772
 Surface Type: -
 Thickness (mm): -

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)
1	0	0	101	0
2	1	1	250	149.0
3	1	2	304	54.0
4	1	3	345	41.0
5	1	4	351	6.0
6	1	5	424	73.0
7	1	6	458	34.0
8	1	7	487	29.0
9	1	8	526	39.0
10	1	9	561	35.0
11	1	10	596	35.0
12	1	11	632	36.0
13	1	12	690	58.0
14	1	13	720	30.0
15	1	14	754	34.0
16	1	15	782	28.0
17	1	16	810	28.0
18	1	17	831	21.0
19	1	18	854	23.0
20	1	19	876	22.0
21	2	21	917	20.5
22	1	22	940	23.0

Layer Boundaries: Chainage 8.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	CBR value	Thickness	Depth	Position	Strength Coefficient
1	2	203	203		
2	11	47	250		
3	6	339	589		
4	8	64	653		
5	11	186	839		

CBR Derived by TDR equation

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{penetration rate})$$

Remarks Surface material description: Grassed TOPSOIL



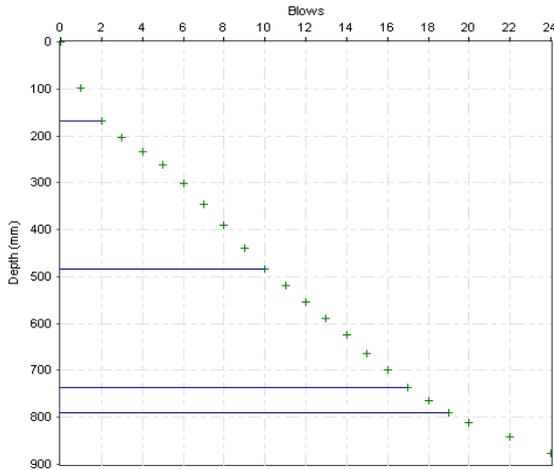
Dynamic Cone Penetrometer Strength Analysis Report

Site: COLOMENDY, DENBIGH
 Location: DCP9
 Cone Angle: 60 degrees
 Zero Error: 71
 Test Date: 24/01/2019

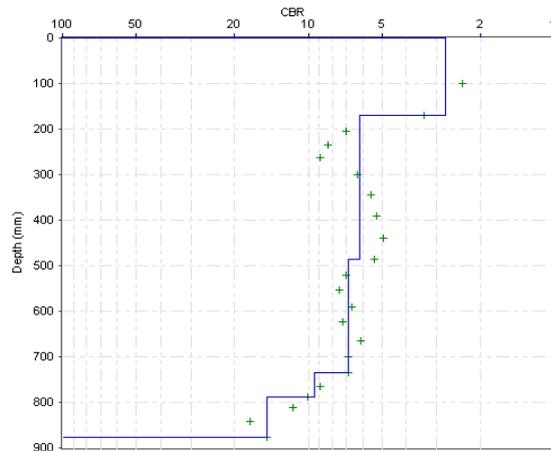
Job Number: CCG-C-19-10772
 Surface Type: -
 Thickness (mm): -

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)
1	0	0	71	0
2	1	1	170	99.0
3	1	2	240	70.0
4	1	3	275	35.0
5	1	4	305	30.0
6	1	5	333	28.0
7	1	6	372	39.0
8	1	7	416	44.0
9	1	8	462	46.0
10	1	9	511	49.0
11	1	10	556	45.0
12	1	11	591	35.0
13	1	12	624	33.0
14	1	13	661	37.0
15	1	14	695	34.0
16	1	15	735	40.0
17	1	16	771	36.0
18	1	17	807	36.0
19	1	18	835	28.0
20	1	19	860	25.0
21	1	20	882	22.0
22	2	22	912	15.0
23	2	24	947	17.5

Layer Boundaries: Chainage 9.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	CBR value	Thickness	Depth	Position	Strength Coefficient
1	3	169	169		
2	6	316	485		
3	7	251	736		
4	9	53	789		
5	15	87	876		

CBR Derived by TDR equation

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{penetration rate})$$

Remarks Surface material description: Grassed TOPSOIL



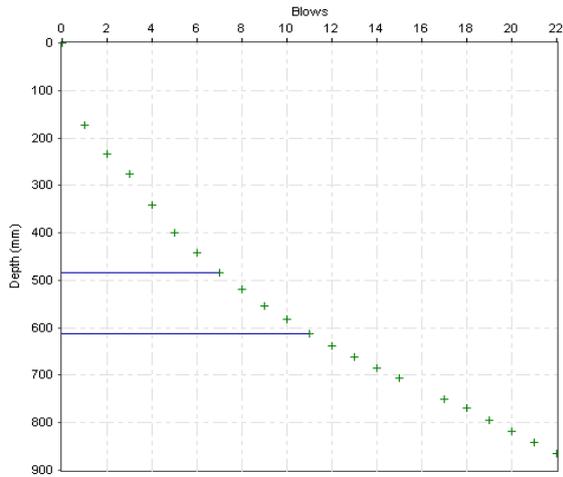
Dynamic Cone Penetrometer Strength Analysis Report

Site: COLOMENDY, DENBIGH
 Location: DCP10
 Cone Angle: 60 degrees
 Zero Error: 71
 Test Date: 24/01/2019

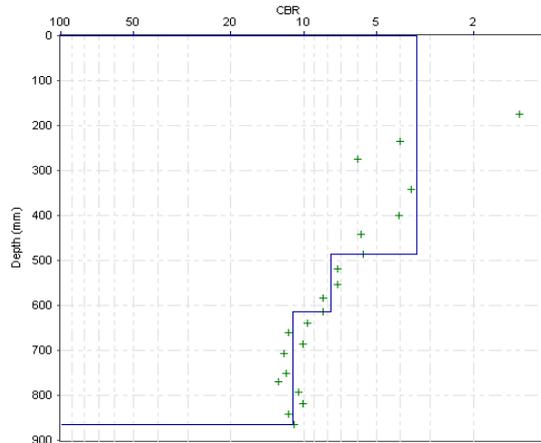
Job Number: CCG-C-19-10772
 Surface Type: -
 Thickness (mm): -

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)
1	0	0	71	0	21	1	21	912	22.0
2	1	1	245	174.0	22	1	22	935	23.0
3	1	2	305	60.0					
4	1	3	346	41.0					
5	1	4	412	66.0					
6	1	5	471	59.0					
7	1	6	513	42.0					
8	1	7	556	43.0					
9	1	8	590	34.0					
10	1	9	624	34.0					
11	1	10	654	30.0					
12	1	11	684	30.0					
13	1	12	710	26.0					
14	1	13	732	22.0					
15	1	14	757	25.0					
16	1	15	778	21.0					
17	2	17	821	21.5					
18	1	18	841	20.0					
19	1	19	865	24.0					
20	1	20	890	25.0					

Layer Boundaries: Chainage 10.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	CBR value	Thickness	Depth	Position	Strength Coefficient
1	3	485	485		
2	8	128	613		
3	11	251	864		

CBR Derived by TDR equation

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{penetration rate})$$

Remarks Surface material description: Grassed TOPSOIL



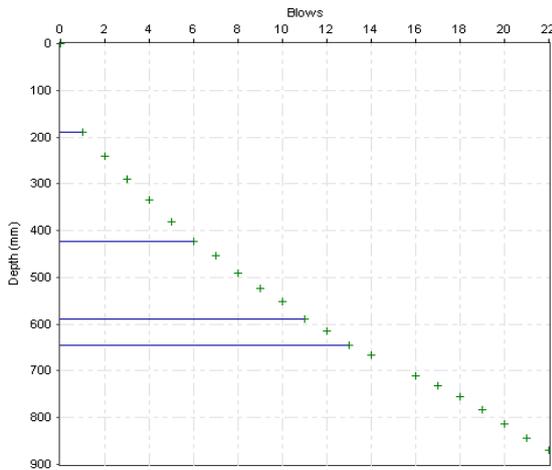
Dynamic Cone Penetrometer Strength Analysis Report

Site: COLOMENDY, DENBIGH
 Location: DCP11
 Cone Angle: 60 degrees
 Zero Error: 80
 Test Date: 24/01/2019

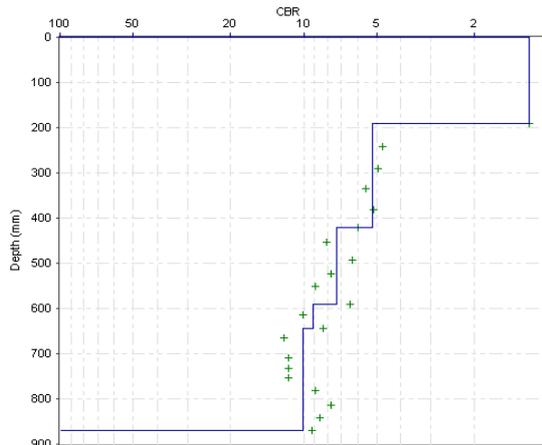
Job Number: CCG-C-19-10772
 Surface Type: -
 Thickness (mm): -

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)
1	0	0	80	0	21	1	21	923	29.0
2	1	1	270	190.0	22	1	22	950	27.0
3	1	2	321	51.0					
4	1	3	370	49.0					
5	1	4	414	44.0					
6	1	5	461	47.0					
7	1	6	502	41.0					
8	1	7	533	31.0					
9	1	8	572	39.0					
10	1	9	604	32.0					
11	1	10	632	28.0					
12	1	11	670	38.0					
13	1	12	695	25.0					
14	1	13	725	30.0					
15	1	14	746	21.0					
16	2	16	790	22.0					
17	1	17	812	22.0					
18	1	18	834	22.0					
19	1	19	862	28.0					
20	1	20	894	32.0					

Layer Boundaries: Chainage 11.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	CBR value	Thickness	Depth	Position	Strength Coefficient
1	1	190	190		
2	5	232	422		
3	7	168	590		
4	9	55	645		
5	10	225	870		

CBR Derived by TDR equation

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{penetration rate})$$

Remarks Surface material description: Grassed TOPSOIL



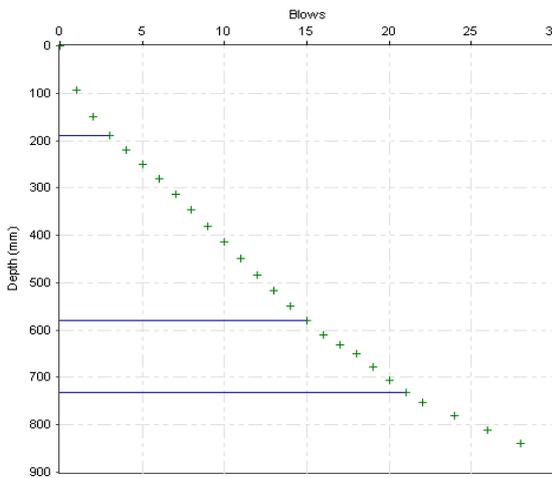
Dynamic Cone Penetrometer Strength Analysis Report

Site: COLOMENDY, DENBIGH
 Location: DCP13
 Cone Angle: 60 degrees
 Zero Error: 101
 Test Date: 24/01/2019

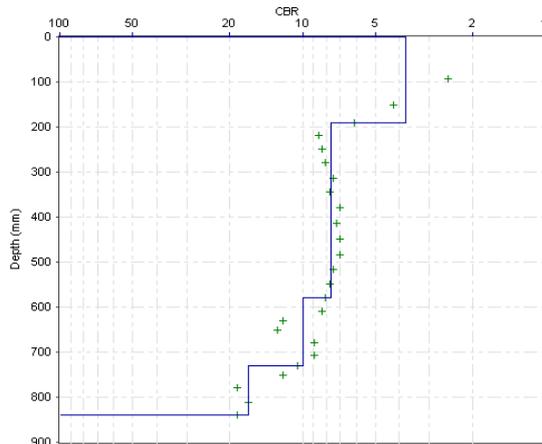
Job Number: CCG-C-19-10772
 Surface Type: -
 Thickness (mm): -

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)
1	0	0	101	0	21	1	20	808	28.0
2	1	1	194	93.0	22	1	21	832	24.0
3	1	2	251	57.0	23	1	22	853	21.0
4	1	3	291	40.0	24	2	24	881	14.0
5	1	4	320	29.0	25	2	26	912	15.5
6	1	5	350	30.0	26	2	28	940	14.0
7	1	6	381	31.0					
8	1	7	414	33.0					
9	1	8	446	32.0					
10	1	9	481	35.0					
11	1	10	515	34.0					
12	1	11	550	35.0					
13	1	12	585	35.0					
14	1	13	618	33.0					
15	1	14	650	32.0					
16	1	15	681	31.0					
17	1	16	711	30.0					
18	1	17	732	21.0					
19	1	18	752	20.0					
20	1	19	780	28.0					

Layer Boundaries: Chainage 13.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	CBR value	Thickness	Depth	Position	Strength Coefficient
1	4	190	190		
2	8	390	580		
3	10	151	731		
4	17	108	839		

CBR Derived by TDR equation

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{penetration rate})$$

Remarks Surface material description: Grassed TOPSOIL



Dynamic Cone Penetrometer Strength Analysis Report

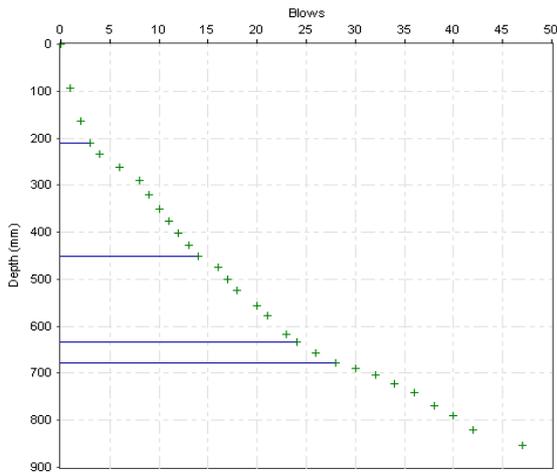
Site: COLOMENDY, DENBIGH
 Location: DCP16
 Cone Angle: 60 degrees
 Zero Error: 81
 Test Date: 24/01/2019

Job Number: CCG-C-19-10772
 Surface Type: -
 Thickness (mm): -

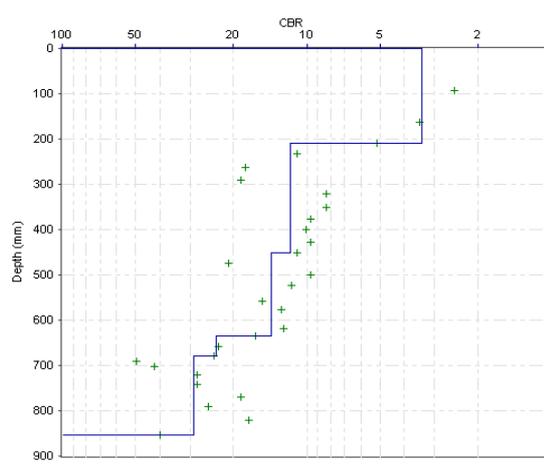
No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)
1	0	0	81	0
2	1	1	175	94.0
3	1	2	244	69.0
4	1	3	291	47.0
5	1	4	314	23.0
6	2	6	343	14.5
7	2	8	371	14.0
8	1	9	401	30.0
9	1	10	431	30.0
10	1	11	457	26.0
11	1	12	482	25.0
12	1	13	508	26.0
13	1	14	531	23.0
14	2	16	556	12.5
15	1	17	582	26.0
16	1	18	604	22.0
17	2	20	638	17.0
18	1	21	658	20.0
19	2	23	699	20.5
20	1	24	715	16.0

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)
21	2	26	738	11.5
22	2	28	760	11.0
23	2	30	771	5.5
24	2	32	784	6.5
25	2	34	803	9.5
26	2	36	822	9.5
27	2	38	850	14.0
28	2	40	871	10.5
29	2	42	901	15.0
30	5	47	935	6.8

Layer Boundaries: Chainage 16.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	CBR value	Thickness	Depth	Position	Strength Coefficient
1	3	210	210		
2	12	240	450		
3	14	184	634		
4	23	45	679		
5	29	175	854		

CBR Derived by TDR equation

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{penetration rate})$$

Remarks Surface material description: Grassed TOPSOIL



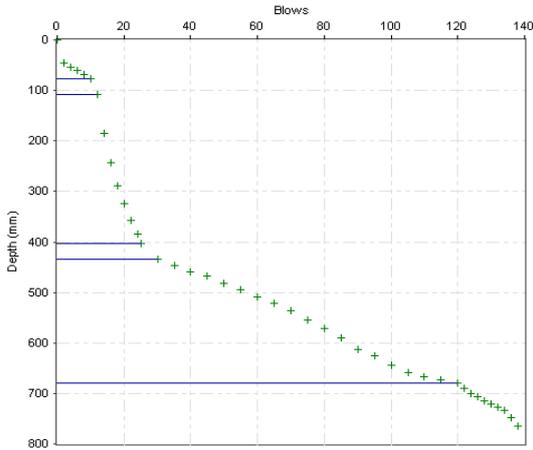
Dynamic Cone Penetrometer Strength Analysis Report

Site: COLOMENDY, DENBIGH
 Location: HP01 (commenced at 0.46mbgl)
 Cone Angle: 60 degrees
 Zero Error: 151
 Test Date: 24/01/2019

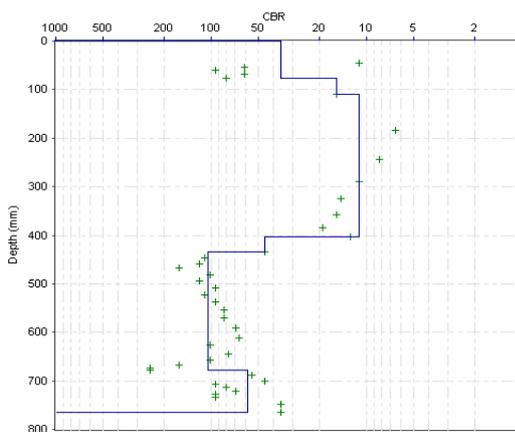
Job Number: CCG-C-19-10772
 Surface Type: -
 Thickness (mm): -

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)
1	0	0	151	0	22	5	65	673	2.6
2	2	2	196	22.5	23	5	70	688	3.0
3	2	4	205	4.5	24	5	75	705	3.4
4	2	6	211	3.0	25	5	80	722	3.4
5	2	8	220	4.5	26	5	85	742	4.0
6	2	10	227	3.5	27	5	90	763	4.2
7	2	12	260	16.5	28	5	95	777	2.8
8	2	14	335	37.5	29	5	100	795	3.6
9	2	16	395	30.0	30	5	105	809	2.8
10	2	18	440	22.5	31	5	110	818	1.8
11	2	20	475	17.5	32	5	115	824	1.2
12	2	22	508	16.5	33	5	120	830	1.2
13	2	24	535	13.5	34	2	122	840	5
14	1	25	555	20.0	35	2	124	852	6
15	5	30	585	6.0	36	2	126	858	3
16	5	35	598	2.6	37	2	128	865	3.5
17	5	40	610	2.4	38	2	130	873	4
18	5	45	619	1.8	39	2	132	879	3
19	5	50	633	2.8	40	2	134	885	3
20	5	55	645	2.4	41	2	136	900	7.5
21	5	60	660	3	42	2	138	915	7.5

Layer Boundaries: Chainage 1.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	CBR value	Thickness	Depth	Position	Strength Coefficient
1	35	76	76		
2	16	33	109		
3	11	295	404		
4	45	30	434		
5	105	245	679		
6	59	85	764		

CBR Derived by TDR equation

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{penetration rate})$$

Remarks Surface material description: (Client description): Sandy clay subgrade



Dynamic Cone Penetrometer Strength Analysis Report

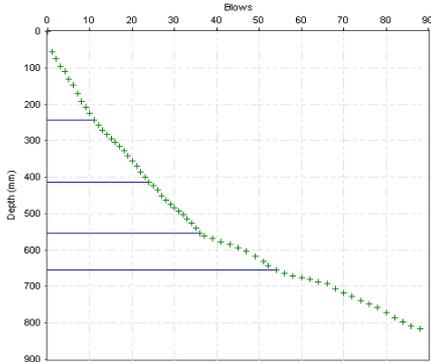
Site: COLOMENDY, DENBIGH
 Location: HP02 (commenced at 0.8mbgl)
 Cone Angle: 60 degrees
 Zero Error: 100
 Test Date: 21/02/2019

Job Number: CCG-C-19-10772
 Surface Type: -
 Thickness (mm): -

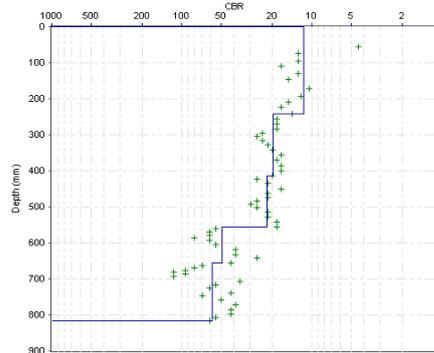
No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)
1	0	0	100	0
2	1	1	155	55.0
3	1	2	175	20.0
4	1	3	195	20.0
5	1	4	210	15.0
6	1	5	230	20.0
7	1	6	247	17.0
8	1	7	271	24.0
9	1	8	292	21.0
10	1	9	309	17.0
11	1	10	324	15.0
12	1	11	342	18.0
13	1	12	356	14.0
14	1	13	370	14.0
15	1	14	384	14.0
16	1	15	395	11.0
17	1	16	405	10.0
18	1	17	416	11.0
19	1	18	428	12.0
20	1	19	441	13.0
21	1	20	456	15
22	1	21	470	14
23	1	22	485	15
24	1	23	500	15
25	1	24	513	13
26	1	25	523	10
27	1	26	535	12
28	1	27	550	15
29	1	28	562	12
30	1	29	574	12
31	1	30	584	10
32	1	31	593	9

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)
33	1	32	603	10.0
34	1	33	615	12.0
35	1	34	627	12.0
36	1	35	641	14.0
37	1	36	655	14.0
38	1	37	660	5.0
39	2	39	669	4.5
40	2	41	678	4.5
41	2	43	685	3.5
42	2	45	694	4.5
43	2	47	704	5
44	2	49	718	7
45	2	51	732	7
46	1	52	742	10
47	2	54	755	6.5
48	2	56	763	4
49	2	58	770	3.5
50	2	60	776	3
51	2	62	781	2.5
52	2	64	787	3
53	2	66	792	2.5
54	2	68	807	7.5
55	2	70	817	5
56	2	72	826	4.5
57	2	74	839	6.5
58	2	76	847	4
59	2	78	858	5.5
60	2	80	872	7
61	2	82	885	6.5
62	2	84	898	6.5
63	2	86	908	5
64	2	88	917	4.5

Layer Boundaries: Chainage 2.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	CBR value	Thickness	Depth	Position	Strength Coefficient
1	12	242	242		
2	20	171	413		
3	22	142	555		
4	49	100	655		
5	58	162	817		

CBR Derived by TDR equation

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{penetration rate})$$

Remarks Surface material description:



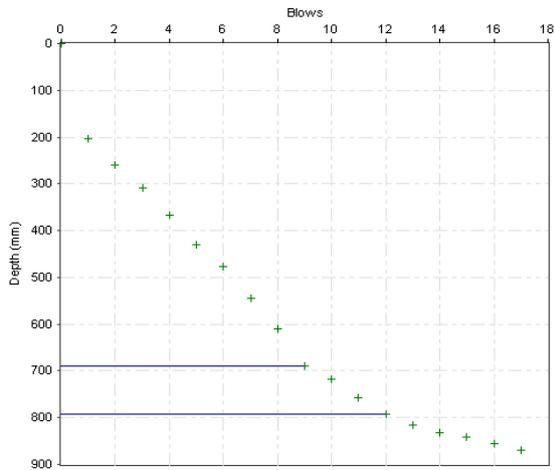
Dynamic Cone Penetrometer Strength Analysis Report

Site: COLOMENDY, DENBIGH
 Location: HP03A
 Cone Angle: 60 degrees
 Zero Error: 72
 Test Date: 24/01/2019

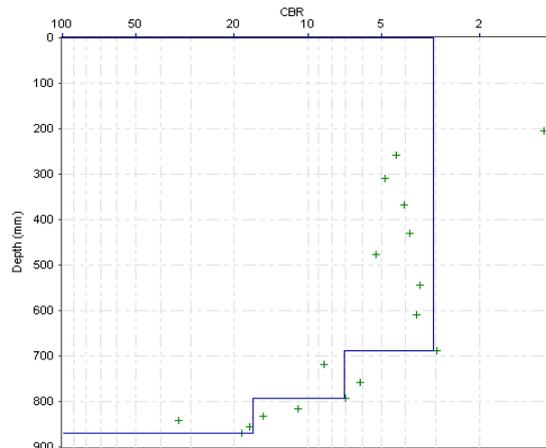
Job Number: CCG-C-19-10772
 Surface Type: -
 Thickness (mm): -

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)
1	0	0	72	0
2	1	1	276	204.0
3	1	2	331	55.0
4	1	3	381	50.0
5	1	4	440	59.0
6	1	5	502	62.0
7	1	6	548	46.0
8	1	7	616	68.0
9	1	8	682	66.0
10	1	9	761	79.0
11	1	10	790	29.0
12	1	11	830	40.0
13	1	12	865	35.0
14	1	13	888	23.0
15	1	14	905	17.0
16	1	15	913	8.0
17	1	16	928	15.0
18	1	17	942	14.0

Layer Boundaries: Chainage 3.100



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	CBR value	Thickness	Depth	Position	Strength Coefficient
1	3	689	689		
2	7	104	793		
3	17	77	870		

CBR Derived by TDR equation

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{penetration rate})$$

Remarks Surface material description:



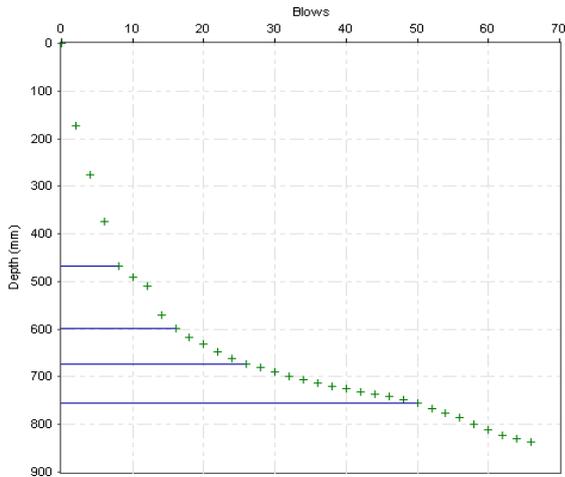
Dynamic Cone Penetrometer Strength Analysis Report

Site: COLOMENDY, DENBIGH
 Location: HP03C
 Cone Angle: 60 degrees
 Zero Error: 80
 Test Date: 24/01/2019

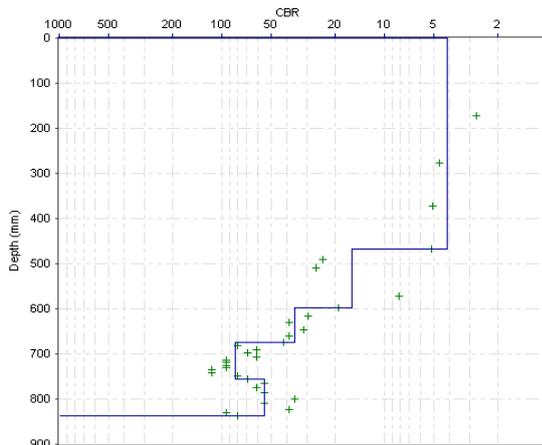
Job Number: CCG-C-19-10772
 Surface Type: -
 Thickness (mm): -

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)
1	0	0	80	0	21	2	40	805	3.0
2	2	2	252	86.0	22	2	42	811	3.0
3	2	4	357	52.5	23	2	44	816	2.5
4	2	6	453	48.0	24	2	46	821	2.5
5	2	8	548	47.5	25	2	48	828	3.5
6	2	10	570	11.0	26	2	50	836	4.0
7	2	12	590	10.0	27	2	52	846	5.0
8	2	14	651	30.5	28	2	54	855	4.5
9	2	16	678	13.5	29	2	56	865	5.0
10	2	18	696	9.0	30	2	58	880	7.5
11	2	20	710	7.0	31	2	60	890	5
12	2	22	727	8.5	32	2	62	904	7
13	2	24	741	7.0	33	2	64	910	3
14	2	26	754	6.5	34	2	66	917	3.5
15	2	28	761	3.5					
16	2	30	770	4.5					
17	2	32	778	4.0					
18	2	34	787	4.5					
19	2	36	793	3.0					
20	2	38	799	3.0					

Layer Boundaries: Chainage 3.300



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	CBR value	Thickness	Depth	Position	Strength Coefficient
1	4	468	468		
2	16	130	598		
3	35	76	674		
4	82	82	756		
5	54	81	837		

CBR Derived by TDR equation

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{penetration rate})$$

Remarks Surface material description:



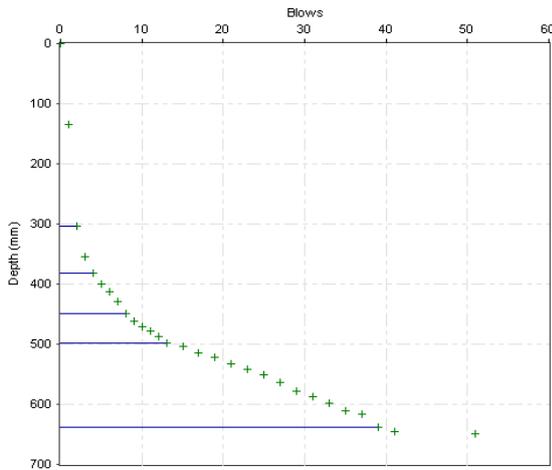
Dynamic Cone Penetrometer Strength Analysis Report

Site: COLOMENDY, DENBIGH
 Location: HP03D
 Cone Angle: 60 degrees
 Zero Error: 196
 Test Date: 24/01/2019

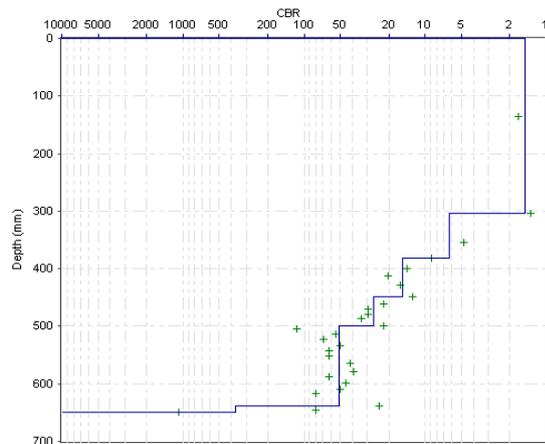
Job Number: CCG-C-19-10772
 Surface Type: -
 Thickness (mm): -

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)
1	0	0	196	0
2	1	1	331	135.0
3	1	2	500	169.0
4	1	3	550	50.0
5	1	4	578	28.0
6	1	5	596	18.0
7	1	6	609	13.0
8	1	7	625	16.0
9	1	8	645	20.0
10	1	9	657	12.0
11	1	10	666	9.0
12	1	11	675	9.0
13	1	12	683	8.0
14	1	13	695	12.0
15	2	15	700	2.5
16	2	17	710	5.0
17	2	19	718	4.0
18	2	21	729	5.5
19	2	23	738	4.5
20	2	25	747	4.5
21	2	27	760	6.5
22	2	29	774	7.0
23	2	31	783	4.5
24	2	33	795	6.0
25	2	35	806	5.5
26	2	37	813	3.5
27	2	39	835	11.0
28	2	41	842	3.5
29	10	51	845	0.3

Layer Boundaries: Chainage 3.400



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	CBR value	Thickness	Depth	Position	Strength Coefficient
1	1	304	304		
2	6	78	382		
3	15	67	449		
4	26	50	499		
5	51	140	639		
6	366	10	649		

CBR Derived by TDR equation

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{penetration rate})$$

Remarks Surface material description:



Dynamic Cone Penetrometer Strength Analysis Report

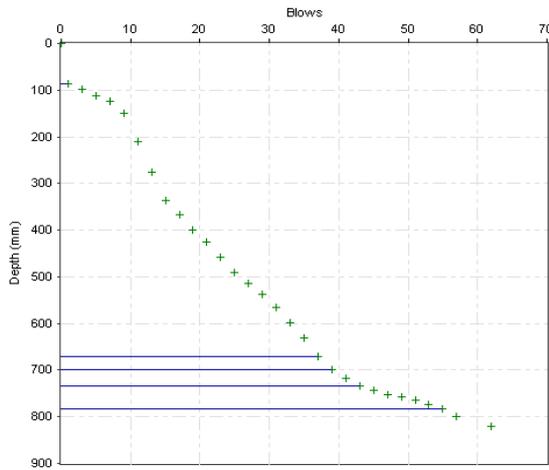
Site: COLOMENDY, DENBIGH
 Location: HP04 (commenced at 0.35mbgl)
 Cone Angle: 60 degrees
 Zero Error: 105
 Test Date: 24/01/2019

Job Number: CCG-C-19-10772
 Surface Type: -
 Thickness (mm): -

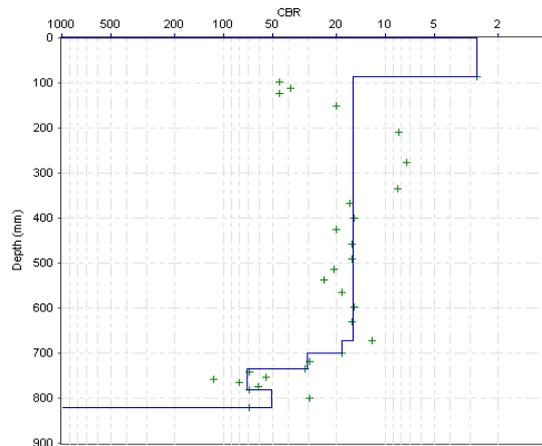
No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)
1	0	0	105	0
2	1	1	191	86.0
3	2	3	203	6.0
4	2	5	217	7.0
5	2	7	229	6.0
6	2	9	255	13.0
7	2	11	315	30.0
8	2	13	382	33.5
9	2	15	441	29.5
10	2	17	472	15.5
11	2	19	505	16.5
12	2	21	531	13.0
13	2	23	563	16.0
14	2	25	595	16.0
15	2	27	620	12.5
16	2	29	642	11.0
17	2	31	670	14.0
18	2	33	703	16.5
19	2	35	735	16.0
20	2	37	777	21.0

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)
21	2	39	805	14.0
22	2	41	823	9.0
23	2	43	840	8.5
24	2	45	848	4.0
25	2	47	858	5.0
26	2	49	863	2.5
27	2	51	870	3.5
28	2	53	879	4.5
29	2	55	887	4.0
30	2	57	905	9
31	5	62	925	4

Layer Boundaries: Chainage 4.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	CBR value	Thickness	Depth	Position	Strength Coefficient
1	3	86	86		
2	16	586	672		
3	19	28	700		
4	30	35	735		
5	71	47	782		
6	51	38	820		

CBR Derived by TDR equation

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{penetration rate})$$

Remarks Surface material description:



Dynamic Cone Penetrometer Strength Analysis Report

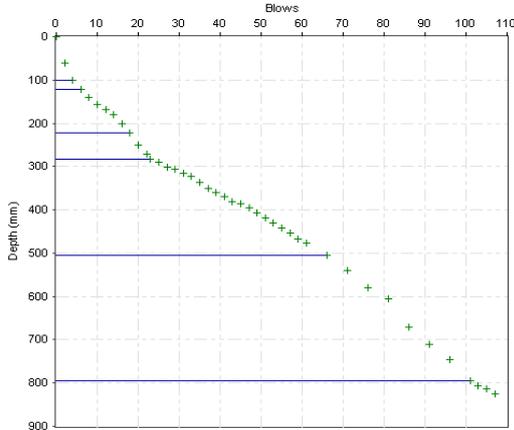
Site: COLOMENDY, DENBIGH
 Location: HP05 (commenced at 1.1mbgl)
 Cone Angle: 60 degrees
 Zero Error: 95
 Test Date: 24/01/2019

Job Number: CCG-C-19-10772
 Surface Type: -
 Thickness (mm): -

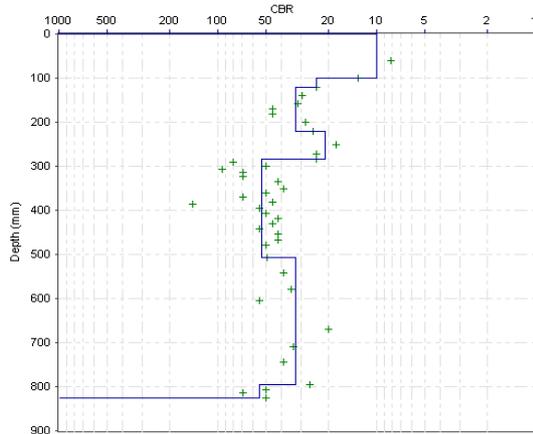
No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)
1	0	0	95	0
2	2	2	156	30.5
3	2	4	195	19.5
4	2	6	217	11.0
5	2	8	235	9.0
6	2	10	252	8.5
7	2	12	264	6.0
8	2	14	276	6.0
9	2	16	295	9.5
10	2	18	316	10.5
11	2	20	345	14.5
12	2	22	367	11.0
13	1	23	378	11.0
14	2	25	385	3.5
15	2	27	396	5.5
16	2	29	402	3.0
17	2	31	410	4.0
18	2	33	418	4.0
19	2	35	431	6.5
20	2	37	445	7.0
21	2	39	456	5.5
22	2	41	464	4

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)
23	2	43	476	6.0
24	2	45	480	2.0
25	2	47	490	5.0
26	2	49	501	5.5
27	2	51	514	6.5
28	2	53	526	6.0
29	2	55	536	5.0
30	2	57	549	6.5
31	2	59	562	6.5
32	2	61	573	5.5
33	5	66	601	5.6
34	5	71	636	7
35	5	76	675	7.8
36	5	81	700	5
37	5	86	765	13
38	5	91	805	8
39	5	96	840	7
40	5	101	890	10
41	2	103	901	5.5
42	2	105	909	4
43	2	107	920	5.5

Layer Boundaries: Chainage 5.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	CBR value	Thickness	Depth	Position	Strength Coefficient
1	10	100	100		
2	24	22	122		
3	32	99	221		
4	21	62	283		
5	53	223	506		
6	32	289	795		
7	55	30	825		

CBR Derived by TDR equation

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{penetration rate})$$

Remarks Surface material description:



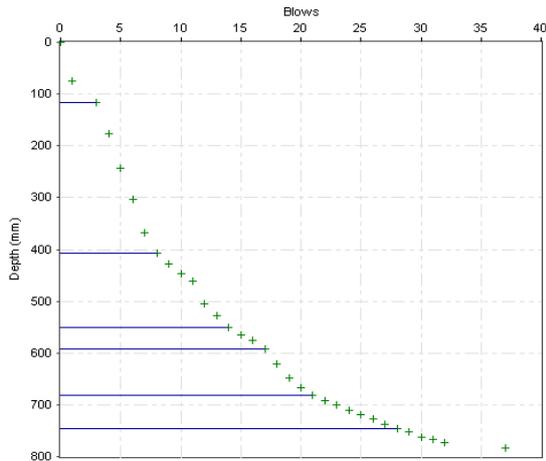
Dynamic Cone Penetrometer Strength Analysis Report

Site: COLOMENDY, DENBIGH
 Location: HP06B
 Cone Angle: 60 degrees
 Zero Error: 145
 Test Date: 24/01/2019

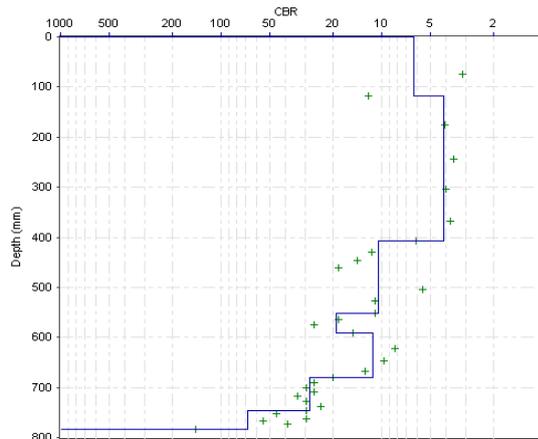
Job Number: CCG-C-19-10772
 Surface Type: -
 Thickness (mm): -

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/b)
1	0	0	145	0
2	1	1	220	75.0
3	2	3	262	21.0
4	1	4	321	59.0
5	1	5	388	67.0
6	1	6	448	60.0
7	1	7	512	64.0
8	1	8	552	40.0
9	1	9	574	22.0
10	1	10	592	18.0
11	1	11	606	14.0
12	1	12	650	44.0
13	1	13	673	23.0
14	1	14	696	23.0
15	1	15	710	14.0
16	1	16	720	10.0
17	1	17	737	17.0
18	1	18	767	30.0
19	1	19	793	26.0
20	1	20	813	20.0
21	1	21	826	13.0
22	1	22	836	10.0
23	1	23	845	9.0
24	1	24	855	10.0
25	1	25	863	8.0
26	1	26	872	9.0
27	1	27	883	11.0
28	1	28	892	9.0
29	1	29	898	6.0
30	1	30	907	9
31	1	31	912	5
32	1	32	919	7
33	5	37	929	2

Layer Boundaries: Chainage 6.200



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	CBR value	Thickness	Depth	Position	Strength Coefficient
1	6	117	117		
2	4	290	407		
3	10	144	551		
4	19	41	592		
5	11	89	681		
6	28	66	747		
7	68	37	784		

CBR Derived by TDR equation

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{penetration rate})$$

Remarks Surface material description:

APPENDIX E

Hand Pit Logs (Road Widening)

		Project: Colomendy Industrial Estate Depot, Denbigh	Hand Pit: HP01
Excavation date: 21 st Feb 2019	Logged by: APJ	Client: Cyngor Sir Ddinbych	Project ID: 1639
Strata:			
Depth (m)		Description	Samples/Tests
From	To		
0	0.15	Excavated adjacent to edge of carriageway Tarmac, upper layer c.80mm	
0.15	0.38	Slightly silty sandy GRAVEL of slate (Sub-base/capping)	
0.38	0.46	Reddish brown sandy CLAY	
CBR Probe HP01 carried out from 0.46m			CBR >11%
Photographs			
			

		Project: Colomendy Industrial Estate Depot, Denbigh	Hand Pit: HP02
Excavation date: 21 st Feb 2019	Logged by: APJ	Client: Cyngor Sir Ddinbych	Project ID: 1639
Strata:			
Depth (m)		Description	Samples
From	To		
0	0.7	Excavated into 1.1m high, 35° cut slope adjacent to road. All Dims measured from top of cut slope Moss and sparse grass cover on surface Loose to medium dense, slightly gravelly, clayey/silty SAND	Bulk; 0.7-0.9m
0.7	1.2	Medium dense, slightly silty gravelly SAND	
1.2	1.55	Very clayey silty SAND grading into firm to stiff sandy silty CLAY Terminated on boulder	
		CBR Probe HP02 carried out from 0.8m	CBR >12%
Photographs			
			

		Project: Colomendy Industrial Estate Depot, Denbigh	Hand Pit: HP03
Excavation date: 21 st Feb 2019	Logged by: APJ	Client: Cyngor Sir Ddinbych	Project ID: 1639
Strata:			
Depth (m)		Description	Samples
From	To		
0 0.45	0.45 0.85	Positioned 6m from edge of road. Dark Brown Topsoil with numerous roots Loose to medium dense, light brown clayey, silty, gravelly to very gravelly SAND Terminated on boulder of limestone CBR Probe carried out from ground level CBR HP3A -3D positioned around pit and confirmed obstruction as boulder not bedrock	Bulk; 0.5-0.8m
Photographs			
			

		Project: Colomendy Industrial Estate Depot, Denbigh	Hand Pit: HP04
Excavation date: 21 st Feb 2019	Logged by: APJ	Client: Cyngor Sir Ddinbych	Project ID: 1639
Strata:			
Depth (m)		Description	Samples/Tests
From	To		
0	0.08	Excavated adjacent to edge of carriageway Tarmac	CBR 3% to 0.85m >15% below 0.85m
0.08	0.26	Slightly silty sandy GRAVEL of slate (Sub-base / capping)	
0.26	0.35	Reddish brown clayey, very sandy GRAVEL CBR Probe HP04 carried out from 0.35	
Photographs			
			

		Project: Colomendy Industrial Estate Depot, Denbigh	Hand Pit: HP05
Excavation date: 21 st Feb 2019	Logged by: APJ	Client: Cyngor Sir Ddinbych	Project ID: 1639
Strata:			
Depth (m)		Description	Samples/tests
From	To		
0	1.2	Excavated into 1.1m high, 36-38° cut slope adjacent to road. All Dims from top of cut slope Moss and sparse grass cover on surface Loose to medium dense, light brown clayey, silty slightly gravelly SAND, grading into sandy CLAY	
1.2	1.6	Slightly silty very gravelly SAND	
1.6	1.8	Grey mottled orange slightly sandy CLAY (possible completely weathered limestone). CBR Probe (CBRHP05) carried out from 1.1m	CBR >10%

Photographs



		Project: Colomendy Industrial Estate Depot, Denbigh	Hand Pit: HP06
Excavation date: 21 st Feb 2019	Logged by: APJ	Client: Cyngor Sir Ddinbych	Project ID: 1639
Strata:			
Depth (m)		Description	Samples
From	To		
0 0.3 0.5	0.3 0.5 0.9	Positioned 10.5m from edge of road. Dark Brown Topsoil with numerous roots Loose to medium dense, light brown slightly clayey/silty SAND & GRAVEL with occasional sub rounded to sub-angular cobbles and boulders (<300mm) of mixed lithologies. Terminated on boulder/possible bedrock, CBR probe could not be driven past 0.9m CBR Probe HP06a – 6c carried out from ground level adjacent to pit	CBR 0-0.6m – 2-10% >0.6m - >10%

Photographs:



APPENDIX F

Pavement Investigation Factual Report (Asphalt Cores)

Pavement Investigation

Factual Report

Prepared for:

Daear Geo Consulting
Llanidan Lodge
Brynsiencyn
Ynys Mon
LL61 6HJ

Site:

Colomendy

Report Reference: **TR No: 648739**
Issue Reference: **1**
Issue Date: **07 February 2019**

Prepared by:
Celtest Limited
Cyttir Lane
Bangor
Gwynedd, LL57 4DA
01248 355 269

Contents:

Page No:

1.0 Introduction	1
2.0 Testing Methods and Procedures	1
3.0 Core Description and Photographs	2-5
4.0 Location Map	6

1.0 Introduction

The following report contains material description and photographs of Bituminous Cores removed from

Name and Location of Testing: Colomendy

2.0 Test Methods and Procedures

On site sampling was carried out by Celtest and samples were returned to our Bangor Laboratories.

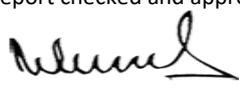
i) In-Situ:-

- a) Removal of laid and compacted materials in accordance with BS EN 12697-27

ii) In the Laboratory

- a) Core description and photographs (In House Method)
- b) Layer Thickness - BS EN 12697-36 (UKAS)
- c) PAK Marker (In House Method)

Note: The Pak marker test provides an indication of the presence of Polycyclic Aromatic Hydrocarbons (PAH) and the potential of tar. We recommend that samples found to be positive as indicated by the Pak marker are subject to further analysis to confirm the presence of tar.

Comments:	Report checked and approved by:  Dyfed Thomas Asphalt Team Manager
------------------	---

3.1 Core No.1

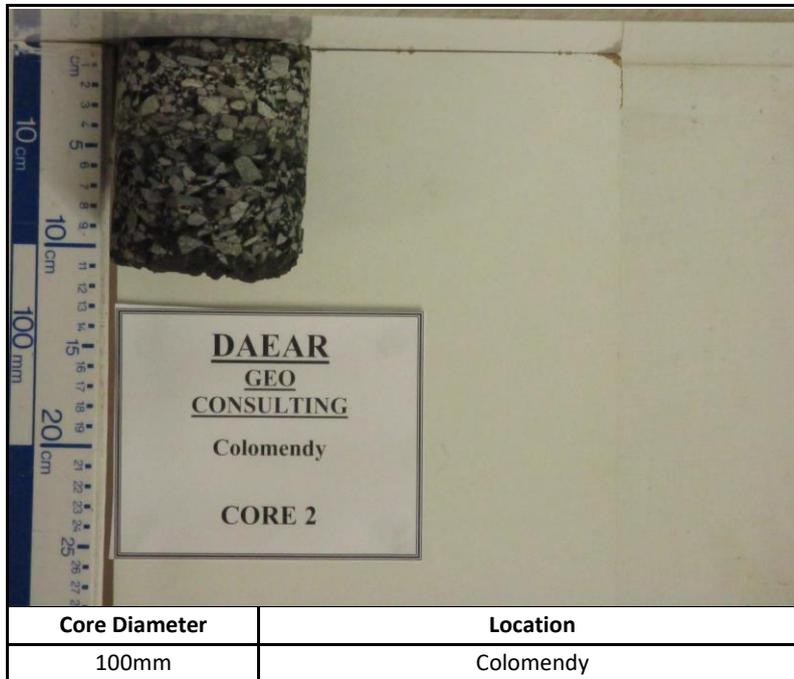


Core Diameter	Location
100mm	Colomendy

Core Depth (mm)	Layer Thickness (mm)	Assumed Material	Nominal Size	Comments	Category	Tar Level
0-7	7	Thin Surface Course	6		Category 3	Category B
7-40	33	Regulating or Surface Course	10		Category 4	Category D
40-60	20	Regulating or Surface Course	6		Category 3	Category D
60-101	41	Regulating or Surface Course	10		Category 3	Category E
101-111	10	Base Course	32		Category 5	Category E

In-house categories for guidance purposes					
Category 1	Excellent – No visible voids, full compaction	Category A	No TAR Presence	No TAR Presence under UV Light	
Category 2	Good – Few small voids, good compaction	Category B	Slight Presence of Tar	Faint specks on core under UV light	
Category 3	Fair – Small voids, Fair compaction	Category C	Low to Medium	Low level yellow marks under UV light	
Category 4	Poor - large voids, easily broken	Category D	Medium	Yellow marks showing under UV light	
Category 5	Very Poor – No Adhesion, large voids, loose or missing material	Category E	High	Bright yellow marks showing under UV light	

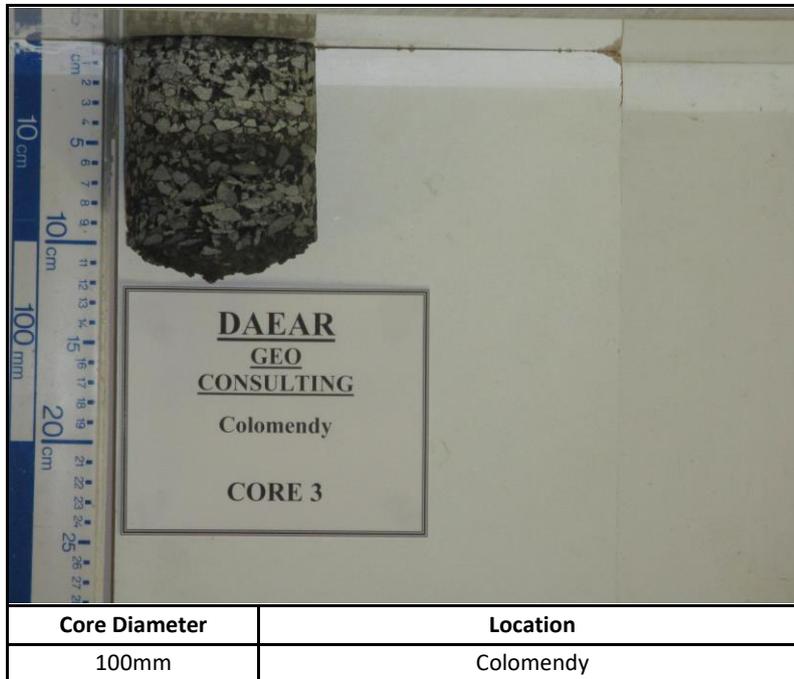
3.2 Core No.2



Core Depth (mm)	Layer Thickness (mm)	Assumed Material	Nominal Size	Comments	Category	Tar Level
0-9	9	Thin Surface Course	6		Category 3	Category B
9-43	34	Regulating or Surface Course	10		Category 4	Category B
43-106	63	Regulating or Surface Course	10		Category 4	Category C

In-house categories for guidance purposes					
Category 1	Excellent – No visible voids, full compaction	Category A	No TAR Presence	No TAR Presence under UV Light	
Category 2	Good – Few small voids, good compaction	Category B	Slight Presence of Tar	Faint specks on core under UV light	
Category 3	Fair – Small voids, Fair compaction	Category C	Low to Medium	Low level yellow marks under UV light	
Category 4	Poor - large voids, easily broken	Category D	Medium	Yellow marks showing under UV light	
Category 5	Very Poor – No Adhesion, large voids, loose or missing material	Category E	High	Bright yellow marks showing under UV light	

3.3 Core No.3



Core Depth (mm)	Layer Thickness (mm)	Assumed Material	Nominal Size	Comments	Category	Tar Level
0-5	5	Thin Surface Course	6		Category 3	Category B
5-42	37	Regulating or Surface Course	10		Category 4	Category C
42-53	11	Regulating or Surface Course	10		Category 3	Category C
53-100	47	Regulating or Surface Course	10		Category 4	Category C

In-house categories for guidance purposes					
Category 1	Excellent – No visible voids, full compaction	Category A	No TAR Presence	No TAR Presence under UV Light	
Category 2	Good – Few small voids, good compaction	Category B	Slight Presence of Tar	Faint specks on core under UV light	
Category 3	Fair – Small voids, Fair compaction	Category C	Low to Medium	Low level yellow marks under UV light	
Category 4	Poor - large voids, easily broken	Category D	Medium	Yellow marks showing under UV light	
Category 5	Very Poor – No Adhesion, large voids, loose or missing material	Category E	High	Bright yellow marks showing under UV light	

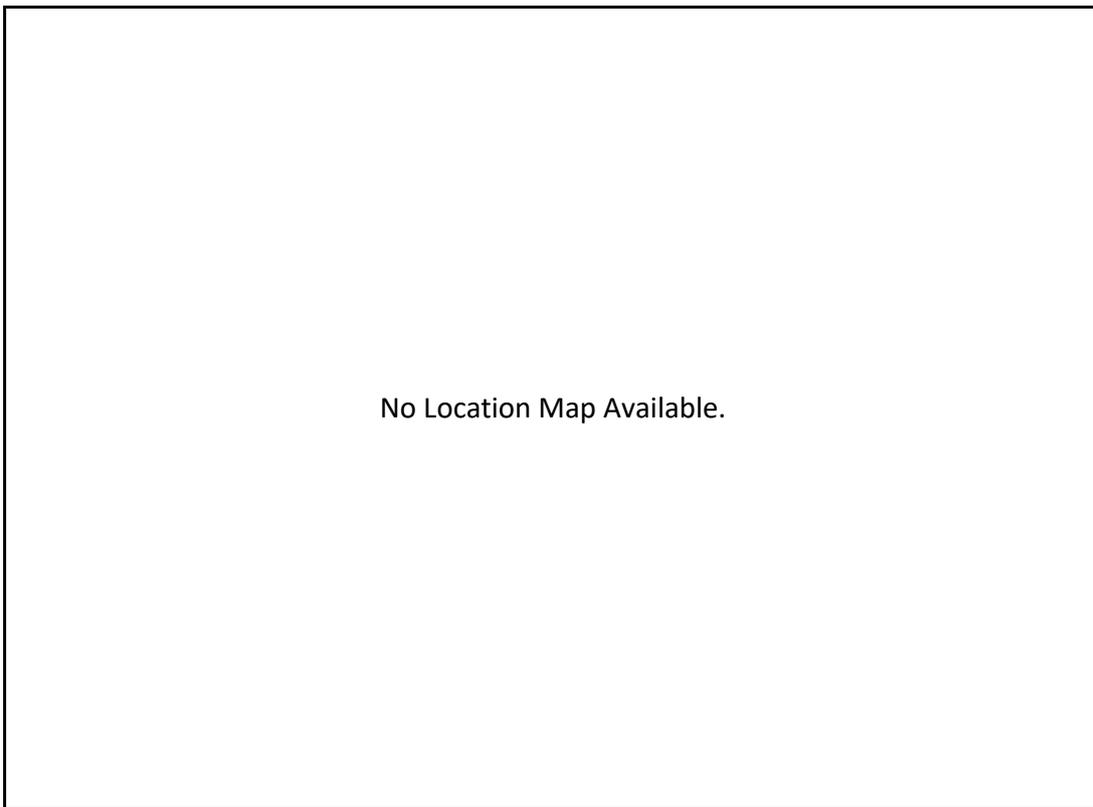
3.4 Core No.4



Core Diameter	Location
100mm	Colomendy

Core Depth (mm)	Layer Thickness (mm)	Assumed Material	Nominal Size	Comments	Category	Tar Level
0-6	6	Thin Surface Course	6		Category 3	Category C
6-53	47	Regulating or Surface Course	10		Category 3	Category C
53-136	83	Binder Course	20		Category 3	Category C

In-house categories for guidance purposes					
Category 1	Excellent – No visible voids, full compaction	Category A	No TAR Presence	No TAR Presence under UV Light	
Category 2	Good – Few small voids, good compaction	Category B	Slight Presence of Tar	Faint specks on core under UV light	
Category 3	Fair – Small voids, Fair compaction	Category C	Low to Medium	Low level yellow marks under UV light	
Category 4	Poor - large voids, easily broken	Category D	Medium	Yellow marks showing under UV light	
Category 5	Very Poor – No Adhesion, large voids, loose or missing material	Category E	High	Bright yellow marks showing under UV light	



End of Report



Project:
**Colomendy Industrial Estate
Depot, Denbigh**

Hole Ref:
**Asphalt
Cores**

Reinstatement Photographs:

Core 01:



Core 02:



Core 03:



Core 04:



APPENDIX G

Geo Classification Test Results (Cetest; Trial Pit Samples)

Daear Geo Consulting
Llanidan Lodge
Brynsiencyn
Ynys Mon
LL61 6HJ

Date: 20 February 2019
Test Report Ref: TR 648893

Order No: 1639/celtest

Page 1 of 1

Contract: Colomendy

LABORATORY TEST REPORT

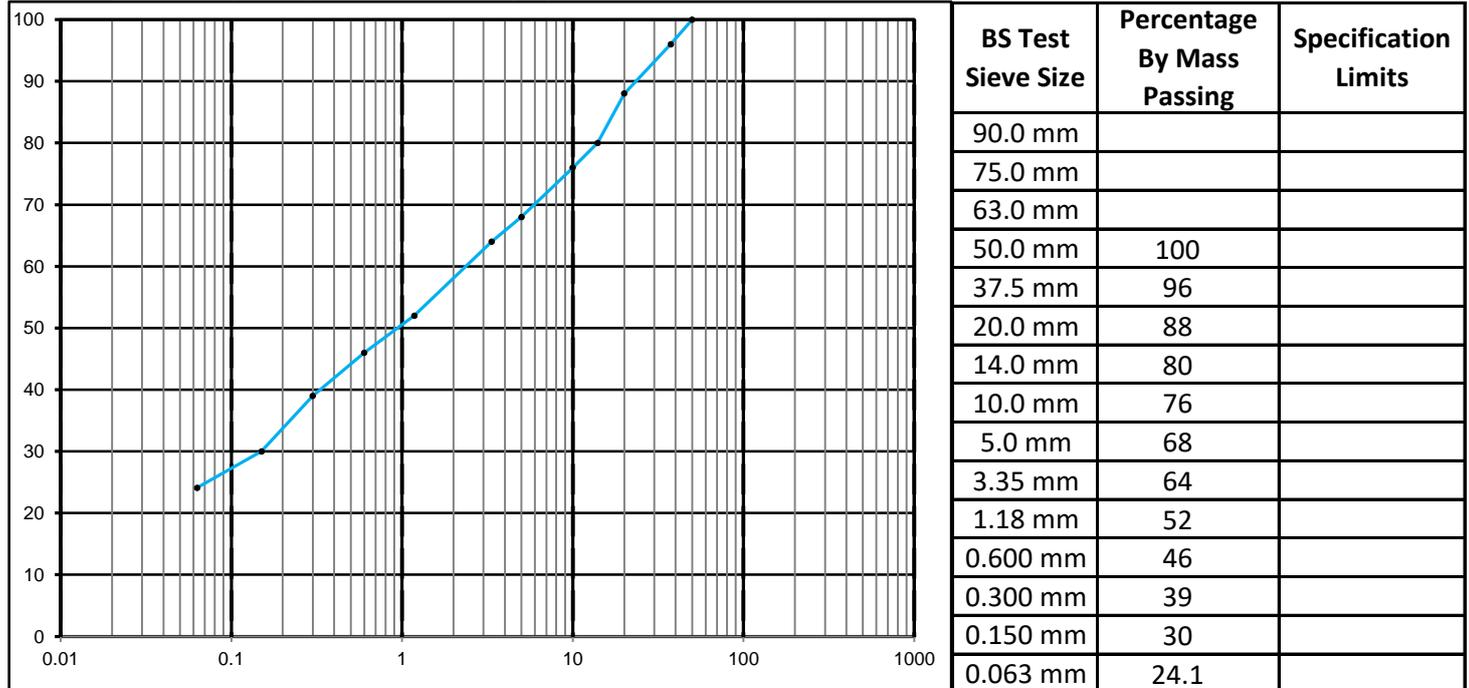
TEST REQUIREMENTS:

To determine the Particle Size Distribution (PSD) of a soil sample-washing and sieving method in accordance with **BS1377-Part2-1990**

SAMPLE DETAILS:

Certificate of sampling received:	No	Name of Source:	Site Won
Laboratory Ref. No:	S78135	Method of Sampling:	Disturbed Bulk Sample
Client Ref. No:	TP4 @ 1.0 - 1.4m	Sampled By:	Client
Date and Time of Sampling:	29/01/2019		
Date of Receipt at Lab:	30/01/2019		
Date of Start of Test:	07/02/2019		
Sampling Location:	TP4 @ 1.0 - 1.4m		
Material Description:	Brown gravelly very sandy silty clay		
Target Specification:	N/A		

RESULTS: Were any unrepresentative lumps present? No



Comments:

None

Report checked and approved by:

Meical Owen
Meical Owen
Soils Team Manager

Daear Geo Consulting
Llanidan Lodge
Brynsiencyn
Ynys Mon
LL61 6HJ

Date: 20 February 2019
Test Report Ref: TR 648892

Order No: 1639/celtest

Page 1 of 1

Contract: Colomendy

LABORATORY TEST REPORT

TEST REQUIREMENTS:

To determine the Moisture Content of a soil sample
(definitive oven-drying method) in accordance with
BS 1377 : Part 2 : 1990 : clause 3.2

SAMPLE DETAILS:

Certificate of sampling received:	No
Laboratory Ref. No:	S78135
Client Ref. No:	TP4 @ 1.0 - 1.4m
Date and Time of Sampling:	29/01/2019
Date of Receipt at Lab:	30/01/2019
Date of Start of Test:	07/02/2019
Sampling Location:	TP4 @ 1.0 - 1.4m
Name of Source:	Site Won
Method of Sampling:	Disturbed Bulk Sample
Sampled By:	Client
Material Description:	Brown gravelly very sandy silty clay
Target Specification:	N/A

RESULTS:

Moisture Content (%) = 10.7

Comments

None

Report checked and approved by:



Meical Owen
Soils Team Manager

Daear Geo Consulting
Llanidan Lodge
Brynsiencyn
Ynys Mon
LL61 6HJ

Date: 20 February 2019
Test Report Ref: TR 648891

Order No: 1639/celtest

Page 1 of 1

Contract: Colomendy

LABORATORY TEST REPORT

TEST REQUIREMENTS:

To determine the Plastic Limit, Liquid Limit, and Plasticity Index of sample in accordance with
BS 1377:Part 2:1990 Clause 5.3, Clause 4.3, and Clause 5.4.

SAMPLE DETAILS:

Certificate of sampling received:	No
Laboratory Ref. No:	S78135
Client Ref. :	TP4 @ 0.5m
Date and Time of Sampling:	29/01/2019
Date of Receipt at Lab:	30/01/2019
Date of Start of Test:	11/02/2019
Sampling Location:	TP4 @ 0.5m
Name of Source:	Site Won
Method of Sampling:	Disturbed Bulk Sample
Sampled By:	Client
Soil Description:	Brown gravelly very sandy silty clay
Target Specification:	N/A

RESULTS:

History of sample:	:	After wet sieving
% Materials passing 425µm	=	71
Plastic Limit	=	17
Liquid Limit	=	28
Plasticity Index	=	11

Comments:

None

Report checked and approved by:



Meical Owen

Soils Team Manager

Daear Geo Consulting
Llanidan Lodge
Brynsiencyn
Ynys Mon
LL61 6HJ

Date: 20 February 2019
Test Report Ref: TR 648890

Order No: 1639/celtest

Page 1 of 1

Contract: Colomendy

LABORATORY TEST REPORT

TEST REQUIREMENTS:

To determine the Moisture Content of a soil sample
(definitive oven-drying method) in accordance with
BS 1377 : Part 2 : 1990 : clause 3.2

SAMPLE DETAILS:

Certificate of sampling received:	No
Laboratory Ref. No:	S78135
Client Ref. No:	TP4 @ 0.5m
Date and Time of Sampling:	29/01/2019
Date of Receipt at Lab:	30/01/2019
Date of Start of Test:	07/02/2019
Sampling Location:	TP4 @ 0.5m
Name of Source:	Site Won
Method of Sampling:	Disturbed Bulk Sample
Sampled By:	Client
Material Description:	Brown gravelly very sandy silty clay
Target Specification:	N/A

RESULTS:

Moisture Content (%) = 21.8

Comments

None

Report checked and approved by:



Meical Owen
Soils Team Manager

Daear Geo Consulting
 Llanidan Lodge
 Brynsiencyn
 Ynys Mon
 LL61 6HJ

Date: 21 February 2019
 Test Report Ref: TR 648889

Order No: 1639/celtest

Page 1 of 1

Contract: Colomendy

LABORATORY TEST REPORT

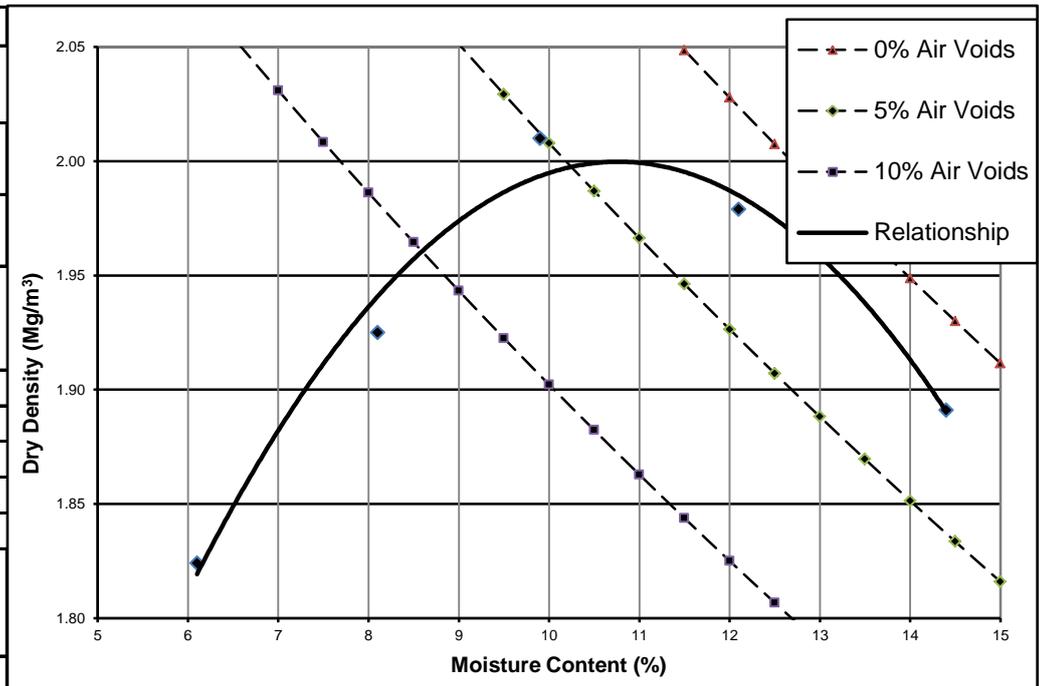
TEST REQUIREMENTS:

To determine the Dry Density and Moisture Content Relationship of soil sieve 2.5kg Rammer Method in accordance with BS 1377: 4: 1990 Clause 3.4

SAMPLE DETAILS:

Certificate of sampling received:	No	Name of Source:	Site Won
Laboratory Ref. No:	S78135	Method of Sampling:	Disturbed Bulk Sample
Client Ref. :	TP2 @ 0.8 - 1.0m	Sampled By:	Client
Date and Time of Sampling:	29/01/2019	Unrepresentative lumps present?	No
Date of Receipt at Lab:	30/01/2019	Sample Preparation Procedure:	3.4.4.2
Date of Start of Test:	13/02/2019	Sample Preparation Method:	Separate
Sampling Location:	TP2 @ 0.8 - 1.0m		
Soil Description:	Brown slightly clayey silty sand & gravel		

RESULTS:	
Particle Density: 2.68Mg/m³ (Found using Gas Jar Method)	
Retained on 37.5mm Sieve:	83 %
Retained on 20mm Sieve: 71	71 %
Moisture Content (%)	Dry Density Mg/m ³
6.1	1.82
8.1	1.93
9.9	2.01
12.1	1.98
14.4	1.89
Optimum Moisture Content (%)	Maximum Dry Density Mg/m³
11	2.00



Comments:

None

Report checked and approved by:

Meical Owen
 Meical Owen
 Soils Team Manager

Daear Geo Consulting
Llanidan Lodge
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LL61 6HJ
TN27 0BP
Contract: Colomendy

Date: 20 February 2019
Test Report Ref: TR 648888

Order No: 1639/celtest

Page 1 of 1

LABORATORY TEST REPORT

TEST REQUIREMENTS:

To determine the Particle Density of Soil – Gas Jar method, in accordance with **BS 1377 : Part 2 : 1990 : Clause 8.2.**

SAMPLE DETAILS:

Certificate of sampling received:	No
Laboratory Ref. No:	S78135
Client Ref. No:	TP2 @ 0.8 - 1.0m
Date and Time of Sampling:	29/01/2019
Date of Receipt at Lab:	30/01/2019
Date of Start of Test:	09/02/2019
Sampling Location:	TP2 @ 0.8 - 1.0m
Name of Source:	Site Won
Method of Sampling:	Disturbed Bulk Sample
Sampled By:	Client
Material Description:	Brown slightly clayey silty sand & gravel
Target Specification	N/A

RESULTS:

Particle Density = 2.68 Mg/m³

Comments:

None

Report checked and approved by:



Meical Owen
Soils Team Manager

Daear Geo Consulting
Llanidan Lodge
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Ynys Mon
LL61 6HJ

Date: 20 February 2019
Test Report Ref: TR 648887

Order No: 1639/celtest

Page 1 of 1

Contract: Colomendy

LABORATORY TEST REPORT

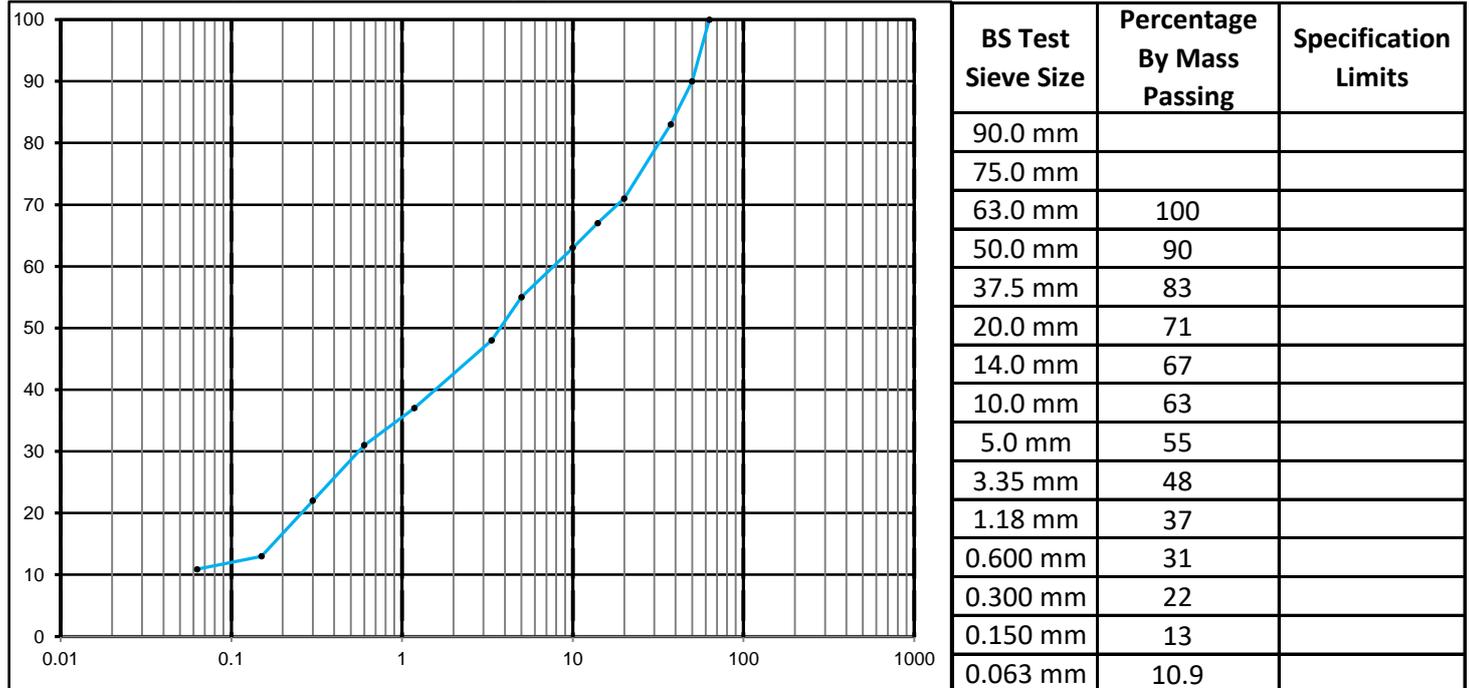
TEST REQUIREMENTS:

To determine the Particle Size Distribution (PSD) of a soil sample-washing and sieving method in accordance with **BS1377-Part2-1990**

SAMPLE DETAILS:

Certificate of sampling received:	No	Name of Source:	Site Won
Laboratory Ref. No:	S78135	Method of Sampling:	Disturbed Bulk Sample
Client Ref. No:	TP2 @ 0.8 - 1.0m	Sampled By:	Client
Date and Time of Sampling:	29/01/2019		
Date of Receipt at Lab:	30/01/2019		
Date of Start of Test:	07/02/2019		
Sampling Location:	TP2 @ 0.8 - 1.0m		
Material Description:	Brown slightly clayey silty sand & gravel		
Target Specification:	N/A		

RESULTS: Were any unrepresentative lumps present? No



Comments:

None

Report checked and approved by:

Meical Owen
Meical Owen
Soils Team Manager

Daear Geo Consulting
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Brynsiencyn
Ynys Mon
LL61 6HJ

Date: 20 February 2019
Test Report Ref: TR 648886

Order No: 1639/celtest

Page 1 of 1

Contract: Colomendy

LABORATORY TEST REPORT

TEST REQUIREMENTS:

To determine the Moisture Content of a soil sample
(definitive oven-drying method) in accordance with
BS 1377 : Part 2 : 1990 : clause 3.2

SAMPLE DETAILS:

Certificate of sampling received:	No
Laboratory Ref. No:	S78135
Client Ref. No:	TP2 @ 0.8 - 1.0m
Date and Time of Sampling:	29/01/2019
Date of Receipt at Lab:	30/01/2019
Date of Start of Test:	07/02/2019
Sampling Location:	TP2 @ 0.8 - 1.0m
Name of Source:	Site Won
Method of Sampling:	Disturbed Bulk Sample
Sampled By:	Client
Material Description:	Brown slightly clayey silty sand & gravel
Target Specification:	N/A

RESULTS:

Moisture Content (%) = 7.6

Comments

None

Report checked and approved by:



Meical Owen
Soils Team Manager

Daear Geo Consulting
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 Brynsiencyn
 Ynys Mon
 LL61 6HJ

Date: 21 February 2019
 Test Report Ref: TR 648885

Order No: 1639/celtest

Page 1 of 1

Contract: Colomendy

LABORATORY TEST REPORT

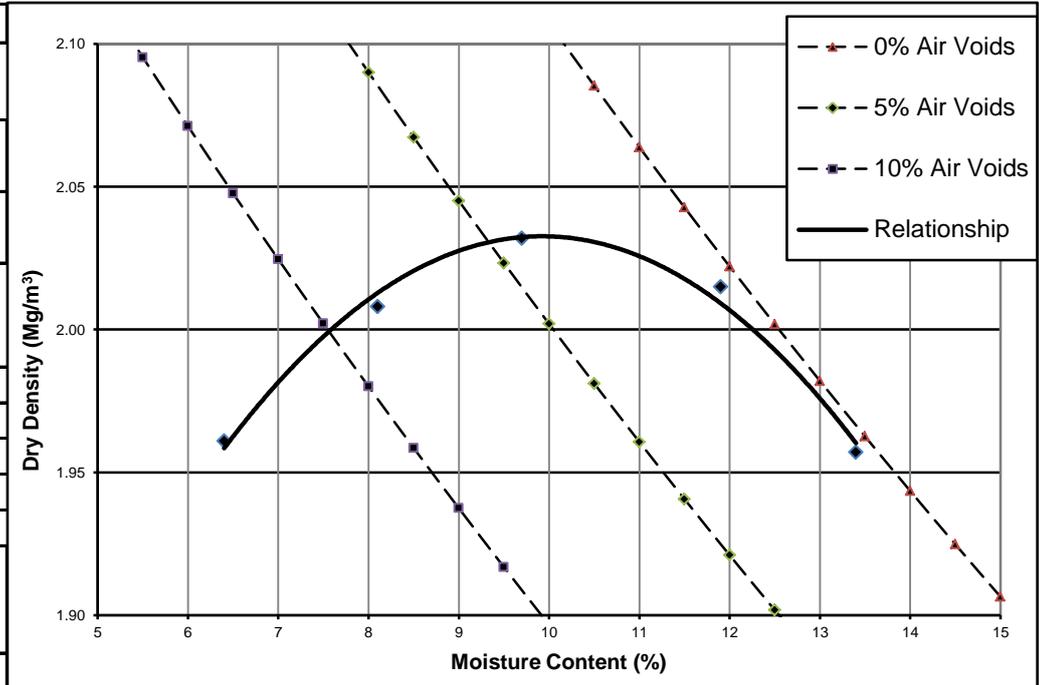
TEST REQUIREMENTS:

To determine the Dry Density and Moisture Content Relationship of soil
 2.5kg Rammer Method in accordance with BS 1377: 4: 1990 Clause 3.3

SAMPLE DETAILS:

Certificate of sampling received:	No	Name of Source:	Site Won
Laboratory Ref. No:	S78135	Method of Sampling:	Disturbed Bulk Sample
Client Ref. :	TP2 @ 0.3 - 0.6m	Sampled By:	Client
Date and Time of Sampling:	29/01/2019	Unrepresentative lumps present?	No
Date of Receipt at Lab:	30/01/2019	Sample Preparation Procedure:	3.2.4.1
Date of Start of Test:	13/02/2019	Sample Preparation Method:	Separate
Sampling Location:	TP2 @ 0.3 - 0.6m		
Soil Description:	Brown gravelly very sandy silty clay		

RESULTS:	
Particle Density: 2.67Mg/m³ (Found using Gas Jar Method)	
Retained on 37.5mm Sieve:	0 %
Retained on 20mm Sieve: 0	0 %
Moisture Content (%)	Dry Density Mg/m ³
6.4	1.96
8.1	2.01
9.7	2.03
11.9	2.02
13.4	1.96
Optimum Moisture Content (%)	Maximum Dry Density Mg/m³
10	2.03



Comments:

None

Report checked and approved by:

Meical Owen
 Meical Owen
 Soils Team Manager

Daear Geo Consulting
Llanidan Lodge
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LL61 6HJ
TN27 0BP
Contract: Colomendy

Date: 20 February 2019
Test Report Ref: TR 648884

Order No: 1639/celtest

Page 1 of 1

LABORATORY TEST REPORT

TEST REQUIREMENTS:

To determine the Particle Density of Soil – Gas Jar method, in accordance with **BS 1377 : Part 2 : 1990 : Clause 8.2.**

SAMPLE DETAILS:

Certificate of sampling received:	No
Laboratory Ref. No:	S78135
Client Ref. No:	TP2 @ 0.3 - 0.6m
Date and Time of Sampling:	29/01/2019
Date of Receipt at Lab:	30/01/2019
Date of Start of Test:	09/02/2019
Sampling Location:	TP2 @ 0.3 - 0.6m
Name of Source:	Site Won
Method of Sampling:	Disturbed Bulk Sample
Sampled By:	Client
Material Description:	Brown gravelly very sandy silty clay
Target Specification	N/A

RESULTS:

Particle Density = 2.67 Mg/m³

Comments:

None

Report checked and approved by:



Meical Owen
Soils Team Manager

Daear Geo Consulting
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LL61 6HJ

Date: 20 February 2019
Test Report Ref: TR 648883

Order No: 1639/celtest

Page 1 of 2

Contract: Colomendy

LABORATORY TEST REPORT

TEST REQUIREMENTS:

To determine the Particle Size Distribution (PSD) of a soil sample-
washing and sieving method in accordance with **BS1377-Part2-1990 Clause 9.2**
Sedimentation by pipette method to **BS 1377: Part 2: 1990: clause 9.4.**

SAMPLE DETAILS:

Certificate of sampling received:	No
Laboratory Ref. No:	S78135
Client Ref. No:	TP2 @ 0.3 - 0.6m
Date and Time of Sampling:	29/01/2019
Date of Receipt at Lab:	30/01/2019
Date of Start of Test:	07/02/2019
Sampling Location:	TP2 @ 0.3 - 0.6m
Name of Source:	Site Won
Method of Sampling:	Disturbed Bulk Sample
Sampled By:	Client
Material Description:	Brown gravelly very sandy silty clay
Target Specification:	N/A

RESULTS:

SEE ATTACHED

Comments:

None

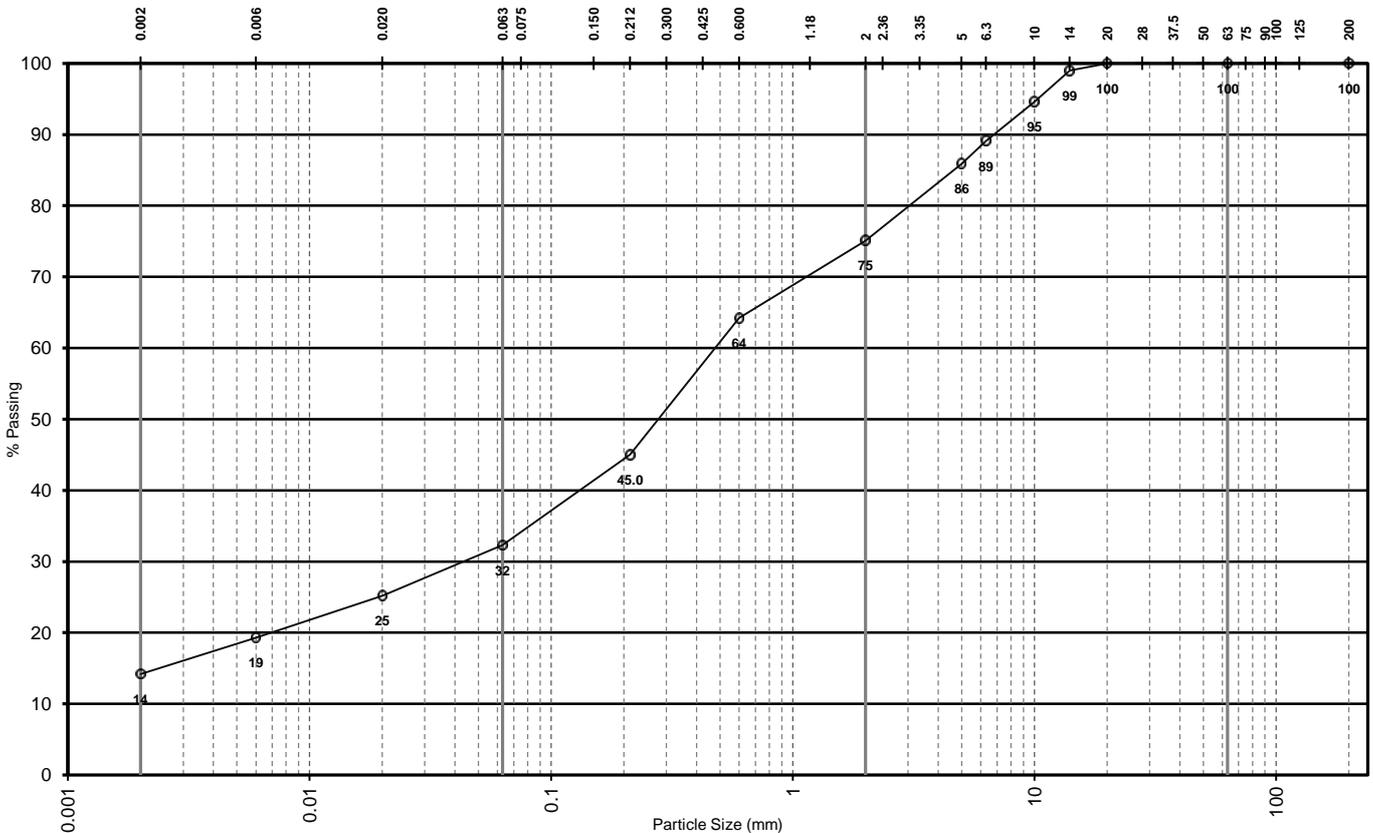
Report checked and approved by:



Meical Owen
Soils Team Manager

MATERIAL DESCRIPTION
Brown gravelly very sandy silty clay

Method of pre-treatment:		N/A			
Sieve Size mm	% Passing	Sieve Size mm	% Passing	Cobbles	0.0
				Gravel	24.9
				Sand	42.8
200	100	3.35		Silt	18.1
125		2.36		Clay	14.2
100		2.0	75		
90		1.18			
75		0.600	64		
63	100	0.425			
50		0.300			
37.5		0.212	45		
28		0.150			
20	100	0.075			
14	99	0.063	32.3		
10	95	0.020	25.2		
6.3	89	0.006	19.3		
5.0	86	0.002	14.2		



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	0.002	0.006	0.02	0.063	0.2	0.63	2.0	6.3	20	
	SILT			SAND			GRAVEL			

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LL61 6HJ

Date: 20 February 2019
Test Report Ref: TR 648882

Order No: 1639/celtest

Page 1 of 1

Contract: Colomendy

LABORATORY TEST REPORT

TEST REQUIREMENTS:

To determine the Moisture Content of a soil sample
(definitive oven-drying method) in accordance with
BS 1377 : Part 2 : 1990 : clause 3.2

SAMPLE DETAILS:

Certificate of sampling received:	No
Laboratory Ref. No:	S78135
Client Ref. No:	TP2 @ 0.3 - 0.6m
Date and Time of Sampling:	29/01/2019
Date of Receipt at Lab:	30/01/2019
Date of Start of Test:	07/02/2019
Sampling Location:	TP2 @ 0.3 - 0.6m
Name of Source:	Site Won
Method of Sampling:	Disturbed Bulk Sample
Sampled By:	Client
Material Description:	Brown gravelly very sandy silty clay
Target Specification:	N/A

RESULTS:

Moisture Content (%) = 14.9

Comments None	Report checked and approved by:  Meical Owen Soils Team Manager
-------------------------	---

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LL61 6HJ

Date: 20 February 2019
Test Report Ref: TR 648905

Order No: 1639/celtest

Page 1 of 2

Contract: Colomendy

LABORATORY TEST REPORT

TEST REQUIREMENTS:

To determine the Particle Size Distribution (PSD) of a soil sample-
washing and sieving method in accordance with **BS1377-Part2-1990 Clause 9.2**
Sedimentation by pipette method to **BS 1377: Part 2: 1990: clause 9.4.**

SAMPLE DETAILS:

Certificate of sampling received:	No
Laboratory Ref. No:	S78135
Client Ref. No:	TP13 @ 0.7 - 0.9m
Date and Time of Sampling:	29/01/2019
Date of Receipt at Lab:	30/01/2019
Date of Start of Test:	07/02/2019
Sampling Location:	TP13 @ 0.7 - 0.9m
Name of Source:	Site Won
Method of Sampling:	Disturbed Bulk Sample
Sampled By:	Client
Material Description:	Brown gravelly sandy very silty clay
Target Specification:	N/A

RESULTS:

SEE ATTACHED

Comments:

None

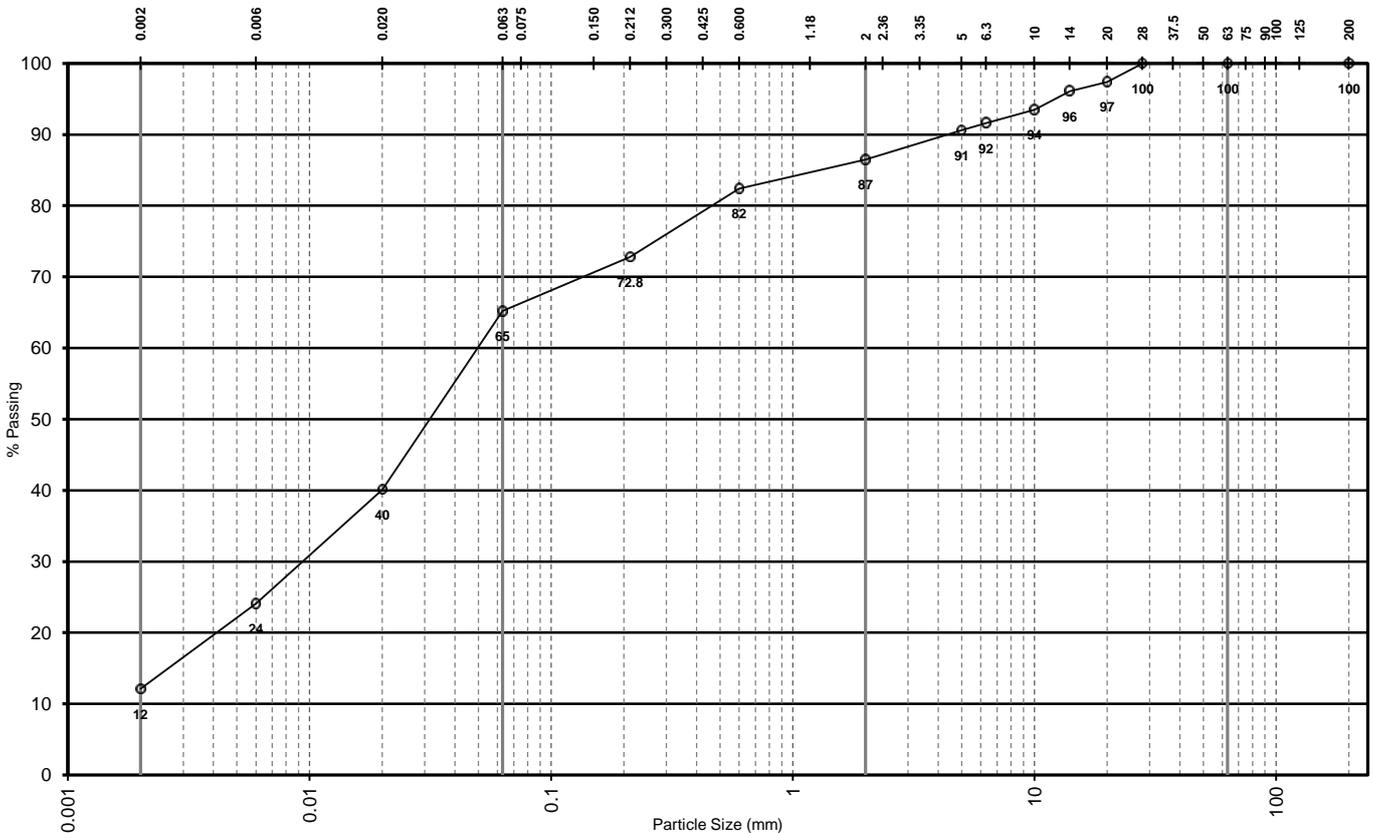
Report checked and approved by:



Meical Owen
Soils Team Manager

MATERIAL DESCRIPTION
Brown gravelly sandy very silty clay

Method of pre-treatment:		N/A			
Sieve Size mm	% Passing	Sieve Size mm	% Passing	Cobbles	0.0
				Gravel	13.5
				Sand	21.3
200	100	3.35		Silt	53.1
125		2.36		Clay	12.1
100		2.0	87		
90		1.18			
75		0.600	82		
63	100	0.425			
50		0.300			
37.5		0.212	73		
28	100	0.150			
20	97	0.075			
14	96	0.063	65.2		
10	94	0.020	40.1		
6.3	92	0.006	24.1		
5.0	91	0.002	12.1		



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	0.002	0.006	0.02	0.063	0.2	0.63	2.0	6.3	20	
	SILT			SAND			GRAVEL			

Daear Geo Consulting
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Ynys Mon
LL61 6HJ

Date: 20 February 2019
Test Report Ref: TR 648904

Order No: 1639/celtest

Page 1 of 1

Contract: Colomendy

LABORATORY TEST REPORT

TEST REQUIREMENTS:

To determine the Plastic Limit, Liquid Limit, and Plasticity Index of sample in accordance with
BS 1377:Part 2:1990 Clause 5.3, Clause 4.3, and Clause 5.4.

SAMPLE DETAILS:

Certificate of sampling received:	No
Laboratory Ref. No:	S78135
Client Ref. :	TP13 @ 0.7 - 0.9m
Date and Time of Sampling:	29/01/2019
Date of Receipt at Lab:	30/01/2019
Date of Start of Test:	11/02/2019
Sampling Location:	TP13 @ 0.7 - 0.9m
Name of Source:	Site Won
Method of Sampling:	Disturbed Bulk Sample
Sampled By:	Client
Soil Description:	Brown gravelly sandy very silty clay
Target Specification:	N/A

RESULTS:

History of sample:	:	After wet sieving
% Materials passing 425µm	=	77
Plastic Limit	=	16
Liquid Limit	=	27
Plasticity Index	=	11

Comments:

None

Report checked and approved by:



Meical Owen
Soils Team Manager

Daear Geo Consulting
Llanidan Lodge
Brynsiencyn
Ynys Mon
LL61 6HJ

Date: 20 February 2019
Test Report Ref: TR 648903

Order No: 1639/celtest

Page 1 of 1

Contract: Colomendy

LABORATORY TEST REPORT

TEST REQUIREMENTS:

To determine the Moisture Content of a soil sample
(definitive oven-drying method) in accordance with
BS 1377 : Part 2 : 1990 : clause 3.2

SAMPLE DETAILS:

Certificate of sampling received:	No
Laboratory Ref. No:	S78135
Client Ref. No:	TP13 @ 0.7 - 0.9m
Date and Time of Sampling:	29/01/2019
Date of Receipt at Lab:	30/01/2019
Date of Start of Test:	07/02/2019
Sampling Location:	TP13 @ 0.7 - 0.9m
Name of Source:	Site Won
Method of Sampling:	Disturbed Bulk Sample
Sampled By:	Client
Material Description:	Brown gravelly sandy very silty clay
Target Specification:	N/A

RESULTS:

Moisture Content (%) = 18.3

Comments None	Report checked and approved by:  Meical Owen Soils Team Manager
-------------------------	---

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Llanidan Lodge
Brynsiencyn
Ynys Mon
LL61 6HJ

Date: 20 February 2019
Test Report Ref: TR 648902

Order No: 1639/celtest

Page 1 of 1

Contract: Colomendy

LABORATORY TEST REPORT

TEST REQUIREMENTS:

To determine the Plastic Limit, Liquid Limit, and Plasticity Index of sample in accordance with
BS 1377:Part 2:1990 Clause 5.3, Clause 4.3, and Clause 5.4.

SAMPLE DETAILS:

Certificate of sampling received:	No
Laboratory Ref. No:	S78135
Client Ref. :	TP13 @ 0.4 - 0.6m
Date and Time of Sampling:	29/01/2019
Date of Receipt at Lab:	30/01/2019
Date of Start of Test:	11/02/2019
Sampling Location:	TP13 @ 0.4 - 0.6m
Name of Source:	Site Won
Method of Sampling:	Disturbed Bulk Sample
Sampled By:	Client
Soil Description:	Brown gravelly sandy very silty clay
Target Specification:	N/A

RESULTS:

History of sample:	:	After wet sieving
% Materials passing 425µm	=	81
Plastic Limit	=	17
Liquid Limit	=	29
Plasticity Index	=	12

Comments:

None

Report checked and approved by:



Meical Owen
Soils Team Manager

Daear Geo Consulting
Llanidan Lodge
Brynsiencyn
Ynys Mon
LL61 6HJ

Date: 20 February 2019
Test Report Ref: TR 648901

Order No: 1639/celtest

Page 1 of 2

Contract: Colomendy

LABORATORY TEST REPORT

TEST REQUIREMENTS:

To determine the Particle Size Distribution (PSD) of a soil sample-
washing and sieving method in accordance with **BS1377-Part2-1990 Clause 9.2**
Sedimentation by pipette method to **BS 1377: Part 2: 1990: clause 9.4.**

SAMPLE DETAILS:

Certificate of sampling received:	No
Laboratory Ref. No:	S78135
Client Ref. No:	TP13 @ 0.4 - 0.6m
Date and Time of Sampling:	29/01/2019
Date of Receipt at Lab:	30/01/2019
Date of Start of Test:	07/02/2019
Sampling Location:	TP13 @ 0.4 - 0.6m
Name of Source:	Site Won
Method of Sampling:	Disturbed Bulk Sample
Sampled By:	Client
Material Description:	Brown gravelly sandy very silty clay
Target Specification:	N/A

RESULTS:

SEE ATTACHED

Comments:

None

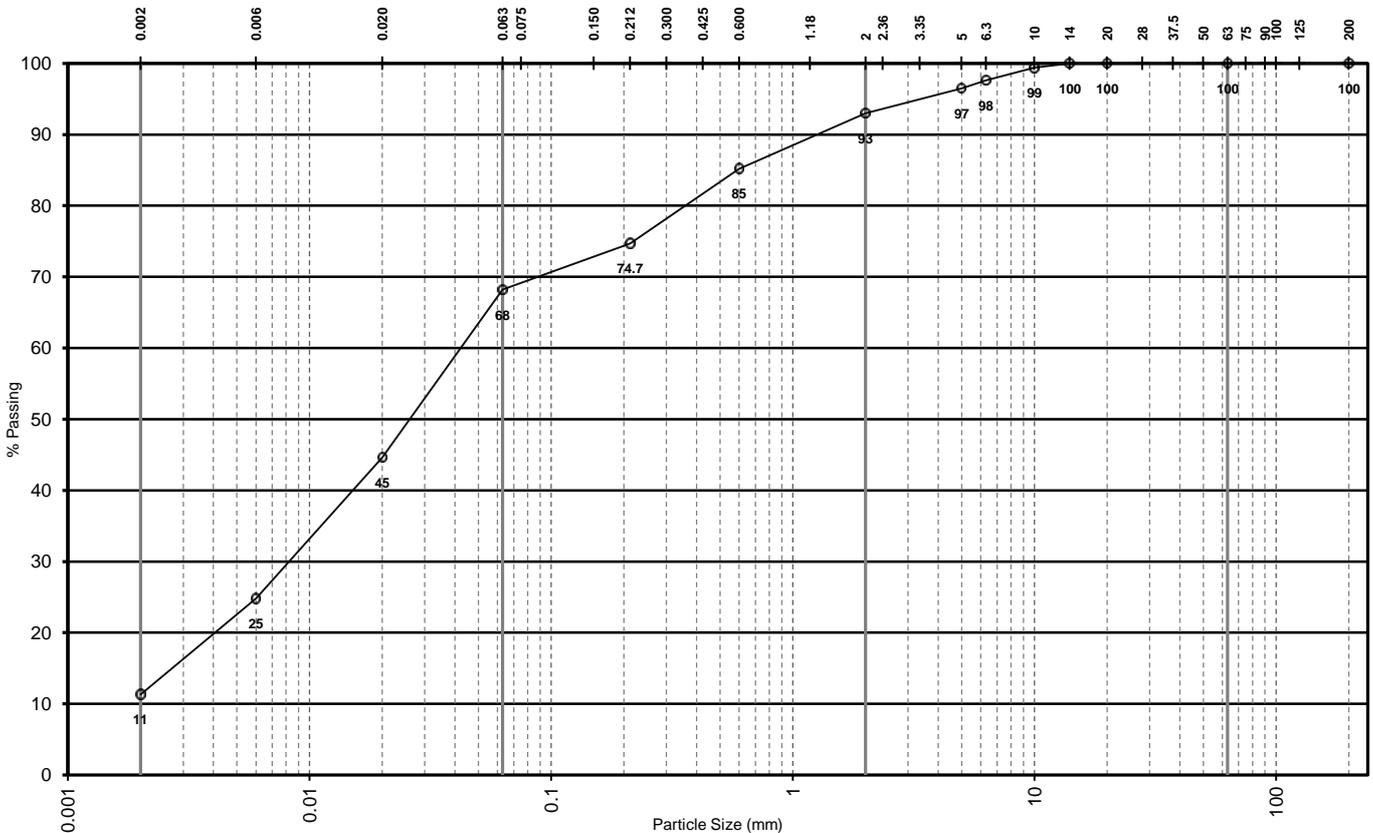
Report checked and approved by:



Meical Owen
Soils Team Manager

MATERIAL DESCRIPTION
Brown gravelly sandy very silty clay

Method of pre-treatment:		N/A			
Sieve Size mm	% Passing	Sieve Size mm	% Passing	Cobbles	0.0
				Gravel	7.0
				Sand	24.8
200	100	3.35		Silt	56.9
125		2.36		Clay	11.3
100		2.0	93		
90		1.18			
75		0.600	85		
63	100	0.425			
50		0.300			
37.5		0.212	75		
28		0.150			
20	100	0.075			
14	100	0.063	68.2		
10	99	0.020	44.6		
6.3	98	0.006	24.8		
5.0	97	0.002	11.3		



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	0.002	0.006	0.02	0.063	0.2	0.63	2.0	6.3	20	
	SILT			SAND			GRAVEL			

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LL61 6HJ

Date: 20 February 2019
Test Report Ref: TR 648900

Order No: 1639/celtest

Page 1 of 1

Contract: Colomendy

LABORATORY TEST REPORT

TEST REQUIREMENTS:

To determine the Moisture Content of a soil sample
(definitive oven-drying method) in accordance with
BS 1377 : Part 2 : 1990 : clause 3.2

SAMPLE DETAILS:

Certificate of sampling received:	No
Laboratory Ref. No:	S78135
Client Ref. No:	TP13 @ 0.4 - 0.6m
Date and Time of Sampling:	29/01/2019
Date of Receipt at Lab:	30/01/2019
Date of Start of Test:	07/02/2019
Sampling Location:	TP13 @ 0.4 - 0.6m
Name of Source:	Site Won
Method of Sampling:	Disturbed Bulk Sample
Sampled By:	Client
Material Description:	Brown gravelly sandy very silty clay
Target Specification:	N/A

RESULTS:

Moisture Content (%) = 24.8

Comments

None

Report checked and approved by:



Meical Owen
Soils Team Manager

Daear Geo Consulting
Llanidan Lodge
Brynsiencyn
Ynys Mon
LL61 6HJ

Date: 20 February 2019
Test Report Ref: TR 648899

Order No: 1639/celtest

Page 1 of 1

Contract: Colomendy

LABORATORY TEST REPORT

TEST REQUIREMENTS:

To determine the Plastic Limit, Liquid Limit, and Plasticity Index of sample in accordance with
BS 1377:Part 2:1990 Clause 5.3, Clause 4.3, and Clause 5.4.

SAMPLE DETAILS:

Certificate of sampling received:	No
Laboratory Ref. No:	S78135
Client Ref. :	TP11 @ 0.5m
Date and Time of Sampling:	29/01/2019
Date of Receipt at Lab:	30/01/2019
Date of Start of Test:	11/02/2019
Sampling Location:	TP11 @ 0.5m
Name of Source:	Site Won
Method of Sampling:	Disturbed Bulk Sample
Sampled By:	Client
Soil Description:	Brown gravelly sandy very silty clay
Target Specification:	N/A

RESULTS:

History of sample:	:	After wet sieving
% Materials passing 425µm	=	88
Plastic Limit	=	22
Liquid Limit	=	36
Plasticity Index	=	14

Comments:

None

Report checked and approved by:



Meical Owen

Soils Team Manager

Daear Geo Consulting
Llanidan Lodge
Brynsiencyn
Ynys Mon
LL61 6HJ

Date: 20 February 2019
Test Report Ref: TR 648898

Order No: 1639/celtest

Page 1 of 1

Contract: Colomendy

LABORATORY TEST REPORT

TEST REQUIREMENTS:

To determine the Moisture Content of a soil sample
(definitive oven-drying method) in accordance with
BS 1377 : Part 2 : 1990 : clause 3.2

SAMPLE DETAILS:

Certificate of sampling received:	No
Laboratory Ref. No:	S78135
Client Ref. No:	TP11 @ 0.5m
Date and Time of Sampling:	29/01/2019
Date of Receipt at Lab:	30/01/2019
Date of Start of Test:	07/02/2019
Sampling Location:	TP11 @ 0.5m
Name of Source:	Site Won
Method of Sampling:	Disturbed Bulk Sample
Sampled By:	Client
Material Description:	Brown gravelly sandy very silty clay
Target Specification:	N/A

RESULTS:

Moisture Content (%) = 27.5

Comments

None

Report checked and approved by:



Meical Owen
Soils Team Manager

Daear Geo Consulting
Llanidan Lodge
Brynsiencyn
Ynys Mon
LL61 6HJ

Date: 20 February 2019
Test Report Ref: TR 648897

Order No: 1639/celtest

Page 1 of 1

Contract: Colomendy

LABORATORY TEST REPORT

TEST REQUIREMENTS:

To determine the Plastic Limit, Liquid Limit, and Plasticity Index of sample in accordance with
BS 1377:Part 2:1990 Clause 5.3, Clause 4.3, and Clause 5.4.

SAMPLE DETAILS:

Certificate of sampling received:	No
Laboratory Ref. No:	S78135
Client Ref. :	TP10 @ 0.3 - 0.5m
Date and Time of Sampling:	29/01/2019
Date of Receipt at Lab:	30/01/2019
Date of Start of Test:	08/02/2019
Sampling Location:	TP10 @ 0.3 - 0.5m
Name of Source:	Site Won
Method of Sampling:	Disturbed Bulk Sample
Sampled By:	Client
Soil Description:	Brown gravelly very sandy silty clay
Target Specification:	N/A

RESULTS:

History of sample:	:	After wet sieving
% Materials passing 425µm	=	57
Plastic Limit	=	19
Liquid Limit	=	36
Plasticity Index	=	17

Comments:

None

Report checked and approved by:



Meical Owen

Soils Team Manager

Daear Geo Consulting
Llanidan Lodge
Brynsiencyn
Ynys Mon
LL61 6HJ

Date: 20 February 2019
Test Report Ref: TR 648896

Order No: 1639/celtest

Page 1 of 1

Contract: Colomendy

LABORATORY TEST REPORT

TEST REQUIREMENTS:

To determine the Moisture Content of a soil sample
(definitive oven-drying method) in accordance with
BS 1377 : Part 2 : 1990 : clause 3.2

SAMPLE DETAILS:

Certificate of sampling received:	No
Laboratory Ref. No:	S78135
Client Ref. No:	TP10 @ 0.3 - 0.5m
Date and Time of Sampling:	29/01/2019
Date of Receipt at Lab:	30/01/2019
Date of Start of Test:	07/02/2019
Sampling Location:	TP10 @ 0.3 - 0.5m
Name of Source:	Site Won
Method of Sampling:	Disturbed Bulk Sample
Sampled By:	Client
Material Description:	Brown gravelly very sandy silty clay
Target Specification:	N/A

RESULTS:

Moisture Content (%) = 28.4

Comments

None

Report checked and approved by:



Meical Owen
Soils Team Manager

Daear Geo Consulting
Llanidan Lodge
Brynsiencyn
Ynys Mon
LL61 6HJ

Date: 20 February 2019
Test Report Ref: TR 648895

Order No: 1639/celtest

Page 1 of 1

Contract: Colomendy

LABORATORY TEST REPORT

TEST REQUIREMENTS:

To determine the Plastic Limit, Liquid Limit, and Plasticity Index of sample in accordance with
BS 1377:Part 2:1990 Clause 5.3, Clause 4.3, and Clause 5.4.

SAMPLE DETAILS:

Certificate of sampling received:	No
Laboratory Ref. No:	S78135
Client Ref. :	TP6 @ 0.4 - 0.6m
Date and Time of Sampling:	29/01/2019
Date of Receipt at Lab:	30/01/2019
Date of Start of Test:	11/02/2019
Sampling Location:	TP6 @ 0.4 - 0.6m
Name of Source:	Site Won
Method of Sampling:	Disturbed Bulk Sample
Sampled By:	Client
Soil Description:	Brown gravelly sandy silty clay
Target Specification:	N/A

RESULTS:

History of sample:	:	After wet sieving
% Materials passing 425µm	=	83
Plastic Limit	=	18
Liquid Limit	=	31
Plasticity Index	=	13

Comments:

None

Report checked and approved by:



Meical Owen
Soils Team Manager

Daear Geo Consulting
Llanidan Lodge
Brynsiencyn
Ynys Mon
LL61 6HJ

Date: 20 February 2019
Test Report Ref: TR 648894

Order No: 1639/celtest

Page 1 of 1

Contract: Colomendy

LABORATORY TEST REPORT

TEST REQUIREMENTS:

To determine the Moisture Content of a soil sample
(definitive oven-drying method) in accordance with
BS 1377 : Part 2 : 1990 : clause 3.2

SAMPLE DETAILS:

Certificate of sampling received:	No
Laboratory Ref. No:	S78135
Client Ref. No:	TP6 @ 0.4 - 0.6m
Date and Time of Sampling:	29/01/2019
Date of Receipt at Lab:	30/01/2019
Date of Start of Test:	07/02/2019
Sampling Location:	TP6 @ 0.4 - 0.6m
Name of Source:	Site Won
Method of Sampling:	Disturbed Bulk Sample
Sampled By:	Client
Material Description:	Brown gravelly sandy silty clay
Target Specification:	N/A

RESULTS:

Moisture Content (%) = 18.6

Comments

None

Report checked and approved by:



Meical Owen
Soils Team Manager

APPENDIX H

Geo Classification Test Results (CCG; boreholes and HP Samples)

Units 1 & 2
Deltic Place
Deltic Way
Knowsley Industrial Estate
Liverpool
L33 7BU

Telephone: (0151) 545 2750
Fax: (0151) 548 7892
Email: enquiries@ccgeotechnical.com
www.ccgeotechnical.com



LABORATORY REPORT

CONTRACT NUMBER: CCG-C-19-10772

CONTRACT TITLE: COLOMENDY

CLIENT: DAEAR CONSULTING

DATE RECEIVED: 04/02/19
DATE COMMENCED: 13/02/19
DATE COMPLETED: 12/03/19
REPORT DATE: 12/03/19

Test Description	Qty
Determination of Moisture Content BS 1377-2:1990 (a)	10
Determination of Liquid & Plastic Limits BS 1377-2:1990 (a)	5
Particle Size Distribution BS 1377-2:1990 (a)	2
Sedimentation by Hydrometer BS 1377-2:1990 (#)	1

Notes: Observations and interpretations are not accredited by UKAS

denotes non-accredited test

a denotes UKAS accredited test

s denotes test undertaken by approved subcontractor

This report is issued in accordance with the requirements of the United Kingdom Accreditation Services and EN ISO/IEC 17025:2005. The results reported herein relate only to the material supplied to the laboratory. This report shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved Signatories: Chris Bolan (Managing Director) – Daniel Kerfoot (Laboratory Manager)

SUMMARY OF LABORATORY SOIL TEST RESULTS

BH / TP / WS Number	Sample Type	Depth From (m)	Depth To (m)	Moisture Content (%)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Shear Strength (kN/m ²)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425m m (%)	Soil Classification	UKAS accredited test (Y/N)	Description / Test Method Samples described in accordance with BS EN ISO 14688-2 2004
WS1	WS	0.50	0.50	20	-	-	-	-	-	-	-	-	Y	Brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to coarse subangular to subrounded limestone and quartz. (BS1377Pt2:3.2)
WS1	WS	1.00	1.00	15	-	-	-	35	17	18	88	CL / CI	Y	Brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to coarse subangular to subrounded limestone and quartz. (BS1377Pt2:3.2,4,4,5)
WS1	WS	1.50	1.50	15	-	-	-	-	-	-	-	-	Y	Brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to coarse subangular to subrounded limestone and quartz. (BS1377Pt2:3.2)
WS1	WS	2.00	2.00	15	-	-	-	36	16	20	85	CI	Y	Brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to coarse subangular to subrounded limestone and quartz. (BS1377Pt2:3.2,4,4,5)
WS1	WS	2.50	2.50	12	-	-	-	-	-	-	-	-	Y	Brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to coarse subangular to subrounded limestone and quartz. (BS1377Pt2:3.2)
WS2	WS	4.00	4.00	15	-	-	-	33	15	18	89	CL	Y	Brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to coarse subangular to subrounded limestone and quartz. (BS1377Pt2:3.2,4,4,5)
WS3	WS	0.75	0.75	19	-	-	-	38	15	23	98	CI	Y	Brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to coarse subangular to subrounded limestone and quartz. (BS1377Pt2:3.2,4,4,5)
WS5	WS	0.50	0.50	26	-	-	-	-	-	-	-	-	Y	Brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to coarse subangular to subrounded limestone and quartz. (BS1377Pt2:3.2)
WS5	WS	1.00	1.00	15	-	-	-	35	15	20	93	CL / CI	Y	Brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to coarse subangular to subrounded limestone and quartz. (BS1377Pt2:3.2,4,4,5)
WS5	WS	1.50	1.50	14	-	-	-	-	-	-	-	-	Y	Brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to coarse subangular to subrounded limestone and quartz. (BS1377Pt2:3.2)

SITE: COLOMENDY (CCG-C-19-10772)

DATE: 18.02.19

CLIENT: DAEAR GEOCONSULTING

Key:- BD = Bulk Disturbed; SD = Small Disturbed; U100 = Undisturbed 100mm; WS = Window Sample

CL = Low Plasticity; CI = Intermediate; CH = High; CV = Very high; CE = Extremely high; NP = Non-plastic

(* Denotes Hand Shear Vane test result)

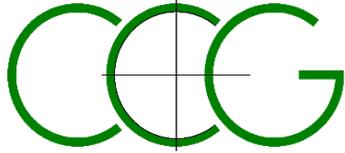
Sample description not accredited by UKAS



4514

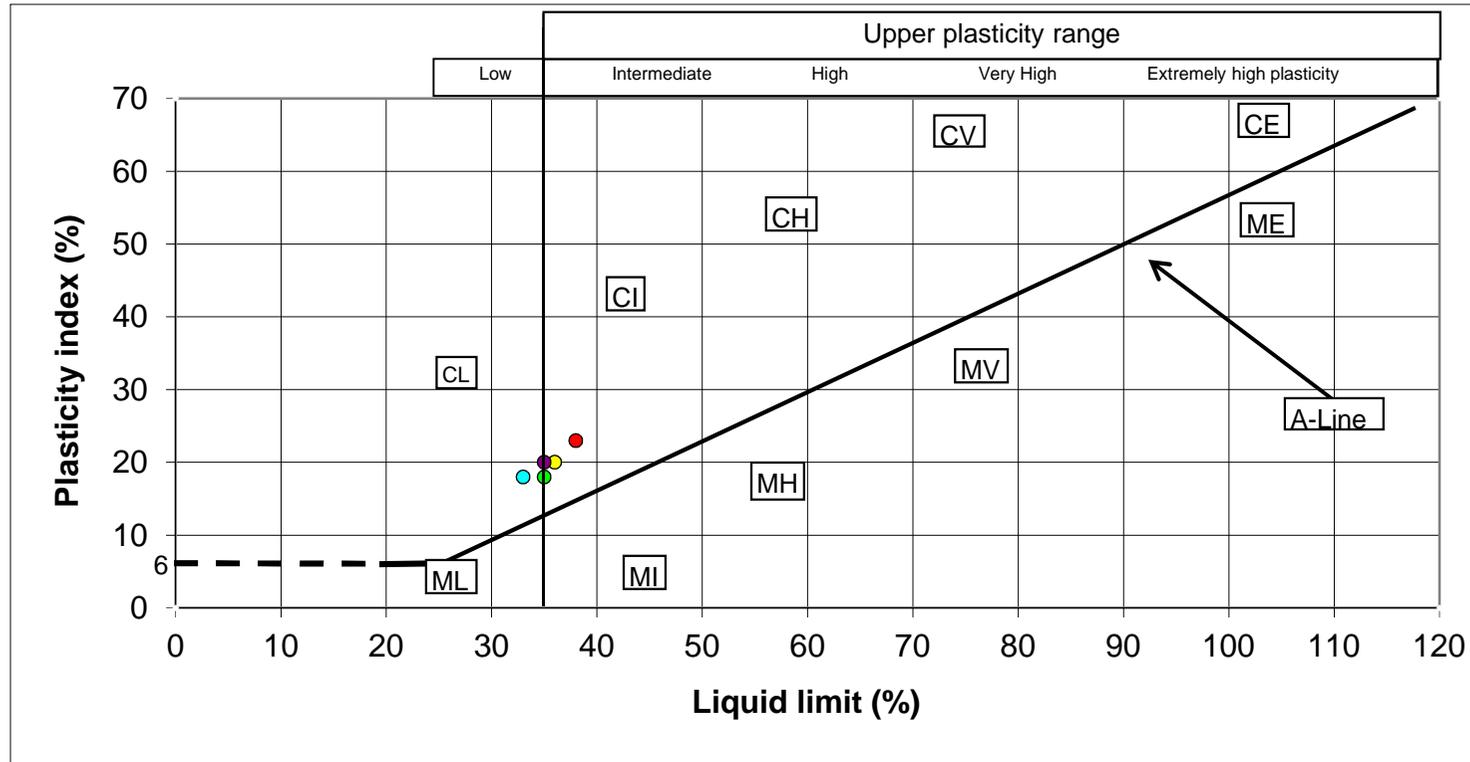


10772 RES 1.xls



ATTERBERG TEST RESULT SHEET
BS 1377:Part 2:1990:cl 4.4,5

SILT (M-SOIL), M plots below A-Line , CLAY,C, plots above A-Line, M and C may be combined as FINE SOIL, F.



BH	Sample Depth	Liquid limit	Plasticity index
WS1	1.00	35.0	18.0
WS1	2.00	36.0	20.0
WS2	4.00	33.0	18.0
WS3	0.75	38.0	23.0
WS5	1.00	35.0	20.0



4514

APPROVED BY DK

CLIENT: DAEAR CONSULTING SITE: COLOMENDY (CCG-C-19-10772)

SUMMARY OF LABORATORY SOIL TEST RESULTS

BH / TP / WS Number	Sample Type	Depth From (m)	Depth To (m)	Moisture Content (%)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Shear Strength (kN/m ²)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425m m (%)	Soil Classification	UKAS accredited test (Y/N)	Description / Test Method Samples described in accordance with BS EN ISO 14688-2 2004
HP02	B	0.70	0.90	-	-	-	-	-	-	-	-	-	Y	Brown very sandy silty GRAVEL. Gravel si fine to coarse subangular to subrounded sandstone, limestone, quartz. (BS1377Pt2:9.2)
HP03	B	0.50	0.80	-	-	-	-	-	-	-	-	-	Y	Brown very gravelly silty clayey fine to coarse grained SAND. Gravel is fine to coarse subrounded to subangular sandstone. (BS1377Pt2:9.2,9.5)

SITE: COLOMENDY (CCG-C-19-10772)
 CLIENT: DAEAR GEOCONSULTING

DATE: 12.03.19



Key:- BD = Bulk Disturbed; SD = Small Disturbed; U100 = Undisturbed 100mm; WS = Window Sample
 CL = Low Plasticity; CI = Intermediate; CH = High; CV = Very high; CE = Extremely high; NP = Non-plastic
 (* Denotes Hand Shear Vane test result)
 Sample description not accredited by UKAS



CC Geotechnical Ltd
Tel: 0151 545 2750
e: lab@ccgeotechnical.com

PARTICLE SIZE DISTRIBUTION

Job Ref

CCG-C-19-10772

Borehole/Pit No.

HP02

Site Name

COLOMENDY

Sample No.

2

Specimen Description

Brown very sandy silty GRAVEL. Gravel si fine to coarse subangular to subrounded sandstone, limestone, quartz

Depth, m

0.70-0.90

Specimen Reference

Specimen Depth

m

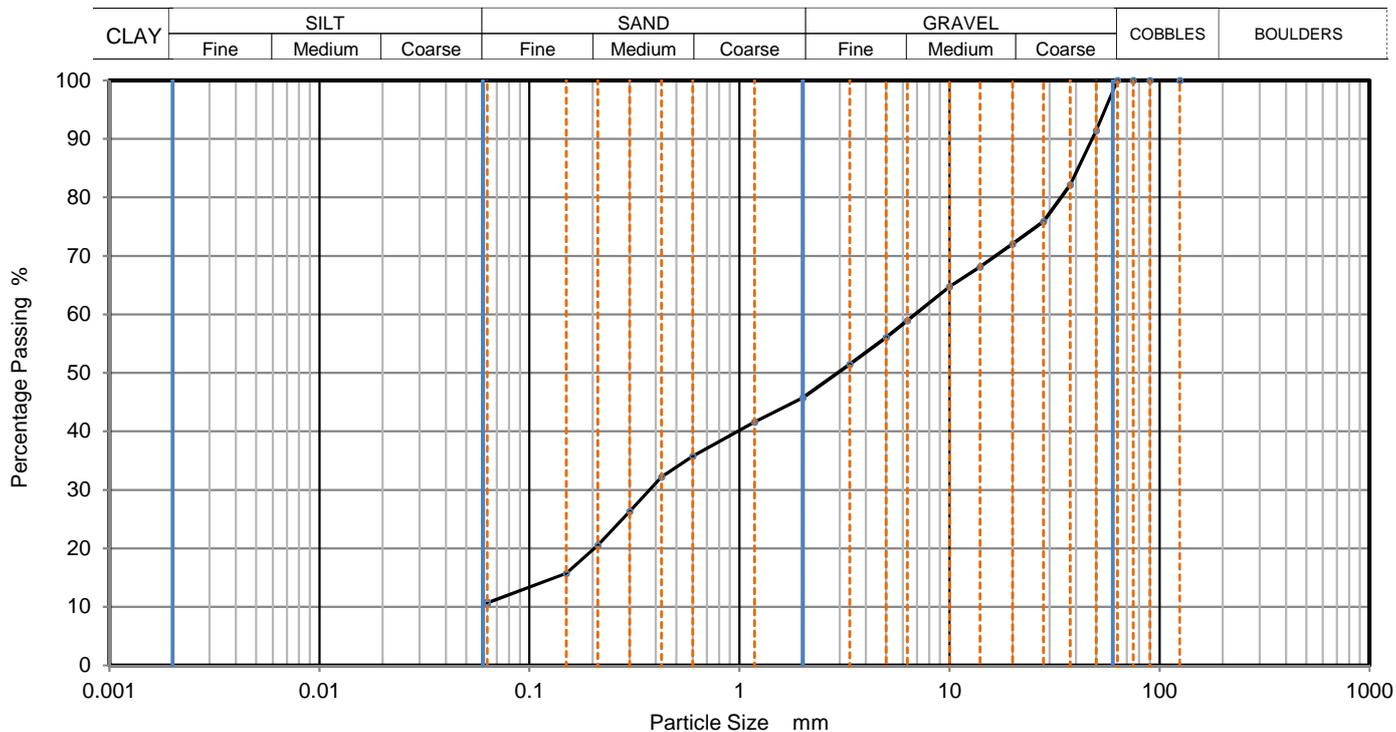
Sample Type

B

Test Method

WET SIEVE

KeyLAB ID



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	91		
37.5	82		
28	76		
20	72		
14	68		
10	65		
6.3	59		
5	56		
3.35	51		
2	46		
1.18	42		
0.6	36		
0.425	32		
0.3	26		
0.212	21		
0.15	16		
0.063	11		

Dry Mass of sample, g

7436

Sample Proportions	% dry mass
Very coarse	0
Gravel	54
Sand	35
Fines <0.063mm	11

Grading Analysis		
D ₁₀₀	mm	
D ₆₀	mm	
D ₃₀	mm	
D ₁₀	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
MH	DK	DK	12/03/2019 09:18	Sheet



CC Geotechnical Ltd
Tel: 0151 545 2750
e: lab@ccgeotechnical.com

PARTICLE SIZE DISTRIBUTION

Job Ref

CCG-C-19-10772

Borehole/Pit No.

HP03

Site Name

COLOMENDY

Sample No.

1

Specimen Description

Brown very gravelly silty clayey fine to coarse grained SAND. Gravel is fine to coarse subrounded to subangular sandstone

Depth, m

0.50-0.80

Specimen Reference

Specimen Depth

m

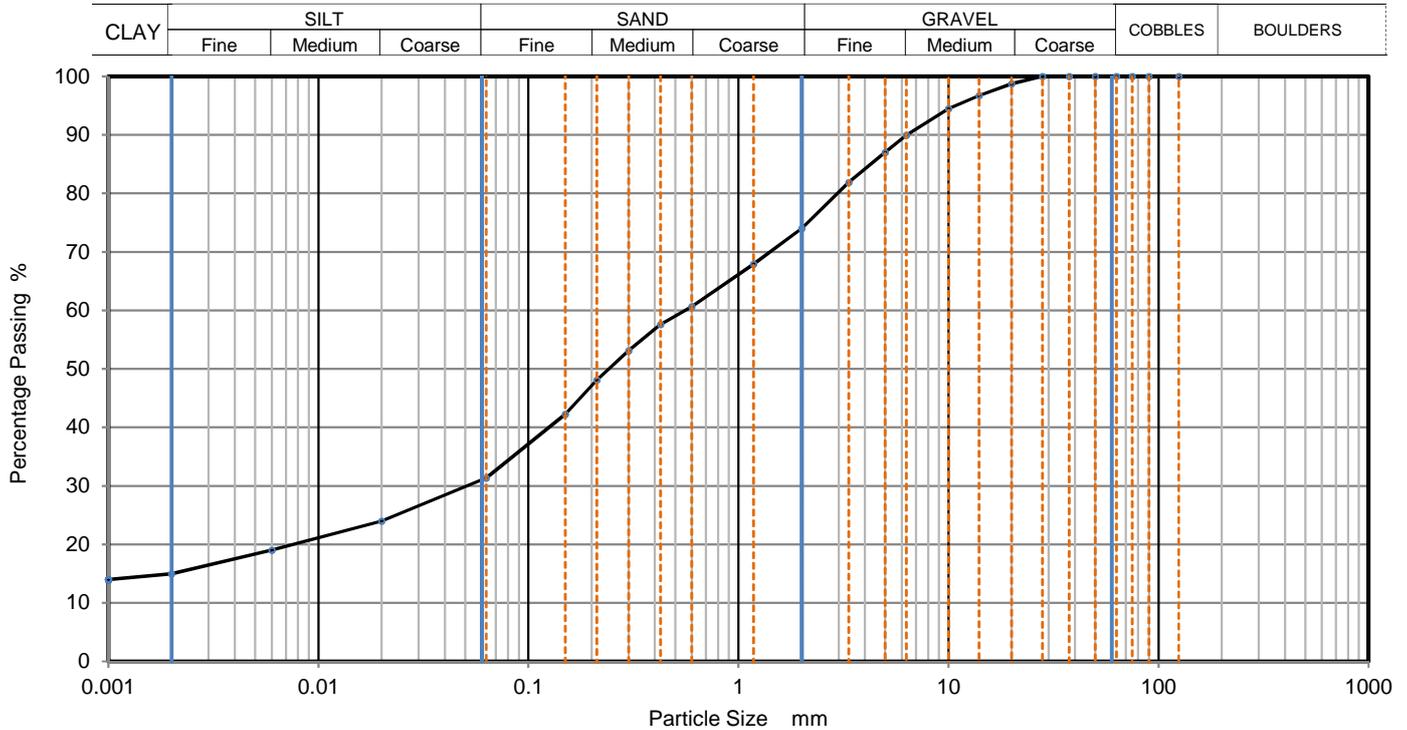
Sample Type

B

Test Method

WET SIEVE & HYDROMETER

KeyLAB ID



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	24
90	100	0.0060	19
75	100	0.0020	15
63	100	0.0010	14
50	100		
37.5	100		
28	100		
20	99		
14	97		
10	94		
6.3	90		
5	87		
3.35	82		
2	74		
1.18	68		
0.6	61		
0.425	58		
0.3	53		
0.212	48		
0.15	42		
0.063	31		

Dry Mass of sample, g

2181

Sample Proportions	% dry mass
Very coarse	0
Gravel	26
Sand	43
Silt	16
Clay	15

Grading Analysis	
D ₁₀₀	mm
D ₆₀	mm
D ₃₀	mm
D ₁₀	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig Sheet
MH	DK	DK	12/03/2019 09:16	

APPENDIX J

Chemical Test Results



Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY
Telephone: (01424) 718618

cs@elab-uk.co.uk
info@elab-uk.co.uk

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number: 19-21598
Issue: 1
Date of Issue: 05/02/2019
Contact: Meical Owen
Customer Details: Celtest
Trefelin
Llandegai
Bangor
Gwynedd
LL57 4LH
Quotation No: Q19-01419
Order No: 21774
Customer Reference: S78135
Date Received: 01/02/2019
Date Approved: 05/02/2019
Details: S78135
Approved by:

Mike Varley, Technical Manager

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)



Sample Summary

Report No.: 19-21598

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
164028	TP18 0.05 - 0.1	30/01/2019	01/02/2019	Sandy silty loam	

Results Summary

Report No.: 19-21598

ELAB Reference	164028
Customer Reference	
Sample ID	
Sample Type	SOIL
Sample Location	TP18
Sample Depth (m)	0.05 - 0.1
Sampling Date	30/01/2019

Determinand	Codes	Units	LOD	
Metals				
Arsenic	M	mg/kg	1	9.2
Barium	U	mg/kg	10	94.9
Beryllium	U	mg/kg	1	< 1.0
Cadmium	M	mg/kg	0.5	0.5
Chromium	M	mg/kg	5	30.7
Copper	M	mg/kg	5	25.8
Lead	M	mg/kg	5	49.8
Mercury	M	mg/kg	0.5	< 0.5
Nickel	M	mg/kg	5	30.1
Selenium	M	mg/kg	1	< 1.0
Vanadium	M	mg/kg	5	24.3
Zinc	M	mg/kg	5	84.8
Anions				
Water Soluble Sulphate	M	mg/l	20	28
Inorganics				
Hexavalent Chromium	N	mg/kg	0.8	< 0.8
Total Sulphide	N	mg/kg	2	< 2
Total Cyanide	M	mg/kg	1	< 1.0
Miscellaneous				
pH	M	pH units	0.1	7.9
Total Organic Carbon	N	%	0.01	0.80
Phenols				
Phenol	M	mg/kg	1	< 1
M,P-Cresol	N	mg/kg	1	< 1
O-Cresol	N	mg/kg	1	< 1
3,4-Dimethylphenol	N	mg/kg	1	< 1
2,3-Dimethylphenol	M	mg/kg	1	< 1
1-Naphthol	N	mg/kg	1	< 1
2,3,5-trimethylphenol	M	mg/kg	1	< 1
Total Phenols	N	mg/kg	6	< 6

Results Summary

Report No.: 19-21598

ELAB Reference	164028
Customer Reference	
Sample ID	
Sample Type	SOIL
Sample Location	TP18
Sample Depth (m)	0.05 - 0.1
Sampling Date	30/01/2019

Determinand	Codes	Units	LOD	
Polyaromatic hydrocarbons				
Naphthalene	M	mg/kg	0.1	< 0.1
Acenaphthylene	M	mg/kg	0.1	< 0.1
Acenaphthene	M	mg/kg	0.1	< 0.1
Fluorene	M	mg/kg	0.1	< 0.1
Phenanthrene	M	mg/kg	0.1	< 0.1
Anthracene	M	mg/kg	0.1	< 0.1
Fluoranthene	M	mg/kg	0.1	< 0.1
Pyrene	M	mg/kg	0.1	< 0.1
Benzo(a)anthracene	M	mg/kg	0.1	< 0.1
Chrysene	M	mg/kg	0.1	< 0.1
Benzo(b)fluoranthene	M	mg/kg	0.1	< 0.1
Benzo(k)fluoranthene	M	mg/kg	0.1	< 0.1
Benzo(a)pyrene	M	mg/kg	0.1	< 0.1
Indeno(1,2,3-cd)pyrene	M	mg/kg	0.1	< 0.1
Dibenzo(a,h)anthracene	M	mg/kg	0.1	< 0.1
Benzo[g,h,i]perylene	M	mg/kg	0.1	< 0.1
Total PAH(16)	M	mg/kg	0.4	< 0.4
TPH CWG				
>C5-C6 Aliphatic	N	mg/kg	0.01	< 0.01
>C6-C8 Aliphatic	N	mg/kg	0.01	< 0.01
>C8-C10 Aliphatic	N	mg/kg	1	< 1.0
>C10-C12 Aliphatic	M	mg/kg	1	< 1.0
>C12-C16 Aliphatic	M	mg/kg	1	< 1.0
>C16-C21 Aliphatic	M	mg/kg	1	< 1.0
>C21-C35 Aliphatic	M	mg/kg	1	< 1.0
>C35-C40 Aliphatic	M	mg/kg	1	< 1.0
Total aliphatic hydrocarbons (>C5 - C40)	N	mg/kg	1	< 1.0
>C5-C7 Aromatic	N	mg/kg	0.01	< 0.01
>C7-C8 Aromatic	N	mg/kg	0.01	< 0.01
>C8-C10 Aromatic	N	mg/kg	1	< 1.0
>C10-C12 Aromatic	M	mg/kg	1	< 1.0
>C12-C16 Aromatic	M	mg/kg	1	< 1.0
>C16-C21 Aromatic	M	mg/kg	1	< 1.0
>C21-C35 Aromatic	M	mg/kg	1	2.2
>C35-C40 Aromatic	M	mg/kg	1	< 1.0
Total aromatic hydrocarbons (>C5 - C40)	N	mg/kg	1	2.2
Total petroleum hydrocarbons (>C5 - C40)	N	mg/kg	1	2.2



Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards on Sea, East Sussex, TN38 9BY
Tel: +44 (0)1424 718618, Email: info@elab-uk.co.uk, Web: www.elab-uk.co.uk

Results Summary

Report No.: 19-21598

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #) in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
164028	0.05 - 0.1	TP18	Brown sandy soil,Stones	No asbestos detected	n/t	n/t	n/t	n/t

Method Summary

Report No.: 19-21598

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Sulphide	N	As submitted sample	05/02/2019	109	Colorimetry
Hexavalent chromium	N	As submitted sample	04/02/2019	110	Colorimetry
pH	M	Air dried sample	04/02/2019	113	Electromeric
Aqua regia extractable metals	M	Air dried sample	04/02/2019	118	ICPMS
Phenols in solids	M	As submitted sample	01/02/2019	121	HPLC
PAH (GC-FID)	M	As submitted sample	04/02/2019	133	GC-FID
Water soluble anions	M	Air dried sample	04/02/2019	172	Ion Chromatography
Low range Aliphatic hydrocarbons soil	N	As submitted sample	05/02/2019	181	GC-MS
Low range Aromatic hydrocarbons soil	N	As submitted sample	05/02/2019	181	GC-MS
Total cyanide	M	As submitted sample	04/02/2019	204	Colorimetry
Total organic carbon/Total sulphur	N	Air dried sample	05/02/2019	210	IR
TPH CWG soil by gc-gc	M	As submitted sample	04/02/2019	214	
Asbestos identification	U	Air dried sample	04/02/2019	PMAN	Microscopy

Tests marked N are not UKAS accredited



Report Information

Report No.: 19-21598

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"

Soil sample results are expressed on an air dried basis (dried at < 30 °C)

ELAB are unable to provide an interpretation or opinion on the content of this report.

The results relate only to the items tested

PCB congener results may include any coeluting PCBs

Uncertainty of measurement for the determinands tested are available upon request

Deviation Codes

-
- | | |
|---|--|
| a | No date of sampling supplied |
| b | No time of sampling supplied (Waters Only) |
| c | Sample not received in appropriate containers |
| d | Sample not received in cooled condition |
| e | The container has been incorrectly filled |
| f | Sample age exceeds stability time (sampling to receipt) |
| g | Sample age exceeds stability time (sampling to analysis) |

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month

All water samples will be retained for 7 days following the date of the test report

Charges may apply to extended sample storage



Unit A2
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Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY
Telephone: (01424) 718618

cs@elab-uk.co.uk
info@elab-uk.co.uk

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number: 19-21657

Issue: 1

Date of Issue: 11/02/2019

Contact: Daniel O'Regan

Customer Details: CC Geotechnical Ltd
Unit 1 & 2 Deltic Place
Deltic Way
Liverpool
Merseyside
L33 7BA

Quotation No: Q14-00045

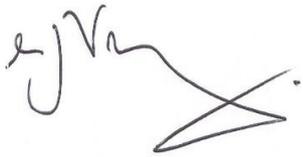
Order No: Not Supplied

Customer Reference: 19/10772

Date Received: 05/02/2019

Date Approved: 11/02/2019

Details: Colomendy, Denbigh

Approved by: 

Mike Varley, Technical Manager

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)



Sample Summary

Report No.: 19-21657

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
164425	WS1 0.10 - 0.20	01/02/2019	05/02/2019	Silty loam	
164426	WS1 0.25 - 0.35	01/02/2019	05/02/2019	Silty loam	
164427	WS5 0.10 - 0.20	01/02/2019	05/02/2019	Silty clayey loam	
164428	WS5 0.25 - 0.35	01/02/2019	05/02/2019	Silty clayey loam	
164429	WS1 1.00	01/02/2019	05/02/2019	Silty clayey loam	
164430	WS3 0.75	01/02/2019	05/02/2019	Silty clayey loam	
164431	WS5 1.00	01/02/2019	05/02/2019	Silty clayey loam	

Results Summary

Report No.: 19-21657

ELAB Reference	164425	164426	164427	164428	164429	164430	164431			
Customer Reference										
Sample ID										
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Location	WS1	WS1	WS5	WS5	WS1	WS3	WS5			
Sample Depth (m)	0.10 - 0.20	0.25 - 0.35	0.10 - 0.20	0.25 - 0.35	1.00	0.75	1.00			
Sampling Date	01/02/2019	01/02/2019	01/02/2019	01/02/2019	01/02/2019	01/02/2019	01/02/2019			
Determinand	Codes	Units	LOD							
Metals										
Arsenic	M	mg/kg	1	9.8	9.3	8.3	8.8	n/t	n/t	n/t
Cadmium	M	mg/kg	0.5	0.5	< 0.5	< 0.5	< 0.5	n/t	n/t	n/t
Chromium	M	mg/kg	5	36.8	37.4	27.3	28.4	n/t	n/t	n/t
Copper	M	mg/kg	5	31.1	30.4	22.3	22.8	n/t	n/t	n/t
Lead	M	mg/kg	5	73.5	86.8	30.1	28.8	n/t	n/t	n/t
Mercury	M	mg/kg	0.5	< 0.5	< 0.5	< 0.5	< 0.5	n/t	n/t	n/t
Nickel	M	mg/kg	5	28.2	31.7	31.6	34.1	n/t	n/t	n/t
Selenium	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	n/t	n/t	n/t
Zinc	M	mg/kg	5	107	104	82.6	88.9	n/t	n/t	n/t
Anions										
Water Soluble Sulphate	M	mg/l	20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Inorganics										
Elemental Sulphur	M	mg/kg	20	< 20	< 20	< 20	< 20	n/t	n/t	n/t
Hexavalent Chromium	N	mg/kg	0.8	< 0.8	< 0.8	< 0.8	< 0.8	n/t	n/t	n/t
Total Sulphide	N	mg/kg	2	< 2	< 2	< 2	< 2	n/t	n/t	n/t
Total Cyanide	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	n/t	n/t	n/t
Water Soluble Boron	N	mg/kg	0.5	1.4	0.7	< 0.5	< 0.5	n/t	n/t	n/t
Miscellaneous										
Moisture Content	N	%	0.1	23.1	20.9	8.5	9.7	n/t	n/t	n/t
pH	M	pH units	0.1	7.5	8.3	8.6	8.6	8.6	8.4	8.6
Total Organic Carbon	N	%	0.01	2.9	1.2	0.17	0.04	n/t	n/t	n/t
Phenols										
Phenol	M	mg/kg	1	2	< 1	< 1	< 1	n/t	n/t	n/t
M,P-Cresol	N	mg/kg	1	< 1	< 1	< 1	< 1	n/t	n/t	n/t
O-Cresol	N	mg/kg	1	< 1	< 1	< 1	< 1	n/t	n/t	n/t
3,4-Dimethylphenol	N	mg/kg	1	< 1	< 1	< 1	< 1	n/t	n/t	n/t
2,3-Dimethylphenol	M	mg/kg	1	< 1	< 1	< 1	< 1	n/t	n/t	n/t
2,3,5-trimethylphenol	M	mg/kg	1	< 1	< 1	< 1	< 1	n/t	n/t	n/t
Total Monohydric Phenols	N	mg/kg	5	< 5	< 5	< 5	< 5	n/t	n/t	n/t
Polyaromatic hydrocarbons										
Naphthalene	M	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	n/t	n/t	n/t
Acenaphthylene	M	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	n/t	n/t	n/t
Acenaphthene	M	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	n/t	n/t	n/t
Fluorene	M	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	n/t	n/t	n/t
Phenanthrene	M	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	n/t	n/t	n/t
Anthracene	M	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	n/t	n/t	n/t
Fluoranthene	M	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	n/t	n/t	n/t
Pyrene	M	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	n/t	n/t	n/t
Benzo(a)anthracene	M	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	n/t	n/t	n/t
Chrysene	M	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	n/t	n/t	n/t
Benzo(b)fluoranthene	M	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	n/t	n/t	n/t
Benzo(k)fluoranthene	M	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	n/t	n/t	n/t
Benzo(a)pyrene	M	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	n/t	n/t	n/t
Indeno(1,2,3-cd)pyrene	M	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	n/t	n/t	n/t
Dibenzo(a,h)anthracene	M	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	n/t	n/t	n/t
Benzo(g,h,i)perylene	M	mg/kg	0.1	< 0.1	< 0.1	< 0.1	< 0.1	n/t	n/t	n/t
Total PAH(16)	M	mg/kg	0.4	< 0.4	< 0.4	< 0.4	< 0.4	n/t	n/t	n/t

Results Summary

Report No.: 19-21657

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #) in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
164425	0.10 - 0.20	WS1	Brown soil, stones	No asbestos detected	n/t	n/t	n/t	n/t
164426	0.25 - 0.35	WS1	Brown soil, stones	No asbestos detected	n/t	n/t	n/t	n/t
164427	0.10 - 0.20	WS5	Brown soil, stones	No asbestos detected	n/t	n/t	n/t	n/t
164428	0.25 - 0.35	WS5	Brown soil, stones	No asbestos detected	n/t	n/t	n/t	n/t

Method Summary

Report No.: 19-21657

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Sulphide	N	As submitted sample	07/02/2019	109	Colorimetry
Hexavalent chromium	N	As submitted sample	07/02/2019	110	Colorimetry
pH	M	Air dried sample	08/02/2019	113	Electromeric
Aqua regia extractable metals	M	Air dried sample	07/02/2019	118	ICPMS
Phenols in solids	M	As submitted sample	07/02/2019	121	HPLC
Elemental Sulphur	M	Air dried sample	07/02/2019	122	HPLC
PAH (GC-FID)	M	As submitted sample	07/02/2019	133	GC-FID
Water soluble anions	M	Air dried sample	07/02/2019	172	Ion Chromatography
Water soluble boron	N	Air dried sample	08/02/2019	202	Colorimetry
Total cyanide	M	As submitted sample	07/02/2019	204	Colorimetry
Total organic carbon/Total sulphur	N	Air dried sample	08/02/2019	210	IR
Asbestos identification	U	Air dried sample	07/02/2019	PMAN	Microscopy

Tests marked N are not UKAS accredited



Report Information

Report No.: 19-21657

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"

Soil sample results are expressed on an air dried basis (dried at < 30°C)

ELAB are unable to provide an interpretation or opinion on the content of this report.

The results relate only to the items tested

PCB congener results may include any coeluting PCBs

Uncertainty of measurement for the determinands tested are available upon request

Deviation Codes

- a No date of sampling supplied
- b No time of sampling supplied (Waters Only)
- c Sample not received in appropriate containers
- d Sample not received in cooled condition
- e The container has been incorrectly filled
- f Sample age exceeds stability time (sampling to receipt)
- g Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month

All water samples will be retained for 7 days following the date of the test report

Charges may apply to extended sample storage