



Natural Resources Wales

St Asaph FRMS (Detailed Design) Ground investigation 2016

Factual Ground Investigation Report

18th May 2016

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Document Control

Document: Factual Ground Investigation Report

Project: St Asaph FRMS Additional Ground Investigation

Client: Natural Resources Wales

Job Number: A089434-1

File Origin: \CARDIFF31\Consulting\dataold\Environmental\projects\A089434-1 St Asaph

Addit GI\Report\A089434-1 Factual Report DRAFT LK Issue.docx

Revision: Draft

Date: 18.05.2016

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1 Introduction

1.1 Instruction

WYG Environment Planning Transport Ltd (WYG) were commissioned by Natural Resources Wales (NRW) to undertake intrusive ground investigation work along the River Elwy in St Asaph. Contract instructions were issued by John Davies and are dated 7th March 2016.

1.2 Brief

The ground investigation was designed to inform the detailed design of flood defence enhancement works. The proposed works included raising and widening existing flood defences embankments along existing flood defence alignments and also possibly the construction of new defences walls set-back from the river's edge; increasing the width of the flood corridor for conveyance. Sheet piles will require installation along some of the flood defence alignment. The ground investigation has been devised by Black and Veatch (B&V) the client engineer.

The investigation comprised the following key elements:

- 5 No. Cable percussive boreholes to between 10.0 and 12.0m depth with SPT testing
- 11 No. Machine excavated trial pits to 2.5m depth
- 14 No. Hand excavated trial pits to 1.55m depth
- 3 No. Window samples to 5.0m depth with dynamic probes to 8.0m depth
- Collection of disturbed and undisturbed soil samples
- Geotechnical and environmental laboratory testing of soil samples



1.3 Report Scope

This report summarises the work undertaken and includes the following key elements:

- Full factual records of the site works carried out
- Ground conditions encountered
- In situ testing results
- Geotechnical and environmental laboratory testing results

1.4 Limitations

The recommendations and opinions expressed in this report are based on information obtained as part of the desk study or provided by others. Information provided from other sources is taken in good faith and WYG cannot guarantee its accuracy.

This report has been prepared in accordance with the requirements of Works Package Order *St Asaph FRMS (Detailed Design) Ground Investigation 2016.* It is subject to the report conditions contained in Appendix A.

The information contained in this report is intended for the use of Natural Resources Wales. WYG can take no responsibility for the use of this information by any third party or for uses other than that described in this report or detailed within the terms of our engagement.



2 Site Information

2.1 Location

The site is on embankments that run along the eastern and western banks of River Elwy as it runs from south to north through the city of St Asaph. The coordinates of the north end of the site are 303184E, 375064N. A site location plan is presented as Figure 1.

2.2 Site description

The site consists of two areas, the northern area is situated west of the Farm Pentre-uchaf on the eastern bank of the River Elwy. There is a footbridge across the river. The setting is rural.

The main area stretches along the River Elwy through the centre of St Asaph. The River Elwy runs through both residential and light commercial areas and more rural and recreational areas.

A site layout plan is included as Figure 2.

2.3 Geology

The BGS geology mapping indicates that the site is underlain by Till deposits and Glaciofluvial deposits of devensian age and Alluvium. The Till deposits are described as diamicton meaning poorly sorted deposits that contain a wide range of particle sizes. The bedrock underlying the site consists of the Warwickshire Group which includes mudstones, siltstones and sandstones.

The information provided as part of the Works Package Order highlighted that Made Ground is to be expected in the recreational areas consisting of both cohesive and granular types.

2.4 Hydrogeology

The Alluvium, Glaciofluvial deposits and Warwickshire Group are categorised as Secondary A Aquifers. There are no Source Protection Zones (SPZs) within 1km of the site. The groundwater vulnerability in the area is listed as being intermediate to high.



3 Site Investigation

The site investigation was undertaken between the 14th and 21st March 2016.

Details of the fieldwork methods are given in the notes section at the end of this report.

3.1 Scope

The scope of the site investigation included the following:

- 4 No. Cable percussive boreholes to between 7.5 and 11.0m depth with SPT testing
- 11 No. Machine excavated trial pits to between 0.8 and 2.1m depth
- 1 No. Machine excavated trial trench
- 15 No. Hand excavated trial pits to between 1.10 and 1.55m depth
- 9 No. Window samples between 2.0 and 5.0m depth with dynamic probes in two locations to 4.0m depth
- Collection of disturbed and undisturbed soil samples
- Geotechnical and environmental laboratory testing of soil samples

Figure 2 shows the layout of the exploratory holes advanced during the site investigation. Exploratory hole logs including photographic plates are presented in Appendix B.

3.2 Amendments to original scope of Works Package Order

During the site investigation the scope of the site investigation was amended to reflect ground conditions and ease the progression of the works. The following amendments were instructed by the client engineer Black and Veatch:

- BH1605 was cancelled due to access restrictions
- WS1602 was undertaken as a hand pit and trial pit instead of window sample
- BH1603A was an additional hand pit undertaken near BH1603
- HD1614 was cancelled
- TP1609 was undertaken as archaeological trial trench TT1601
- 6 No. Window samples were added



4 Ground Conditions Encountered

4.1 Strata encountered

The sequence of strata encountered beneath the site was;

- Topsoil
- Made Ground
- Alluvium
- Fluvioglacial Deposits
- Glacial Till
- Glacial Deposits

A summary of depth of each stratum is provided in Table 4-1 and descriptions of each stratum are detailed in the subsequent sections. Exploratory hole logs including photographic plates can also be seen in Appendix B.

Table 4-1 - Summary of strata depths (m bgl) for all exploratory holes

Location	Topsoil	Made Ground	Alluvium	Fluvio glacial Deposits	Glacial Till	Glacial Deposits
BH1601	0.00-0.70	ne ^b	ne ^b	0.70-3.40	3.40-7.50 ^a	ne ^b
BH1602	0.00-0.30	ne ^b	0.30-0.60	0.60-2.90	2.90-5.50	5.50-7.50 ^a
BH1603	0.00-0.10	0.10-0.40	0.40-0.70	0.70-3.10	3.10-6.80	6.80-8.50 ^a
BH1604	0.00-0.10	0.10-2.20	ne ^b	2.20-6.40	6.40-11.00 ^a	ne ^b
HD1601	0.00-0.35	ne ^b	ne ^b	0.35-1.25 ^a	ne ^b	ne ^b
HD1602	0.00-0.10	0.10-0.85	ne ^b	0.85-1.40 ^a	ne ^b	ne ^b
HD1603	0.00-0.10	0.10-1.40	ne ^b	1.40-1.55 ^a	ne ^b	ne ^b
HD1604	0.00-0.08	0.08-1.55	ne ^b	ne ^b	ne ^b	ne ^b
HD1605	0.00-0.50	ne ^b	ne ^b	0.50-1.25 ^a	ne ^b	ne ^b
HD1606	ne ^b	0.00-1.55 ^a	ne ^b	ne ^b	ne ^b	ne ^b
HD1607	0.00-0.10	0.10-1.50 ^a	ne ^b	ne ^b	ne ^b	ne ^b
HD1608	0.00-0.10	0.10-1.55 ^a	ne ^b	ne ^b	ne ^b	ne ^b
HD1609	0.00-0.20	0.20-1.45 ^a	ne ^b	ne ^b	ne ^b	ne ^b
HD1610	ne ^b	0.00-1.10 ^a	ne ^b	ne ^b	ne ^b	ne ^b
HD1611	ne ^b	0.00-1.50 ^a	ne ^b	ne ^b	ne ^b	ne ^b
HD1612	0.00-0.10	0.10-1.30	1.30-1.50 ^a	ne ^b	ne ^b	ne ^b



Location	Topsoil	Made Ground	Alluvium	Fluvio glacial Deposits	Glacial Till	Glacial Deposits
HD1613	ne ^b	ne ^b	0.00-1.15	1.15-1.30 ^a	ne ^b	ne ^b
BH1613A	0.00-0.08	0.80-1.45	1.45-1.50 ^a	ne ^b	ne ^b	ne ^b
WS1602-HD	ne ^b	ne ^b	ne ^b	0.00-1.10 ^a	ne ^b	ne ^b
TT1601	0.00-0.20	0.20-1.60	ne ^b	1.60-1.80 ^a	ne ^b	ne ^b
TP1601	0.00-0.10	0.10-1.10	ne ^b	1.10-1.50 ^a	ne ^b	ne ^b
TP1602	0.00-0.06	0.06-0.60	ne ^b	0.60-1.20 ^a	ne ^b	ne ^b
TP1603	0.00-0.10	0.10-0.90	ne ^b	0.90-2.10 ^a	ne ^b	ne ^b
TP1604	0.00-0.10	0.10-0.95	ne ^b	0.95-1.20 ^a	ne ^b	ne ^b
TP1605	0.00-0.15	0.15-0.70	ne ^b	0.70-1.40 ^a	ne ^b	ne ^b
TP1606	0.00-0.10	0.10-0.90	0.90-1.40	1.40-1.80 ^a	ne ^b	ne ^b
TP1607	0.00-0.15	0.15-0.70	0.70-0.75	0.75-1.55 ^a	ne ^b	ne ^b
TP1608	0.00-0.15	0.15-1.10	1.10-1.45	1.145-1.60 ^a	ne ^b	ne ^b
TP1609	0.00-0.10	ne ^b	0.10-0.50	0.50-0.80 ^a	ne ^b	ne ^b
TP1610	0.00-0.10	ne ^b	0.10-0.60	0.60-0.80 ^a	ne ^b	ne ^b
WS1602-TP	0.00-0.30	ne ^b	0.30-0.40	0.40-1.10 ^a	ne ^b	ne ^b
WS1601A	0.00-0.15	0.15-2.80	ne ^b	2.80-4.00 ^a	ne ^b	ne ^b
WS1601B	ne ^b	0.00-3.00	ne ^b	3.00-3.40 ^a	ne ^b	ne ^b
WS1601C	ne ^b	0.00-3.00	ne ^b	3.00-3.20 ^a	ne ^b	ne ^b
WS1601D	0.00-0.35	0.35-3.00	ne ^b	3.00-4.00 ^a	ne ^b	ne ^b
WS1603	0.00-0.10	0.10-1.95	ne ^b	ne ^b	1.95-3.90	3.90-4.40 ^a
WS1604	0.00-0.05	0.05-3.70	ne ^b	3.70-4.65	4.65-5.00 ^a	ne ^b
WS1605	0.00-0.05	0.05-2.00 ^a	ne ^b	ne ^b	ne ^b	ne ^b
WS1606	0.00-0.18	0.18-3.00	ne ^b	3.00-4.00 ^a	ne ^b	ne ^b
WS1607	0.00-0.15	0.15-2.00	ne ^b	ne ^b	ne ^b	ne ^b

^aBase of stratum not proven

4.1.1 Topsoil

The topsoil encountered consisted mainly of brown clayey sandy organic silt with varying amounts of fine to coarse rounded sandstone and mudstone gravel. The topsoil was described as soft to firm brown clay in two locations (TT1601 and WS1601A).

bne denotes not encountered



4.1.2 Made Ground

Made Ground was encountered in the majority of exploratory locations. At the locations on the existing flood bund several layers of Made Ground were encountered comprising firm brown clay and stiff reddish brown silty sandy gravelly clay overlying dark brown black ashy silty very sandy gravel of brick coal mudstone, glass and pottery.

In various fill material was encountered on the eastern side of the River Elwy around TP1606 to TP1608 consisting of mainly gravel with varying amounts of subconstituents.

4.1.3 Alluvium

The Alluvium encountered on site was composed mainly of brown or brown grey silt with varying amounts of sub constituents. If cobbles were present they were described as rounded sandstone and the gravel consisted of fine to coarse rounded sandstone, mudstone and siltstone.

4.1.4 Fluvio glacial deposits

Fluvio glacial deposits were encountered in the majority of positions and were described as brown grey sandy gravel with varying cobble content. The gravel and cobbles consisted of fine to coarse subangular to mainly rounded sandstone and mudstone.

4.1.5 Glacial Till

The Glacial Till consisted of firm to very stiff light brown to red brown clay with varying amounts of sub constituents (sand and gravel). The gravel was described as fine to coarse rounded sandstone, mudstone and siltstone.

4.1.6 Glacial Deposits

Glacial deposits were encountered in three locations (BH1602, BH1603 and WS1603). It was described as brown grey or grey clay. In BH1602 and BH1603 where it was encountered at depth below the Glacial Till from 5.5 and 6.8m depth respectively, the clay was firm to stiff. At WS1603 where it was encountered at shallower depth (3.9m bgl), it was soft.



4.2 Groundwater

Groundwater was encountered in all cable percussion boreholes (BH1601-1604) and in several window sample holes the arisings were wet. The depths are summarised in Table 4-2.

Table 4-2 - Summary of groundwater strikes

Location	Depth of groundwater strike (m bgl)	Rest water level (m bgl)	Time to reach rest water level (mins)	Stratum
BH1601	2.70	2.60	20	Fluvio glacial deposits
BH1602	1.70	1.60	20	Fluvio glacial deposits
BH1603	1.80	1.74	20	Fluvio glacial deposits
BH 1003	8.00	0.60	20	Glacial Deposits
BH1604	4.20	4.05	20	Fluvio glacial deposits
WS1601C	2.70-2.95 ^a	-	-	Made Ground
WS1601D	2.70-2.90 ^a	-	-	Made Ground
WC1/02	3.40-3.50 ^a	-	-	Glacial Till
WS1603	4.00-4.40 ^a	-	-	Glacial Deposits
WS1604	4.00-4.60 ^a	-	-	Probable Glacial Deposits

^aArisings are wet.

4.3 In Situ Testing

4.3.1 Standard Penetration Testing

Standard Penetration Tests (SPTs) were undertaken in all boreholes. The results are presented on the exploratory hole logs included in Appendix B and summarised on Figure 3.

4.3.2 Super Heavy Dynamic Probes (SHDP)

SHDP testing was carried out in conjunction with two windowless sample boreholes (WS1601A and WS1606). The results are presented on the exploratory borehole logs (see Appendix B) and SPT N values calculated from the dynamic probing are plotted on Figure 3.

4.4 Visual and Olfactory Evidence of Contamination

No visual or olfactory evidence of contamination was encountered in any of the exploratory positions.

4.5 Obstructions

No obstructions were encountered in any of the exploratory positions.



5 Laboratory Testing

5.1 Geotechnical Testing

A programme of laboratory testing is being carried out at the time of writing. Geotechnical testing was scheduled by client engineer Black and Veatch and undertaken by GSTL Ltd, an approved supplier in accordance with the requirements of WYG quality system and are UKAS accredited for a range of geotechnical tests. The test procedures used in each case are given in Table 5-1. Laboratory geotechnical are included in Appendix C.

Table 5-1 - Summary of geotechnical testing

Test	Standard (BS1377:1990)	No.
Moisture Content	Part 2 Clause 3.2	12
Atterberg Limits (4 point)	Part 2 Clause 4.3 and 5.3	11
Particle size distribution by wet sieving	Part 2 Clause 9.2	35
Particle size distribution by pipette	Part 2 Clause 9.4	4
Lab permeability test	Part 6 Clause 6	1
Consolidated Drained Triaxial Tests	Part 8 Clause 7	5
pH and Sulphate	Part 3 Clause 5 and 9	3

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5.2 Environmental Testing

The environmental chemistry was investigated by specialist chemical analysis of selected soil and groundwater samples carried out by Jones Environmental Forensics Ltd, which is an approved supplier in accordance with the requirements of WYG quality system and is UKAS and MCERTS accredited for a range of chemical analyses. The testing was scheduled by client engineer Black and Veatch and is summarised in Table 5-2. The test suites are detailed in Appendix D. The test results for the soil samples are included in Appendix E. The results for the groundwater testing are outstanding and will be reported in an addendum to this report.

Table 5-2 - Summary of environmental testing

Test suite	No.
Soil Suite E1	7
Soil Suite E2	7
Soil Suite E3	7
Soil Suite E4	7
Soil Suite E8	7
Leachate Suite F1	2
Leachate Suite F2	2
Leachate Suite F3	2



Notes

1. Standards

All boring operations, sampling of soils, *in situ* testing and geotechnical laboratory testing have been carried out in accordance with the recommendations of the British Standards BS 5930+A2 (2010)⁽¹⁾, BS 1377 (1990)⁽²⁾ and BS10175 (2001)⁽³⁾.

Soil and rock descriptions follow the recommendations of BS 5930+A2. Where descriptions or classifications are based on other documents (e.g. BS 8004 (1986) or CIRIA Project Report 11 (1993)), this is stated in the report text.

2. Site methods

Unless specifically stated otherwise, the following methods are used for exploratory holes.

- Holes described as cable percussive are bored using a light cable percussive rig. Standard penetration tests are carried out where appropriate, as shown in the logs. Disturbed and undisturbed samples are taken from the exploratory holes at the depths on the records.
- Window sampling generally uses the windowless sampling method, using a tracked Geotool.
- Dynamic probes are usually heavy dynamic probes, using the same tracked Geotool used for window sampling.

3. Definitions and abbreviations

The following terms are used in the exploratory hole logs

Samples

Sampi	CS
ES	Environmental sample
U	Undisturbed 102mm dia. sample
TW	Thin Walled undisturbed 102mm
	dia. sample
В	Bulk sample
D	Small disturbed sample
W	Water sample
CBR	California Bearing Ratio test or CBR
	value obtained from Mexiprobe test

Core recovery and rock quality

	overy and rock quanty
TCR	Total core recovery (%)
SCR	Solid core recovery (%)
RQD	Rock quality designation (%)
FI	Fracture index
NR	No recovery
NI	Not intact

Water strikes	W	ater	stri	kes
---------------	---	------	------	-----

TTUCCI	Strikes
∇	Level of water strike
•	Water level rose to this level (see
	Remarks at foot of log for
	details)

In situ tests

III 310	
S	Standard penetration test (SPT)
Ν	SPT N value (blows/300mm)
PID	Photo-ionisation detector - used to detect the
	presence of VOCs.
PP	Hand penetrometer - shear strength
HV	Hand shear vane - shear strength
VOC	Volatile organic compounds (ppm)

Rotary drilling sizes

	Nominal diameter (mm)						
Index letter	Borehole	Core					
N	75	54					
Н	99	76					
Р	120	92					
S	146	113					

Depth means depth below existing ground level unless otherwise specified. Values specified in soil descriptions given in the exploratory hole logs are depths unless otherwise specified.



Abbreviations

BGS British Geological Survey

bgl below ground level

NRW Natural Resources Wales

LOD Limit of detection

BTEX Benzene, Toluene, Ethylbenzene and Xylenes

TPH Total Petroleum Hydrocarbon
PAH Polycyclic aromatic hydrocarbon

PRO Petroleum Range Organics

DRO Diesel Range Organics

VPH Volatile Petroleum Hydrocarbons

EPH Extractable Petroleum Hydrocarbons

ppm parts per million

VOC Volatile Organic Carbon

SVOC Semi-volatile organic compounds

SOM Soil Organic Matter

FOC Fraction Organic Carbon



Figures



Figure 1 – Site Location Plan

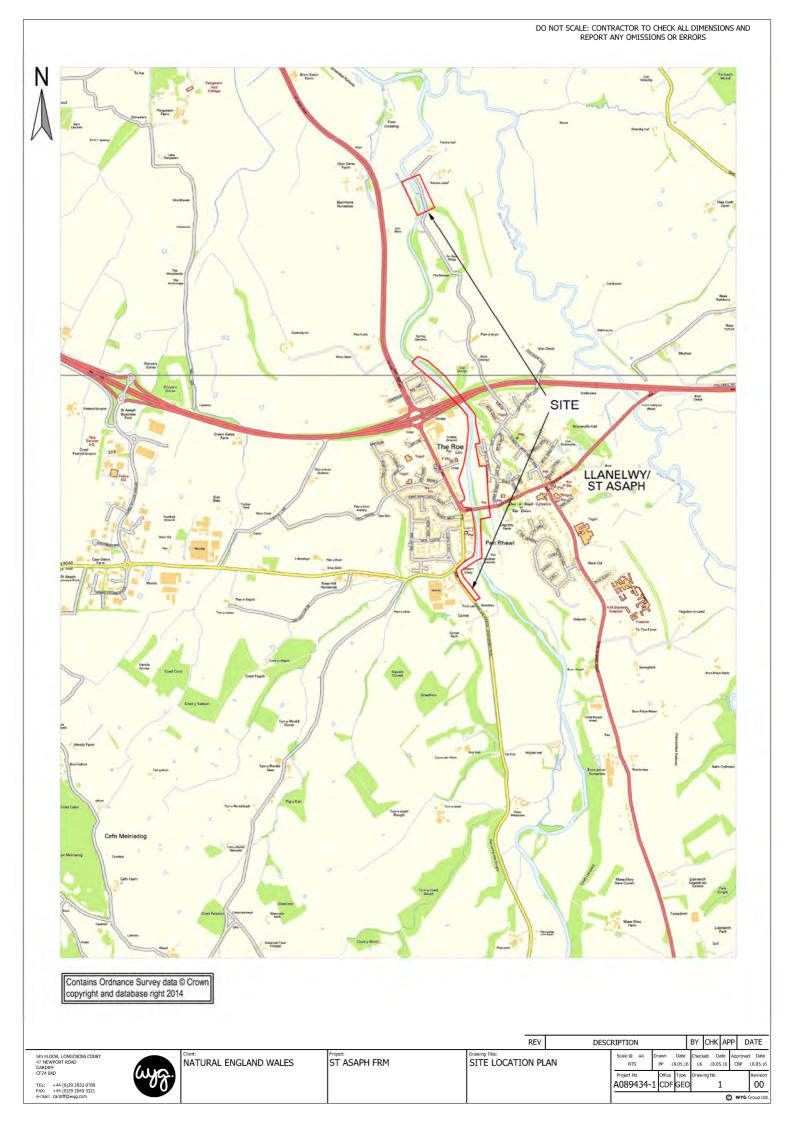
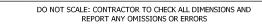




Figure 2 – Site Investigation Layout Plan



LEGEND:

WYG 2016 SITE INVESTIGATION LOCATIONS:

- TRIAL PITS
- HAND PITS •
- WINDOWLESS SAMPLES
- **BOREHOLES**
- DYNAMIC PROBE LOCATIONS

WYG 2014 SITE INVESTIGATION LOCATIONS:

- TRIAL PITS
- HAND PITS
- WINDOWLESS SAMPLES
- **BOREHOLES**



SCALE 1:2500

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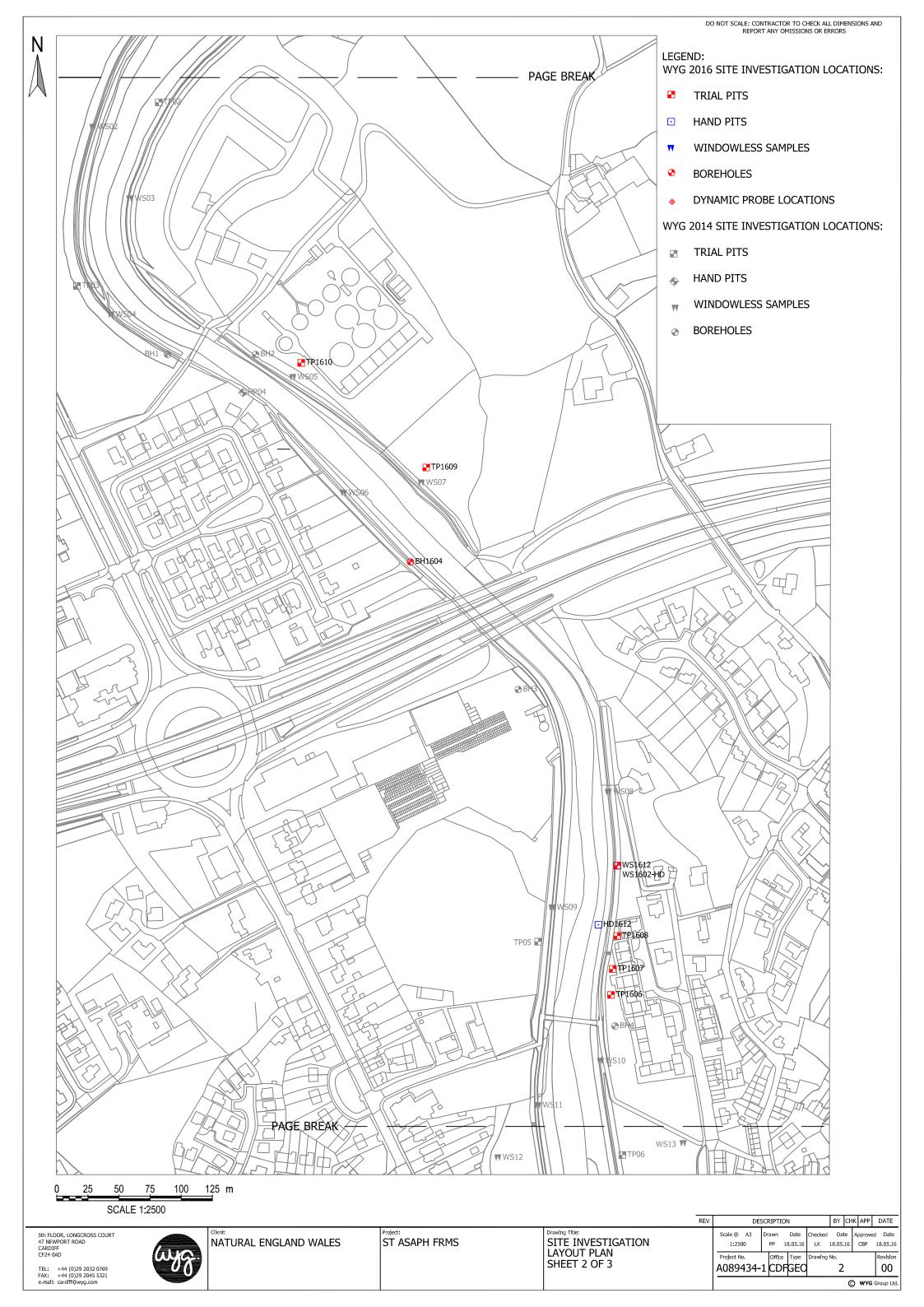
TEL: +44 (0)29 2032 0769 FAX: +44 (0)29 2045 5321 e-mall: cardlff@wyg.com

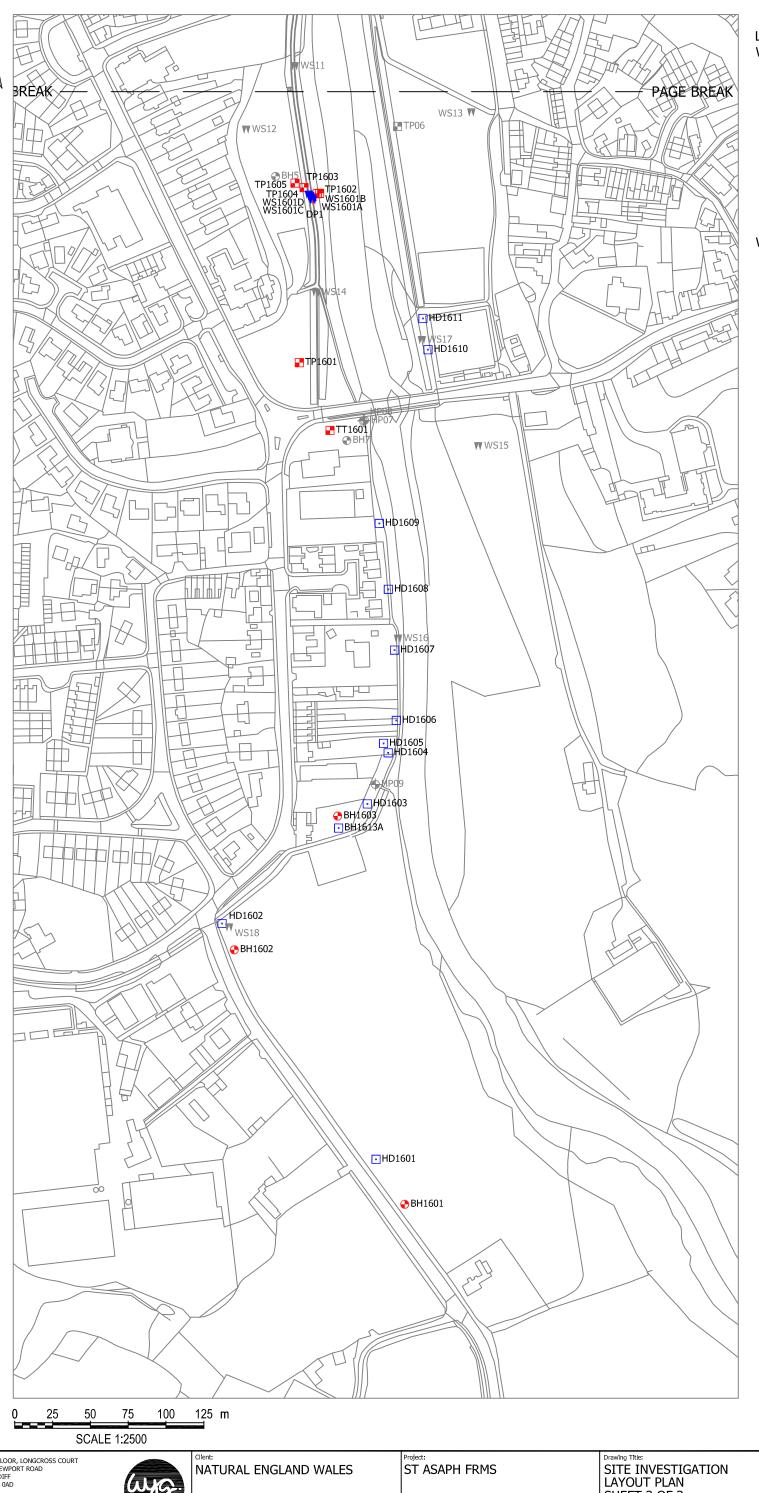
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Drawing Title:
SITE INVESTIGATION
LAYOUT PLAN
SHEET 1 OF 3

REV BY CHK APP DATE DESCRIPTION Scale @ A3 CBP 18.05.16 PP 18.05.16 LK 18.05.16 Project No. Office Type Drawing No. Revision A089434-1 CDFGEO 00 WYG Group Ltd.





LEGEND:

WYG 2016 SITE INVESTIGATION LOCATIONS:

- TRIAL PITS
- HAND PITS •
- WINDOWLESS SAMPLES
- **BOREHOLES**
- DYNAMIC PROBE LOCATIONS

WYG 2014 SITE INVESTIGATION LOCATIONS:

- TRIAL PITS
- HAND PITS
- WINDOWLESS SAMPLES
- **BOREHOLES**

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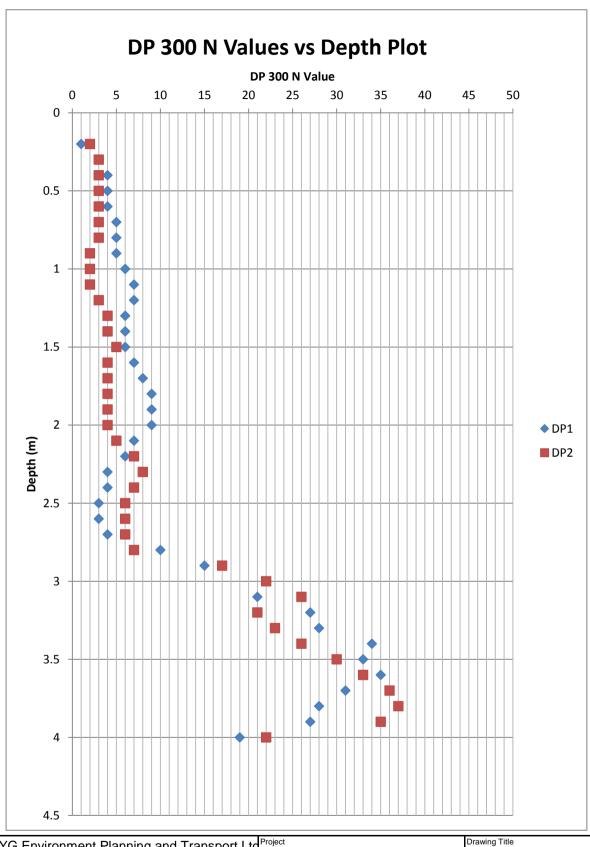
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SHEET 3 OF 3



Figure 3 – SPT N values vs. Depth







Appendices



Appendix A – Report Conditions



APPENDIX A - REPORT CONDITIONS GROUND INVESTIGATION

This report is produced solely for the benefit of Natural Resources Wales and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing otherwise.

This report refers, within the limitations stated, to the condition of the site at the time of the inspections. No warranty is given as to the possibility of future changes in the condition of the site.

This report is based on a visual site inspection, reference to accessible referenced historical records, information supplied by those parties referenced in the text and preliminary discussions with local and Statutory Authorities. Some of the opinions are based on unconfirmed data and information and are presented as the best that can be obtained without further extensive research. Where ground contamination is suspected but no physical site test results are available to confirm this, the report must be regarded as initial advice only, and further assessment should be undertaken prior to activities related to the site. Where test results undertaken by others have been made available these can only be regarded as a limited sample. The possibility of the presence of contaminants, perhaps in higher concentrations, elsewhere on the site cannot be discounted.

Whilst confident in the findings detailed within this report because there are no exact UK definitions of these matters, being subject to risk analysis, we are unable to give categoric assurances that they will be accepted by Authorities or Funds etc. without question as such bodies often have unpublished, more stringent objectives. This report is prepared for the proposed uses stated in the report and should not be used in a different context without reference to WYG. In time improved practices or amended legislation may necessitate a re-assessment.

The assessment of ground conditions within this report is based upon the findings of the study undertaken. We have interpreted the ground conditions in between locations on the assumption that conditions do not vary significantly. However, no investigation can inspect each and every part of the site and therefore changes or variances in the physical and chemical site conditions as described in this report cannot be discounted.

The report is limited to those aspects of land contamination specifically reported on and is necessarily restricted and no liability is accepted for any other aspect especially concerning gradual or sudden pollution incidents. The opinions expressed cannot be absolute due to the limitations of time and resources imposed by the agreed brief and the possibility of unrecorded previous use and abuse of the site and adjacent sites. The report concentrates on the site as defined in the report and provides an opinion on surrounding sites. If migrating pollution or contamination (past or present) exists further extensive research will be required before the effects can be better determined.

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Appendix B — Exploratory Hole Logs

Location Details Status Borehole Number FRM Project: Northing: 373713.20 303540.40 Easting: 16.57mAOD **PRELIM** BH1601 Location: St Asaph Level: Depth: 7.50m JB Type: CP Logger: Client: **Natural Resources Wales** Inclination: 90° Sheet 1 of 1 Method, Plant and Crew Diameter Casing Drilling Progress by Time Scale: 1:50 Dian From (m) To (m) Plant Used epth (m Depth(m) Date Time Depth (m) Casing (m) Type Crew Water (m) Checked By: LK (mm) (mm) 150 Inspection Pit Cable Percussion Hand Excavated Dando 2000 6.00 21/03 17:00 C Jobson C Jobson 7.50 6.00 1.20 7.50 1.20 7.50 Approved By: 21/03/2016 Start Date: 21/03/2016 Finish Date: Samples and Testing Reduced Level (mAOD) Water Inst / Strata Description Leaend Depth (m Level (m) Backfill Depth (m) Ref Tests / Results Soft brown silty sandy very gravelly CLAY with occasional subrounded sandstone cobbles. B2 0.00 - 0.70 Gravel of fine to coarse subangular to subrounded sandstone. (TOPSOIL). <u>></u>¢ ১৫ 0.70 15.87 0.70 0.70 - 1.20 D3 B4 Light brown grey clayey sandy fine to coarse subrounded to rounded sandstone GRAVEL. (FLUVIO GLACIAL DEPOSITS). 1.20 - 1.65 1.20 - 1.70 D5 B6 SPT(S) 1.20m, N=22 (4,5/5,6,5,6) 1.70 D7 2.00 - 2.45 2.00 - 2.50 SPT(S) 2.00m, N=22 (3,5/6,5,5,6) 2 2.50 D10 2.70 EW10 B12 SPT(S) 3.00m, N=11 (1,/2,3,3,3) 3.00 - 3.50 3 3.40 13.17 Stiff light brown sandy very gravelly CLAY with occasional sand lenses. Gravel of fine to 3.50 D13 coarse subrounded to rounded sandstone. (GLACIAL TILL). U14 Ublows=150 Recovery=78% 4.00 - 4.45 4.50 4.50 - 5.00 D15 B16 ---5.00 - 5.45 5.00 - 5.50 D17 B18 SPT(S) 5.00m, N=22 (3,4/4,5,6,7) 5 From 5.00 to 5.50m bgl clay becoming soft. <u> 医生活</u> 5.50 D19 ws=150 Recovery=100% 6 From 6.50 to 7.00m bgl clay becoming firm. 6.50 - 7.00 D23 SPT(S) 7.00m, N=28 (4,6/7,6,7,8) 7 7.50 9.07 EOH at 7.50m - Achieved target depth. 8 9 10 Observations / Remarks Chiselling Water Added Hammer Information No visual or olfactory evidence of contamination encountered.
 Upon completion borehole backfilled with arisings and bentonite. From (m) To (m) Time (mins) From (m) To (m) Serial No. Energy Ratio % JB.14 78 Groundwater Project Number (m) A089434-1

Location Details Status Borehole Number FRM Project: Northing: 373881.48 303427.73 Easting: **PRELIM BH1602** Location: St Asaph Level: 15.14mAOD Depth: 7.50m LK Type: CP Logger: **Natural Resources Wales** Client: Inclination: 90° Sheet 1 of 1 Method, Plant and Crew Diameter Casing Drilling Progress by Time Scale: 1:50 Diar From (m) To (m) Plant Used epth (m Depth(m) Date Time Depth (m) Type Crew Casing (m) Water (m) Checked By: LK (mm) 150 150 (mm) 15/03 16/03 Inspection Pit Cable Percussion Hand Excavated Dando 2000 C Jobson C Jobson 1.20 7.50 Approved By: Start Date: 15/03/2016 16/03/2016 Finish Date: Samples and Testing Reduced Level (mAOD) Water Inst / Strata Description Leaend Depth (m Level (m) Backfill Depth (m) Ref Tests / Results TOPSOIL: Dark brown slightly sandy slightly gravelly clayey organic SILT with occasional 0.00 - 0.30 B2 cobbles 0.30 14.84 0.30 0.30 - 0.60 D3 B4 Brown clayey sandy fine SILT. (ALLUVIUM). 0.60 14.54 D5 B6 Brown slightly clayey silty sandy GRAVEL with low to moderate cobble content. Gravel is 0.60 - 1.70 fine to coarse rounded sandstone and mudstone. Sand is fine to coarse grained. (FLUVIO GLACIAL DEPOSITS). 1.20 - 1.65 1.20 - 1.70 D7 B8 SPT(S) 1.20m, N=20 (6,6/5,4,5,6) D11 B12 SPT(S) 2.00m, N=14 (4,3/3,3,3,5) 2 2.50 D13 2.90 Firm to stiff red brown grey slightly sandy slightly gravelly CLAY. Gravel is fine to rounded sandstone and mudstone. (GLACIAL TILL). 12.24 D14 U15 2.90 3.00 - 3.45 . Ublows=120 Recovery=78% 3 3.50 3.50 - 4.00 D16 B17 4.00 - 4.45 D18 B19 SPT(S) 4.00m, N=22 (2,2/4,5,6,7) 4.00 - 4.50 4.50 D20 -<u>-</u>-Ublows=90 Recovery=100% HV 5.00m, (p)=120 kPa (r)=n/a kPa 5 00 - 5 45 U21 5 . HV 5.45m, (p)=120 kPa (r)=n/a kPa 5.50 9.64 5.50 5.50 - 6.00 Firm to stiff brown grey CLAY. (GLACIAL DEPOSITS). D24 B25 PT(S) 6.00m, N=30 (3,4/5,7,9,9) 6 6.00 - 6.45 6.00 - 6.50 At 6.00 to 6.50m bgl shell fragments. 6.50 D26 Ublows=88 Recovery=89% HV 7.00m, (p)=120 kPa (r)=n/a kPa HV 7.45m, (p)=108 kPa (r)=n/a kPa 7.50 D28 7.50 7.64 EOH at 7.50m - Achieved target depth. 8 9 10 Observations / Remarks Chiselling Water Added Hammer Information 1. No visual or olfactory evidence of contamination encountered. From (m) To (m) Time (mins) From (m) To (m) Serial No. Energy Ratio % 2. Upon completion borehole backfilled with arisings and bentonite. JB.14 78 Groundwater Project Number (m) A089434-1

Location Details Status Borehole Number FRM Project: 303496.06 Northing: 373969.94 Easting: **BH1603** PRFI TM Location: St Asaph Level: 14.69mAOD Depth: 8.50m LK Type: CP Logger: **Natural Resources Wales** Client: Inclination: 90° Sheet 1 of 1 Method, Plant and Crew Diameter Casing Drilling Progress by Time Scale: 1:50 Dian From (m) To (m) Plant Used epth (m Depth(m) Date Time Depth (m) Type Crew Casing (m) Water (m) Checked By: LK (mm) 150 150 (mm) Inspection Pit Cable Percussion 14/03 15/03 Hand Excavated Dando 2000 C Jobson C Jobson 17:00 00:00 1.20 8.50 1.20 8.50 Approved By: Start Date: 14/03/2016 14/03/2016 Finish Date: Samples and Testing Reduced Water Inst / Strata Description Leaend Depth (m Level (m) Backfill (mAOD) Depth (m) Ref Tests / Results Brown slightly clayey organic SILT with many roots and rootlets (TOPSOIL). 0.10 14.59 B2 ES1 0.00 - 0.40 0.10 - 0.40 MADE GROUND: Brown clayey silty gravelly SAND. Gravel is fine to coarse subangular to subrounded brick, glass and sandstone. 0.40 14.29 0.40 0.40 - 0.60 D3 B4 Grey brown clayey silty sandy GRAVEL. Gravel is fine to coarse rounded sandstone and siltstone. (ALLUVIUM). 0.60 0.60 - 1.20 D5 B6 0.70 13.99 Grey brown silty sandy GRAVEL with low to moderate cobble content. Gravel is fine to coarse rounded sandstone and siltstone. (FLUVIO GLACIAL DEPOSITS).

At 0.70 to 3.10m bgl increasing cobble content with depth. 1.20 - 1.65 1.20 - 1.70 D7 B8 SPT(S) 1.20m, N=12 (4,3/3,3,3,3) EW10 D11 B12 SPT(S) 2.00m, N=43 (8,8/7,16,11,9) 2 2.50 B13 D14 B16 D15 3.00 - 3.45 3.00 - 3.50 3.10 SPT(S) 3.00m, N=24 (2,2/4,6,6,8) 3 3.10 11.59 Stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium rounded sandstone and siltstone. (GLACIAL TILL). 3.50 D17 4.00 - 4.45 U18 ws=150 Recovery=78% HV 4.00m, (p)=n/a kPa (r)=n/a kPa Too stiff, unable to do HV. HV 4.45m, (p)=n/a kPa (r)=n/a kPa Too stiff, unable to do 4.50 4.50 - 5.00 D19 B20 . 5.00 - 5.45 5.00 - 5.50 D21 B22 SPT(S) 5.00m, N=32 (4,5/6,8,8,10) 5 5.50 D23 6.00 - 6.45 Ublows=108 Recovery=100% HV 6.00m, (p)=n/a kPa (r)=n/a kPa Too stiff, unable to do : :: • HV 6.45m, (p)=n/a kPa (r)=n/a kPa Sample twists within lines, unable to take reading. D25 B26 6.50 6.50 - 7.00 6.80 7.89 Stiff brown grey thinly laminated CLAY with occasional fine sand laminae. (GLACIAL DEPOSITS). 7.00 - 7.45 7.00 - 7.50 D27 B28 PT(S) 7.00m, N=29 (3,5/6,6,8,9) 7 D29 7.50 \subseteq 8.00 - 8.50 B31 8 8.50 6.19 EOH at 8.50m - Achieved target depth. 9 10 Observations / Remarks Chiselling Water Added Hammer Information 1. No visual or olfactory evidence of contamination encountered. From (m) To (m) Time (mins) From (m) To (m) Serial No. Energy Ratio % 2. Hand vane measurement attempted in U100 samples at 4.00m, 4.45m and 6.00m bgl. Samples were to stiff to take 2.70 3.00 60 JB.14 78 readings. 3. Upon completion borehole backfilled with arisings and bentonite. Groundwater Project Number Remarks (m) A089434-1 20 0.60

Location Details Status Borehole Number FRM Project: 303365.30 Northing: 374902.61 Easting: BH1604 **PRELIM** Location: St Asaph Level: 14.96mAOD Depth: 11.00m LK Type: CP Logger: **Natural Resources Wales** Client: Inclination: 90° Sheet 1 of 2 Method, Plant and Crew Diameter Casing Drilling Progress by Time Scale: 1:50 Dian From (m) Plant Used epth (m Depth(m) Date Time Depth (m) To (m) Type Crew Casing (m) Water (m) Checked By: LK (mm) 150 150 (mm) Inspection Pit Cable Percussion Hand Excavated Dando 2000 C Jobson C Jobson Approved By: Start Date: 18/03/2016 18/03/2016 Finish Date: Samples and Testing Reduce Water Inst / Strata Description Leaend Depth (n Level (m) Backfill (mAOD) Depth (m) Ref Tests / Results Dark brown clayey gravelly organic SAND with many roots and rootlets (TOPSOIL).

MADE GROUND: Stiff red brown sandy gravelly CLAY with large subangular sandstone cobbles. Gravel is fine to coarse subangular to rounded sandstone and mudstone. Sand is B2 D3 B4 0.10 14.86 0.00 - 0.10 0.10 0.10 - 0.50 fine to medium. (REWORKED GLACIAL TILL). 0.50 0.50 - 1.20 D5 B6 . 1.20 - 1.65 1.20 - 1.70 D7 B8 SPT(S) 1.20m, N=18 (3,1/4,4,4,6) -----1.70 B12 SPT(S) 2.00m, 50 (11,13/50 for 114mm) 2 2.20 12.76 Grey brown clayey very silty sandy GRAVEL with low cobble content. Gravel is fine to coarse rounded sandstone and mudstone. (FLUVIO GLACIAL DEPOSITS). 2.50 D13 SPT(S) 3.00m, N=36 (6,6/9,9,7,11) D14 B15 3 3.50 D16 4.00 - 4.45 4.00 - 4.50 D17 SPT(S) 4.00m, N=32 (6,7/7,8,8,9) B18 4.20 FW19 4.50 D20 5.00 - 5.45 5.00 - 5.50 D21 B22 SPT(S) 5.00m, N=16 (6,10/7,3,3,3) 5 5.20 9.76 Brown sandy GRAVEL with occasional large cobbles. Gravel is fine to coarse rounded sandstone and mudstone. (FLUVIO GLACIAL DEPOSITS). 5.50 D23 SPT(S) 6.00m, N=24 (4,2/3,5,8,8) 6 8.56 Very stiff brown very sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to 6.50 D26 coarse rounded sandstone and mudstone. (GLACIAL TILL). ---Ublows=150 Recovery=89% HV 7.00m, (p)=n/a kPa (r)=n/a kPa Too disturbed. HV 7.45m, (p)=n/a kPa (r)=n/a kPa Very stiff, not 7.50 7.50 - 8.00 SPT(S) 8.00m, 0 (25 for 147mm/0 for 0mm) D30 B31 8.00 - 8.45 8.00 - 8.50 8 8.50 D32 9.00 - 9.45 9.00 - 9.50 D33 B34 SPT(S) 9.00m, 50 (10,12/50 for 232mm) 9 9.50 D35 10.00 - 10.45 10.00 - 10.50 SPT(S) 10.00m, 50 (25 for 123mm/50 for 129mm) 10 Continued on Next Page Chiselling Observations / Remarks Water Added Hammer Information 1. No visual or olfactory evidence of contamination encountered. From (m) To (m) Time (mins) From (m) To (m) Serial No. Energy Ratio % 2. Hand vane measurement attempted in U100 samples at 7.00m bgl. Samples were to stiff to take readings. JB.14 78 3. Upon completion borehole backfilled with arisings and bentonite. Groundwater Project Number (m) (m) A089434-1

Location Details Borehole Number Status FRM Project: 303365.30 Northing: 374902.61 Easting: Location: Level: 14.96mAOD Depth: 11.00m **PRELIM BH1604** St Asaph Type: СР Logger: LK **Natural Resources Wales** Client: Sheet 2 of 2 Inclination: 90° Method, Plant and Crew Diameter Casing Drilling Progress by Time Scale: 1:50 Dian From (m) To (m) Type Plant Used Crew epth (m) Depth(m) Date Time Depth (m) Casing (m) Water (m) Checked By: LK (mm) 150 150 (mm) Inspection Pit Cable Percussion Hand Excavated Dando 2000 C Jobson C Jobson Approved By: Start Date: 18/03/2016 Finish Date: 18/03/2016 Samples and Testing Reduced Level (mAOD) Water Inst / Strata Description Legend Depth (m Level (m) Backfill Depth (m) Ref Tests / Results 10.50 D38 11.00 3.96 11.00 - 11.45 SPT(S) 11.00m, 50 (25 for 128mm/50 for 181mm) 11 EOH at 11.00m - Achieved target depth. 12 -13 14 15 16 17 18 19 20 Observations / Remarks Chiselling Water Added Hammer Information No visual or olfactory evidence of contamination encountered.
 Hand vane measurement attempted in U100 samples at 7.00m bgl. Samples were to stiff to take readings.
 Upon completion borehole backfilled with arisings and bentonite. From (m) To (m) Time (mins) From (m) To (m) Serial No. Energy Ratio % 10.50 11.00 JB.14 78 Groundwater Project Number Sealed (m) Rose To (m) Remarks Casing (m) A089434-1

	Project: FRM	Location Details					Status	Pit Number	
Location: St Asaph		Easting: 303496.69 Northing: 373962.00 Level: 14.96mAOD Depth: 1.50m					RELIM	BH161	30
		Logger:		Туре:			CLLIII	DIIIOISA	
	Client: Natural Resources Wales						Sheet 1 of 1		
	Hole Information				Groundwater			Scale:	1:10
	Pit Dimensions Orientation: Shoring: None	Strike (,m) i	Rose To (m)	After (mins)	Remarks	Checked By: Approved By:	LK
	0.20m Stability: Stable								16/03/2016
	0.30m Plant: Hand Excavated								16/03/2016
	Strata Description	Legend	Depth (m)	Reduced Level	Water Level (m) Backl	iii		ples and Testing	
Cross sover over		<u> </u>		(mAOD)	V//X	Depth (m)	Ref	Tests / Results	
Grass cover over brown very silty sandy CLAY with roots and rootlets. (TOPSOIL).		×— ×							-
MADE GROUND: to subangular broccasional angular bro	Firm light brown, mottled orange silty sandy very gravelly CLAY. coarse subangular to subrounded brick and sandstone. 5m bgl becoming less gravelly with depth.		0.08	14.88		0.40 0.75 - 1.45	B1		1
EOH at 1.50m - Exploratory hole abandoned		1.00.1.1.1	1.50	13.46	72///				_
Observations / Re 1. Groundwater not 2. No visual or olfac 3. Upon completion								Project Number	2-
								A089434-1	
								AUU2734-I	-



Plate 45 BH1603A - Spoil



Plate 46 BH1603A - Pit

WYG Environment 5th Floor, Longcross Court 47 Newport Road Cardiff CF24 0AD

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Environmental Consultancy Ground Technologies & Investigation



Project:St Asaph
Additional Ground Investigation

Client: Natural Resources Wales

Project No.: A089434-1 Date :16th May 2016

	Project:	FRM					ation Deta			S	tatus		Pit Nu	mber
wa.	Location:	St Asapl	,		Easting: Level:	303521.4 15.51mA		ing: 373 n: 1.25		DR.	ELI	м	HD1	601
00				M alaa	Logger:		Туре:		2111	' ' '	L L I	1'1	1101	001
	Client:	Naturai	Resources \										Sheet	
	Dit Dim	ensions	Hole Inform		Strike ((m)	Rose To (m)	Groundy	vater er (mins)	l p.	emarks		Scale: Checked By:	1:10 LK
	PIL DIIII		Shoring:	None	1.20		1.20	Aite	20	N.	CIIIdi KS		Approved By:	LN
		0.20m	Stability:	Unstable from 1.00m to 1.25m bgl									Start Date:	15/03/2016
	0.30m		Plant:	Hand Excavated					-				Finish Date:	15/03/2016
		Strata D	Description		Legend	Depth (m)	Reduced Level	Water Level (m)	Backfill			Sample	es and Testing	
Chart grass aver	dark brown			ing to modium gubangular	. · · · · · × · ·		(mAOD)	zere (iii)	X///XX///X	Depth (m)	Ref B1		Tests / Results	
to rounded sands	or clayey silty	sandy fine	to medium si	ine to medium subangular unded sandstone cobbles. ubrounded to rounded stone cobbles.		0.35	15.16			0.00 - 0.35 0.00 - 0.35	B1 D1			
Light brown and rounded sandsto deposit cobbles. From 1.00 to 1.2	one and river (FLUVIO-GL 25m bgl pit walls	deposit GF ACIAL DEP collapsing.	RAVEL with or	medium subrounded to ccasional subrounded river		1.00	14.51	•		1.00 - 1.25 1.00 - 1.25	B3 D3			1 -
EOH	at 1.25m - Ex	ploratory ho	le abandoned	due to poor stability	× ^, ×	1.25	14.26							,
Observations / Re	emarks													2 -
No visual or olfact Upon completion	tory evidence	of contamina	ation encounter	red.										
- p - 1 - 22 p1000011			J											
													Project Num A089434	



Plate 19 HD1601 - Spoil



Plate 20 HD1601 - Pit

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Environmental Consultancy Ground Technologies & Investigation



Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

	Project: FRM				cation Deta			S	tatus		Pit Nu	mber
(AUG)			Easting:	303419.		ing: 3738		DD	СІТ	м	HD1	602
000	Location: St Asaph		Level: Logger:	15.83m	AOD Depth Type:		JM	PK	ELI	I*I	пот	002
	Client: Natural F	Resources Wales			.,,,						Sheet	1 of 1
		Hole Information			(Groundw	vater				Scale:	1:10
	Pit Dimensions	Orientation: °	Strike ((m)	Rose To (m)	Afte	r (mins)	R	emarks		Checked By:	LK
	0.20m	Shoring: None									Approved By:	16/02/2016
	0.30m	Stability: Stable Plant: Hand Excavated									Start Date: Finish Date:	16/03/2016 16/03/2016
		Traine Executive			Reduced						and Testing	,,
	Strata D	escription	Legend	Depth (m) Level (mAOD)	Water Level (m)	Backfill	Depth (m)	Ref		Tests / Results	
Long grass cover	over brown very silty s	andy CLAY with roots and rootlets.	×_^									
(TOPSOIL).	, ,	,	\times									-
MADE GROUND:	Reddish brown very cla	ayey sandy gravelly SILT. Gravel is fine		0.10	15.73			0.10 - 0.35	B1			_
to coarse angular	r to subangular sandsto	ne, coke and brick.										-
												-
												-
												-
								0.35 - 0.85	B2			-
												_
												1
												1
								0.60	ES1			-
												-
												-
												-
												-
Light brown and	arev very clavev silty a	ravelly SAND. Gravel of fine to coarse		0.85	14.98			0.85 - 1.10	В3			-
subrounded to ro	ounded sandstone. (FLU	VIO-GLACIAL DEPOSITS).										-
												-
												1 -
												-
				1.10	14.73			1.10 - 1.40	B4			_
Grey mottled bro	wn clayey silty very san ne and river denosit GR	dy fine to medium subrounded to AVEL. (FLUVIO-GLACIAL DEPOSITS).	$\times \times \cdot \times$	1.10	11.75			1.10 1.10				
Tourided Suridsto	ne and fiver deposit of	AVEL. (120VIO GENEIAE DEI 03173).	\times \times \times									
			××××									-
			×××									1
			×××									-
			×××									=
EC	H at 1.40m - Exploratory h	nole abandoned due to refusal	* 1 * 1 × 1 ×	1.40	14.43		//K////K//					-
												-
												-
												-
												=
												-
												-
												-
												-
												-
												-
												2 -
OI												
Observations / Re 1. Groundwater not												
2. No visual or olfact	tory evidence of contamina	tion encountered.										
3. Upon completion	exploratory hole backfilled	with arisings.							-			
											Project Numl	
											A089434	-1



Plate 21 HD1602 - Spoil



Plate 22 HD1602 - Pit

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Environmental Consultancy Ground Technologies & Investigation



Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

	Project: FRM				Loc	ation Deta	ils		S	tatus		Pit Nun	nber
(JUC)	Location: St Asa	nh		_	303515.7 16.10mA		ing: 373 i: 1.5!		DD	ELII	м I	HD16	:03
		-		Logger:		ор Бериі Туре:		3111	PK	LLII	'	потс	003
	Client: Natura	al Resources	Wales									Sheet 1	of 1
		Hole Inform			,		Froundy					Scale:	1:10
	Pit Dimensions	Orientation: Shoring:	o None	Strike (m) I	Rose To (m)	Afte	er (mins)	Re	emarks		Checked By: Approved By:	LK
	0.20		Stable									Start Date:	16/03/2016
	0.30m	Plant:	Hand Excavated					ı				Finish Date:	16/03/2016
	Strata	Description		Legend	Depth (m)	Reduced Level	Water	Backfill			Sample	es and Testing	
_					4. ()	(mAOD)	Level (m)	*///**///	Depth (m)	Ref		Tests / Results	
Grass cover over subrounded sand	brown very silty sandstone boulder. (TOP)	dy CLAY with r SOIL).	oots and rootlets and	X——— X————————————————————————————————									-
MADE GROUND:	Stiff reddish brown s	silty sandy very	gravelly CLAY. Gravel of fine	— <u> </u>	0.10	16.00			0.10 - 0.70	B1			-
to coarse subrou	nded to subangular s	andstone.											-
													-
													-
									0.30	ES1			-
													-
													-
													-
													-
													-
													-
													-
									0.70 - 1.40	B2			-
													-
													-
													-
													-
													-
													1 -
													-
													-
													-
													-
													-
													-
													=
Grey very clayey	silty sandy fine to co	arse subround	ed to angular sandstone		1.40	14.70			1.40 - 1.55	B3			-
GRAVEL. (FLUVIO	O GLACIAL DEPOSITS	o).											-
													_
	EOH at 1.55m - Ex	ploratory hole al	bandoned	***********	1.55	14.55		x.()(M)					-
													=
													-
													-
													-
													-
													-
													2 -
Observations / Re	marks									\Box			
1. Groundwater not	observed.									\dashv			
3. Only scraped the	tory evidence of contam top of the gravel layer.												
4. Upon completion	exploratory hole backfill	ed with arisings.										Project Numb	er
												A089434-	·1



Plate 23 HD1603 - Spoil





Plate 24 HD1603 - Pit

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Environmental Consultancy Ground Technologies & Investigation



Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

	Project:	FRM				Loc	ation Deta	ils		S	tatus	Pit Nur	mber
					Easting:	303529.4		ing: 374		-			
المركزين	Location:	St Asaph	1		Level: Logger:	15.91mA	OD Depth Type:		ōm	PR	ELIM	HD16	504
	Client:	Natural	Resources '	Wales	Logger:	JD	туре:	IP				Sheet 1	of 1
			Hole Inform	mation			G	Froundw	vater			Scale:	1:10
	Pit Dim	ensions	Orientation:	0	Strike ((m) I	Rose To (m)	Afte	er (mins)	Re	emarks	Checked By:	LK
		0.20m	Shoring:	None								Approved By:	
	0.30m		Stability: Plant:	Stable Hand Excavated								Start Date: Finish Date:	16/03/2016 16/03/2016
	0.30111		Platit:	nanu excavateu							S	amples and Testing	16/03/2016
		Strata D	escription		Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Depth (m)	Ref	Tests / Results	
Grass cover over (TOPSOIL).	brown very	silty sandy	CLAY with r	oots and rootlets.	X———X								
MADE GROUND:	Stiff reddish	brown silt	y sandy very	gravelly CLAY. Gravel of fine		0.08	15.83			0.10 - 1.00	B1		-
to coarse subrou	inded to sub	angular sar	dstone and	brick.									-
													-
													-
													-
													-
													-
													-
										0.50	ES1		_
										0.50			
													-
													-
													-
													-
													-
													-
													-
										1.00 - 1.50	B2		1 -
													-
													-
													-
													-
													-
													-
													-
													-
													_
													_
	EOH at 1	I.55m - Explo	oratory hole al	pandoned		1.55	14.36						-
			-										-
													-
													-
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													-
													-
													-
													_
Observations / Re	emarks					1							2 -
1. Groundwater not	observed.												
 No visual or olfact Upon completion 	tory evidence exploratory h	of contamina ole backfilled	ition encounte with arisings.	red.									
	-		-									Project Numb	per
												A089434	



Plate 25 HD1604 - Spoil



Plate 26 HD1604 - Pit

Tel: 029 20 829200 Fax: 029 20 455321 E-mail enviro.cardiff@wyg.com

Environmental Consultancy Ground Technologies & Investigation



Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

Light brown greystardy gravely SOLCTORE COBSLES. Gave is fine to coarse subrounded of the Constant Con		Project:	FRM					cation Deta			5	Status		Pit Nur	mber
Client: Natural Resources Wales Cogne 18 Togo 19 Short 101	Wa.										DD	EI T	м	HD14	505
Help Information Fig. Direction Fig. Directi	00				W-1					5111	FN	LLI	1*1	1101	303
PE Chemistration of Control State of the Library in Mark State of the Libr		Client:	Naturai												
State of the control		Dit Dim	onsions			Strika ((m)				Г	amarks			
Bidd very copy gravely SIT. Grave of fine to coarse subcounded river coarse graves and some graves in very convey gravely SIT. Grave of fine to coarse subcounded river coarse graves are subcounded river graves as a subcounded send on the coarse subcounded river graves as a subcounded send on the coarse subcounded river graves and some graves in very convey gravely SIT. Grave of fine to coarse subcounded river graves and some graves in the coarse subcounded river graves and some graves in the coarse subcounded in subcounded send on the coarse subcounded send on the subcounded send on the coarse subcounded send on the subcounded send on		PIL DIIII	lensions	1		Suike (,,,,	Rose To (III)	Aite	: (IIIII15)	K	cilidiks		· ·	LK
Strate Description Light some dry and eastly sandy fine to coarse submonded river dispressions and according to the strategy of the strategy			0.20m	Stability:	Unstable from 1.00m bgl									Start Date:	17/03/2016
Eight brown grey sandy grovethy SANDSTONE CORBLES Graved is fine to coasse rounded for the bounded sandstone cobbies. (FILM/IO GLACIAL) Light brown grey sandy grovethy SANDSTONE CORBLES Graved is fine to coasse rounded by a sandstone cobbies. (FILM/IO GLACIAL) Light brown grey sandy grovethy SANDSTONE CORBLES Graved is fine to coasse rounded sandstone cobbies. (FILM/IO GLACIAL) Light brown grey sandy grovethy SANDSTONE CORBLES Graved is fine to coasse rounded sandstone cobbies. (FILM/IO GLACIAL) Light brown grey sandy grovethy SANDSTONE CORBLES Graved is fine to coasse. Light brown grey sandy grovethy SANDSTONE CORBLES Graved is fine to coasse. Light brown grey sandy grovethy SANDSTONE CORBLES Graved is fine to coasse. Light brown grey sandy grovethy SANDSTONE CORBLES Graved is fine to coasse. Light brown grey sandy grovethy SANDSTONE CORBLES Graved is fine to coasse. Light brown grey sandy grovethy SANDSTONE CORBLES Graved is fine to coasse. Light brown grey sandy grovethy SANDSTONE CORBLES Graved is fine to coasse. Light brown grey sandy grovethy SANDSTONE CORBLES Graved is fine to coasse. Light brown grey sandy grovethy SANDSTONE CORBLES Graved is fine to coasse. Light brown grey sandy grovethy SANDSTONE CORBLES Graved is fine to coasse. Light brown grey sandy grovethy SANDSTONE CORBLES Graved is fine to coasse. Light brown grey sandy grovethy SANDSTONE CORBLES Graved is fine to coasse. Light brown grey sandy grovethy SANDSTONE CORBLES Graved is fine to coasse. Light brown grey sandy grovethy SANDSTONE CORBLES Graved is fine to coasse. Light brown grey sandy grovethy SANDSTONE CORBLES Graved is fine to coasse. Light brown grey sandy grovethy SANDSTONE CORBLES Graved is fine to coasse. Light brown grey sandy grovethy SANDSTONE CORBLES Graved is fine to coasse. Light brown grey sandy grovethy SANDSTONE CORBLES Graved is fine to coasse. Light brown grey sandy gravethy SANDSTONE CORBLES Graved is fine to coasse. Light brown grey sandy gravethy SANDSTONE CORBLES Graved is fine to coasse. L		0.30m		Plant:	Hand Excavated										17/03/2016
Black very clayer gravely SIT. Cravel of the to coarse submunded river discovery clayer gravely SIT. Cravel of the to coarse submunded river discovery at the state and safe acrosy nations. Final ASP is also and safe acrosy nations. Light brown grey land wery clayer sity sandy fine to coarse rounded to submunded anoticens (GRWEL with rare submunded sanddone CRWEL			Strata D	Description		Legend	Depth (m)	Level	Water Level (m)	Backfill			Sample		
Light brown grey sandy gravely SANDSTONE COBBLES. Cravel is fine to coarse Light brown grey sandy gravely SANDSTONE COBBLES. Cravel is fine to coarse Light brown grey sandy gravely SANDSTONE COBBLES. Cravel is fine to coarse 1.00 1.00 1.05 1.176 1.00 1.176 1.00 1.176 1.00 1.176 1.00 1.	Black yeny clayey	, gravelly SII	T Gravel	of fine to coa	rce cubrounded river	V V V V		(mAOD)	,	X//ZX//Z				Tests / Results	
Light brown greyish very (layey silty sandy fine to coarse rounded to submounded sandstone CRAVEL with rare subrounded sandstone cobbles. (PLIVIO GLACIAL LIGHT STATE ST	deposit.			of fille to coal	se subiounded river	$\times \times \times \times$	}								-
Light brown grey sandy gravely SANDSTONE COBBLES. Gravel is fine to coarse counted and sandstone cobbles. (FLUNTO GLACIAL DEPOSITS). Light brown grey sandy gravely SANDSTONE COBBLES. Gravel is fine to coarse counted as and stone. **Too I.Oth by a reads colleges.** **Too I.Oth by a reads colleges.** **Foot I.Oth by a read of the read reads in the read read reads in the read read	From 0.00 to 0.0	15m bgl quite ear	rthly material.			(× × × ×									_
Light brown grey sandy gravely SANDSTONE COBBLES. Gravel is fine to coarse counted and sandstone cobbles. (FLUNTO GLACIAL DEPOSITS). Light brown grey sandy gravely SANDSTONE COBBLES. Gravel is fine to coarse counted as and stone. **Too I.Oth by a reads colleges.** **Too I.Oth by a reads colleges.** **Foot I.Oth by a read of the read reads in the read read reads in the read read						(× × × ×									
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Light brown grey sandy gravely SANDSTONE COBBLES, Gravel is fine to coarse rounded sandstone onlyings. Light brown grey sandy gravely SANDSTONE COBBLES, Gravel is fine to coarse rounded sandstone. 1.00 14.01 1 1 1 1 1 1 1 1 1	Light brown grev	ish verv clav	ev siltv sar	ndy fine to co	arse rounded to subrounded	XXXX	0.50	14.51			0.50 - 1.20	B2			-
Light brown grey sandy gravelly SANDSTONE COBBLES. Gravel is fine to coarse rounded sandstone. **Post John Spy Teacher Schooling Stronger.** **From J. Other Spy Teacher Schooling Stronger.** **From J. Other Spy Teacher Schooling Stronger.** **From J. Other Spy Teacher Schooling Stronger.** **EDH at 1.25m - Exploratory hole abandoned due to refusal 1.25 13.76 **Disservations / Remarks.** 1. Countervation spy Teacher Schooling Stronger Schooling Schooling Stronger Schooling Stronger Schooling Stronger Schooling Stronger Schooling Stronger Schooling Stronger Schooling Schooling Schooling Schooling Stronger Schooling Scho	sandstone GRAVI	EL with rare	subrounde	d sandstone	cobbles. (FLUVIO GLACIAL										-
Light trown grey sundy gravely SANDS IONE CUBBLES. Grave is fine to coarse rounded sandstone. **From 1.00m by jet wells collapsing. **From 1.00m by large cobiles at base of hole, very hard to dig.** **EOH at 1.25m - Exploratory hole abandoned due to refusal 1.25 13.76 **DOB control of the control of t	DEPOSITS).														-
Light trown grey sundy gravely SANDS IONE CUBBLES. Grave is fine to coarse rounded sandstone. **From 1.00m by jet wells collapsing. **From 1.00m by large cobiles at base of hole, very hard to dig.** **EOH at 1.25m - Exploratory hole abandoned due to refusal 1.25 13.76 **DOB control of the control of t															-
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Light trown grey sundy gravely SANDS IONE CUBBLES. Grave is fine to coarse rounded sandstone. **From 1.00m by jet wells collapsing. **From 1.00m by large cobiles at base of hole, very hard to dig.** **EOH at 1.25m - Exploratory hole abandoned due to refusal 1.25 13.76 **DOB control of the control of t															-
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Light trown grey sundy gravely SANDS IONE CUBBLES. Grave is fine to coarse rounded sandstone. **From 1.00m by jet wells collapsing. **From 1.00m by large cobiles at base of hole, very hard to dig.** **EOH at 1.25m - Exploratory hole abandoned due to refusal 1.25 13.76 **DOB control of the control of t															-
Light trown grey sundy gravely SANDS IONE CUBBLES. Grave is fine to coarse rounded sandstone. **From 1.00m by jet wells collapsing. **From 1.00m by large cobiles at base of hole, very hard to dig.** **EOH at 1.25m - Exploratory hole abandoned due to refusal 1.25 13.76 **DOB control of the control of t						-									
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From 1.00m big large cobbies at base of hole, very hard to dig. EOH at 1.25m - Exploratory hole abandoned due to refusal 1.25 13.76 Deservations / Remarks 1. Groundwater not observed. From 1.00m big larisings are damp. 2. No visual or olfactory evidence of contamination encountered. 3. Upon completion exploratory hole backfilled with arisings.	rounded sandsto	ne.	•												_
Diservations / Remarks 1. Groundwater not observed. From 1.00m bgl arisings are damp. 2. No visual or olfactory evidence of contamination encountered. 3. Upon completion exploratory hole backfilled with arisings.	From 1.00m bgl	becoming dampe	er.	very hard to dig.		: : : : : :									=
Diservations / Remarks 1. Groundwater not observed. From 1.00m bgl arisings are damp. 2. No visual or olfactory evidence of contamination encountered. 3. Upon completion exploratory hole backfilled with arisings.															_
Dbservations / Remarks 1. Groundwater not observed. From 1.0m bgl arisings are damp. 2. No visual or officatory evidence of contamination encountered. 3. Upon completion exploratory hole backfilled with arisings.															
Observations / Remarks 1. Groundwater not observed. From 1.00m bgl arisings are damp. 2. No visual or olfactory evidence of contamination encountered. 3. Upon completion exploratory hole backfilled with arisings. Project Number	EC	OH at 1.25m -	Exploratory	hole abandone	ed due to refusal	::::::	1.25	13.76							-
Observations / Remarks 1. Groundwater not observed. From 1.00m bgl arisings are damp. 2. No visual or olfactory evidence of contamination encountered. 3. Upon completion exploratory hole backfilled with arisings. Project Number															-
Observations / Remarks 1. Groundwater not observed. From 1.00m bgl arisings are damp. 2. No visual or olfactory evidence of contamination encountered. 3. Upon completion exploratory hole backfilled with arisings. Project Number															-
Observations / Remarks 1. Groundwater not observed. From 1.00m bgl arisings are damp. 2. No visual or olfactory evidence of contamination encountered. 3. Upon completion exploratory hole backfilled with arisings. Project Number															-
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Observations / Remarks 1. Groundwater not observed. From 1.00m bgl arisings are damp. 2. No visual or olfactory evidence of contamination encountered. 3. Upon completion exploratory hole backfilled with arisings. Project Number															_
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Observations / Remarks 1. Groundwater not observed. From 1.00m bgl arisings are damp. 2. No visual or olfactory evidence of contamination encountered. 3. Upon completion exploratory hole backfilled with arisings. Project Number															-
Observations / Remarks 1. Groundwater not observed. From 1.00m bgl arisings are damp. 2. No visual or olfactory evidence of contamination encountered. 3. Upon completion exploratory hole backfilled with arisings. Project Number															-
Observations / Remarks 1. Groundwater not observed. From 1.00m bgl arisings are damp. 2. No visual or olfactory evidence of contamination encountered. 3. Upon completion exploratory hole backfilled with arisings. Project Number															-
Observations / Remarks 1. Groundwater not observed. From 1.00m bgl arisings are damp. 2. No visual or olfactory evidence of contamination encountered. 3. Upon completion exploratory hole backfilled with arisings. Project Number															-
Observations / Remarks 1. Groundwater not observed. From 1.00m bgl arisings are damp. 2. No visual or olfactory evidence of contamination encountered. 3. Upon completion exploratory hole backfilled with arisings. Project Number															-
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2. No visual or olfactory evidence of contamination encountered. 3. Upon completion exploratory hole backfilled with arisings. Project Number			m 1 00m hal	arisings are d	amn										
Project Number	2. No visual or olfact	tory evidence	of contamina	ation encounter	ed.										
	э. орон сотприеноп	слріогацогу По	oic nackiillea	wiui aiisiliys.										Project Numb	per



Plate 27 HD1605 - Spoil



Plate 28 HD1605 - Pit

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E-mail enviro.cardiff@wyg.com
Environmental Consultancy
Ground Technologies & Investigation



Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

	Project:	FRM					cation Deta			S	tatus		Pit Nu	mber
					Easting:	303534.8		ing: 374		DD	-	N.A		
WOX.	Location:	St Asaph	1		Level: Logger:	14.55mA	OD Depth Type:		5m	PK	ELI	lγl	HD1	606
U	Client:	Natural	Resources \	Wales	Logger.	30	турс.	11					Sheet 1	l of 1
			Hole Inform	mation			C	Groundy	vater				Scale:	1:10
	Pit Dim	nensions	Orientation:	0	Strike ((m)	Rose To (m)	Afte	er (mins)	R	emarks		Checked By:	LK
		0.20m	Shoring:	None									Approved By:	
	0.30m		Stability: Plant:	Stable Hand Excavated									Start Date: Finish Date:	16/03/2016 16/03/2016
	0.5011	<u> </u>	ridit.	Haliu Excavateu			Reduced					Sampl	es and Testing	10/03/2010
		Strata D	Description		Legend	Depth (m)	Level	Water Level (m)	Backfill	Depth (m)	Ref			
to coarse subrou	Brown very ubangular po	clayey silty ottery fragn	y sandy very idstone, brick	gravelly CLAY. Gravel of fine stands, glass and coke. ND. Gravel of fine to coarse sandstone and mudstone.	Legend	0.68	13.87	Level (m)	Backfill	0.50 0.68 - 1.55	Ref B1 B1 B2		Tests / Results	1-
														-
														2 -
Observations / Re														
 Groundwater not No visual or olfact Upon completion 	tory evidence	of contamina	ation encounter with arisings	red.										
open compicuon	Exploratory II	Suckinicu	a. uroriga										Project Numb	per
													A089434	
													AU03434	-



Plate 29 HD1606 - Spoil



Plate 30 HD1606 - Pit

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Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

	Project: FRM			cation Deta			S	tatus	Pit Num	ber
wg.	Location: St Asaph	Easting: Level:	303533. ²		ing: 3740 n: 1.50		PR	ELIM	HD16	07
00	Client: Natural Resources Wales	Logger:	JB	Type:	IP					
	Hole Information				Groundw	vater			Sheet 1	of 1 1:10
	Pit Dimensions Orientation: °	Strike ((m)	Rose To (m)		r (mins)	Re	emarks	Checked By:	LK
	Shoring: None 0.20m Stability: Stable								Approved By: Start Date:	17/03/2016
	0.30m Plant: Hand Excavated								Finish Date:	17/03/2016
	Strata Description	Legend	Depth (m)	Reduced Level	Water	Backfill		S	amples and Testing	
I amount of a second		zegena	Depar (III)	(mAOD)	Level (m)	×///×	Depth (m)	Ref	Tests / Results	
(TOPSOIL).	over brown very silty sandy CLAY with roots and rootlets.	× × ×								-
MADE GROUND:	Dark brown very clayey sandy gravelly SILT. Gravel of fine to		0.10	15.23			0.10 - 0.40	B1		-
coarse angular to	o subangular brick and slate with rare brick cobbles.									-
										-
										-
							0.30	ES1		-
			0.40	14.93			0.40 - 1.55	B2		
MADE GROUND: to coarse subrou	Stiff reddish brown silty sandy very gravelly CLAY. Gravel of fine nded to subangular sandstone, brick and slate tile.		5.10	155			1.55			_
										-
										-
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										-
										-
										-
										-
	FOU at 4 FOre Furthern hale about and		1.50	13.83						_
	EOH at 1.50m - Exploratory hole abandoned									-
										-
										-
										-
										-
										-
										1
										2 -
Observations / Re	emarks									-
1. Groundwater not	observed.									
No visual or olfact Upon completion	tory evidence of contamination encountered. exploratory hole backfilled with arisings.									
									Project Numbe	er
									A089434-	1



Plate 31 HD1607 - Spoil



Plate 32 HD1607 - Pit

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Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

	Project: FRM				ation Deta			S	tatus	Pit Num	nber
wa.	Location: St Asaph			303529.6 15.23mA(ng: 374119 : 1.55m	.88	PR	ELIM	HD16	i08
00	Client: Natural Resources Wales		Logger:		Type:	IP		1 1			
						`roundurate				Scale:	
	Hole Information Pit Dimensions Orientation: °		Strike (ı	m) F	Rose To (m)	After (m		Re	marks	Checked By:	1:10 LK
	Shoring: None									Approved By:	
	0.20m Stability: Stable Plant: Hand Exca	avatad								Start Date: Finish Date:	17/03/2016 17/03/2016
	0.30m Plant. Hand Exce	avateu			Reduced				San	nples and Testing	17/03/2010
	Strata Description		Legend	Depth (m)	Level (mAOD)	Water Level (m)	Backfill	Depth (m)	Ref	Tests / Results	
Grass cover over (TOPSOIL).	brown very silty sandy CLAY with roots and ro	potlets.	× ××								-
MADE GROUND: fine to coarse su (BUND).	Stiff reddish, brown silty sandy very gravelly (brounded to subangular sandstone, brick and	CLAY. Gravel of river deposits.		0.10	15.13			0.10 - 0.40	B1		- - -
MADE GROUND: subangular brick cobbles.	Black greyish silty very sandy fine to coarse a , ash, coke and slate tile GRAVEL with frequen	ngular to t angular brick		0.40	14.83			0.40 - 0.90	B2		- - -
								0.60	ES1		- - -
MADE GROUND: Gravel of fine to and slate tile.	Stiff brown mottled orange silty sandy very gr coarse angular to subrounded brick, glass, tile	avelly CLAY. fragments, coke		0.90	14.33			0.90 - 1.55	B3		- - - 1-
At 1.35m bgl tin	paint can be discovered.							1.20	ES2		- - - -
	EOH at 1.55m - Exploratory hole abandoned			1.55	13.68						-
											2-
Observations / Re								· · · · · · · · · · · · · · · · · · ·			
 Groundwater not No visual or olfact 	tory evidence of contamination encountered.										
3. Upon completion	exploratory hole backfilled with arisings.									B. J. + 11 . 1	
										Project Number A089434-	



Plate 33 HD1608 - Spoil



Plate 34 HD1608 - Pit

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Project:St Asaph
Additional Ground Investigation

Client: Natural Resources Wales

Project: FRM	Easting:							l l	
Location: St Asaph	Level:	303523.		ning: 374 h: 1.4		PR	ELIM	HD16	509
Client: Natural Resources Wales	Logger:		Type:			''`			
Hole Information				Ground	water			Sheet 1	of 1
Pit Dimensions Orientation: °	Strike ([m)	Rose To (m)		er (mins)	R	emarks	Checked By:	LK
Shoring: None								Approved By:	
0.20m Stability: Stable Plant: Hand Excavated								Start Date: Finish Date:	16/03/2016 16/03/2016
			Reduced	I			Sam	ples and Testing	10/03/2010
Strata Description	Legend	Depth (m	(mAOD)	Water Level (m)	Backfill	Depth (m)	Ref	Tests / Results	
Strata Description Shrub and wood chipping cover over brown very silty sandy CLAY with roots and rootlets. (TOPSOIL). MADE GROUND: Stiff reddish brown silty sandy very gravelly CLAY. Gravel of fin to coarse subangular to subrounded sandstone, and brick. MADE GROUND: Black dark grey clayey silty sandy fine to coarse subangular to subrounded sandstone, slate tile, pottery fragments, coke and river deposit GRAVEL with rare subrounded sandstone and brick cobbles.	X	0.20 0.50) Level	water Level (m)	Backfill	0.20 - 0.50	B1 B2	Tests / Results	1-
									-
									_
									2 -
Observations / Remarks 1. Groundwater not observed.							_		
No visual or olfactory evidence of contamination encountered. Upon completion exploratory hole backfilled with arisings.									
The second secon							-	Project Numb	er
								A089434	



Plate 35 HD1609 - Spoil



Plate 36 HD1609 - Pit

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Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

	Project: FRM			cation Deta			S	tatus	Pit Numb	er
Way.	Location: St Asaph	Easting: Level:	303555. 14.42m/		ing: 374278.3 n: 1.10m	37	DD	ELIM	HD161	
00		Logger:		Туре:			ГК	LLII	110101	
	Client: Natural Resources Wales								Sheet 1 o	of 1
	Hole Information	GI II	, ,		Groundwate				Scale:	1:10
	Pit Dimensions Orientation: ° Shoring: None	Strike	(m)	Rose To (m)	After (mi	ns)	K	emarks	Checked By: Approved By:	LK
	0.20m Stability: Stable									15/03/2016
	0.30m Plant: Hand Excavated			1						15/03/2016
	Strata Description	Legend	Depth (m)	Reduced Level	Water Level (m) Ba	nckfill			Samples and Testing	
MADE COOLIND				(mAOD)	×///		pth (m)	Ref B1	Tests / Results	
MADE GROUND: coarse angular t From 0.70 to 0. MADE GROUND: fine to coarse ar sandstone.	Black grey slightly clayey sandy gravelly SILT. Gravel of fine to o subangular brick, ash and coke. To be filmestone boulder or slab. Dark brown reddish very clayey sandy gravelly SILT. Gravel of fine to get be found to subangular brick, ash and coke. To be filmestone boulder or slab. Dark brown reddish very clayey sandy gravelly SILT. Gravel of fingular to subrounded brick, pottery fragments, flint and significant to subrounded brick, pottery fragments, flint and the first to subrounded brick, pottery fragments, flint and significant to subrounded brick, pottery fragments, flint and significant to subrounded brick, pottery fragments, flint and significant fragments.		0.70	13.72 13.62		0.8	10 - 0.70 10 - 0.70 10 - 1.10	B1 D1 B2 D2		1-
Observations / Re 1. Groundwater not 2. No visual or olfac 3. Upon completion									Project Number A089434-1	



Plate 37 HD1610 - Spoil



Plate 38 HD1610 - Pit

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Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

	Project: FRM				ocation Deta			5	Status		Pit Nu	mber
(AUG)			Easting:	303552 14.41m		ing: 3742		DD	_ I T	М	HD1	611
000			Level: Logger:		туре:		ווו	PK	ELI	I۴I	ולחם	011
	Client: Natural F	Resources Wales	135		.,,,,						Sheet	1 of 1
		Hole Information			(Groundw	vater				Scale:	1:10
	Pit Dimensions	Orientation: °	Strike	(m)	Rose To (m)	Afte	r (mins)	R	emarks		Checked By:	LK
	0.20m	Shoring: None									Approved By:	15/02/2016
	0.30m	Stability: Stable Plant: Hand Excavated									Start Date: Finish Date:	15/03/2016 15/03/2016
		Traine Executates			Reduced					Sample	es and Testing	
	Strata D	escription	Legend	Depth (n	n) Level (mAOD)	Water Level (m)	Backfill	Depth (m)	Ref		Tests / Results	
MADE GROUND: angular brick cot and brick. MADE GROUND: fine to coarse an sandstone.	Dark brown very clayey bles. Gravel of fine to compare to subrounded bri	y silty gravelly SAND with occasional oarse angular to subrounded sandstone cy clayey sandy gravelly SILT. Gravel of ck, pottery fragments, flint and		0.70	13.71 13.61	Level (m)		0.70 - 0.80 0.70 - 0.80 0.70 - 0.80 0.70 - 0.80	B2 D2 ES1		Tests / Results	
				-								2 -
Observations / Re	marks							<u> </u>				
Groundwater not												
2. No visual or olfact	tory evidence of contamina exploratory hole backfilled	tion encountered.										
5. opon completion	CAPIDIALOI Y HOIE DACKHIILEO	with anomys.									Droingt Nive	hor
											Project Numl	
											A089434	-1

	Project: FRM			cation Deta			S	tatus	Pit Nun	nber
wa.	Location: St Asaph	Easting: Level:	303516.4 12.14mA		ing: 3746 n: 1.50		PR	ELIM	HD16	512
00	Client: Natural Resources Wales	Logger:		Type:			110	LLIII		
	Hole Information	-			Groundwa	nto.r			Sheet 1	of 1
	Pit Dimensions Orientation: °	Strike (m)	Rose To (m)	_	(mins)	Re	emarks	Checked By:	LK
	Shoring: None	1.50		1.50		20			Approved By:	
	0.20m Stability: Stable 0.30m Plant: Hand Excavated								Start Date: Finish Date:	15/03/2016 15/03/2016
	0.30III FIBIL. Hallu Excavateu			Reduced				Sa	mples and Testing	13/03/2010
	Strata Description	Legend	Depth (m)	Level (mAOD)	Water Level (m)	Backfill	Depth (m)	Ref	Tests / Results	
Grass and twigs	over very silty CLAY with roots and rootlets.	××					0.00 - 0.03 0.00 - 0.60	B1 D1		-
MADE GROUND: rootlets. Gravel of	Brown very clayey sandy slightly gravelly SILT with roots and of fine to coarse subangular to subrounded sandstone.		0.10	12.04						-
subrounded sand	Brown very clayey sandy slightly gravelly SILT with rare dstone cobbles. Gravel of fine to coarse subrounded to stone, brick, quartz and pottery fragments. 30m bgl frequent wood chippings and roots.		0.60	11.54			0.60 - 1.30 0.60 - 1.30	82 D2		-
rounded to subro	orown sandy very silty gravelly CLAY. Gravel of fine to medium ounded sandstone. (ALLUVIUM). 50 bgl free wood chipping and roots.		1.30	10.84			1.30 1.30 - 1.50	83 D3		1-
	EOH at 1.50m - Exploratory hole abandoned		1.50	10.64						2-
Observations / Re										
No visual or olfaction Upon completion	tory evidence of contamination encountered. borehole backfilled with arisings.									
									Project Numb	er
									A089434-	
								1		



Plate 39 HD1612 - Spoil



Plate 40 HD1612 - Pit

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Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

Project: FRM	Location Details Stat Easting: 303212.43 Northing: 376029.86							Pit Numbe	r
Location: St Asaph	Easting: Level:	303212. 8.12mA		-		DD	ELIM	HD1613	2
	Logger:		Type:		,,,,	FIX	LL11	1101013	,
Client: Natural Resources Wales								Sheet 1 of	1
Hole Information					roundwater			Scale:	1:10
Pit Dimensions Orientation: ° Shoring: None	Strike	(m)	Rose To (m)	Afte	r (mins)	R	emarks	Checked By: Approved By:	LK
0.20m Stability: Stable									/03/2016
0.30m Plant: Hand Excavated								Finish Date: 17	/03/2016
Strata Description	Legend	Depth (m	Reduced Level	Water	Backfill			Samples and Testing	
	Legend	Берат (т	(mAOD)	Level (m)	Ducium .	Depth (m)	Ref	Tests / Results	
Brown very clayey sandy SILT with rare rounded sandstone cobbles. From 0.38 to 0.40m bgl lens of reish clay. Brown very clayey sandy gravelly SILT with occasional subrounded sandstone cobbles. Gravel of fine to coarse subrounded to rounded sandstone. Grey brown clayey silty very sandy fine to coarse rounded to subrounded sandstone GRAVEL with occasional subrounded sandstone cobbles. (FLUVIO-GLACIAL DEPOSITS). From 1.15 to 1.30m bgl very cobbley at the bose of hole, too hard to go further. EOH at 1.30m - Exploratory hole abandoned due to difficult digging / refusal	X	0.40	6.97			0.40 - 1.10	B1 B2 B2		1-
Observations / Remarks 1. Groundwater not observed. 2. No visual or olfactory evidence of contamination encountered. 3. Upon completion exploratory hole backfilled with arisings.								Project Number A089434-1	



Plate 41 HD1613 - Spoil



Plate 42 HD1613 - Pit

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Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

	Project: FRM			Location Details Status Easting: 303470.74 Northing: 374269.80							Pit Number			
wg.	Location: St Asaph	1		Level:	13.85m				PRELIM			TP16	501	
00		Resources \	Wales	Logger:	LK	Type:	TP							
		Hole Inform					Groundy	vator				Sheet 1	1:25	
	Pit Dimensions	Orientation:		Strike (m)	Rose To (m)	_	After (mins)		emarks		Checked By:	LK	
		Shoring:	None Unstable from 0.90 to 1.50m									Approved By:	Ву:	
	0.30m	Stability: Plant:	bgl. 3t Tracked Excavator									Start Date: Finish Date:	17/03/2016 17/03/2016	
	0.3011	Plant:	St Tracked Excavator			Reduced					Sample	es and Testing	17/03/2016	
	Strata D	escription		Legend	Depth (m)	Level (mAOD)	Water Level (m)	Backfill	Depth (m)	Ref		Tests / Results		
Brown slightly cla	ayey organic SILT with	many roots a	and rootlets (TOPSOIL).	XXXX	0.10	12.75		XXX					-	
coarse rounded s GLACIAL DEPOSI			0.10	13.75			0.34 - 0.40	В1			- - - - - - - - - - - - - - - - - - -			
At 0.70m bgl root	īs.			× × ×									- - -	
From 1 00m hall	high gabble content			×·×·					1.00 - 1.10	B2			1 1	
	ey gravelly sandy SILT.	(FLUVIO GLA	ACIAL DEPOSITS).	× ^ × × ×	1.10	12.75			1.10 - 1.20	В3				
	, , , , , , , , , , , , , , , , , , , ,	(,	,										- - - -	
	EOH at 1.50m - Ac	chieved target	depth.	(× × × × × × × × × × ×	1.50	12.35							-	
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Observations / Re				1	1	1			ı					
Groundwater not No visual or olfact	tory evidence of contamina	ntion encounter	red.											
3. Upon completion	exploratory hole backfilled	with arisings.										Droingt News	or	
												Project Numb		



Plate 46 TP1601 - Spoil





Plate 47 TP1601 - Pit

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Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

	Project: FRM			Location Details Status Easting: 303484.14 Northing: 374381.77							Pit Number		
wg.	Location: St Asaph	1		Level:	13.85m				PRELIM			TP1602	
00		Resources \	Wales	Logger:	LK	Type:	TP						
	Silener Tradardin	Hole Inforr					Groundy	water				Sheet 1	1:25
	Pit Dimensions	Orientation:		Strike (m)	Rose To (m)		er (mins)	Re	emarks		Checked By:	LK
		Shoring:	None Unstable from 0.60 to 1.20m									Approved By:	
	1.20m	Stability: Plant:	bgl. 3t Tracked Excavator									Start Date: Finish Date:	17/03/2016 17/03/2016
	1.20111	riaiit.	St Tracked Excavator			Reduced					Sample	es and Testing	17/03/2010
	Strata D	escription		Legend	Depth (m	Level (mAOD)	Water Level (m)	Backfill	Depth (m)	Ref		Tests / Results	
			and rootlets (TOPSOIL).	XXXXX	0.06	13.79							
fragments. Grave	Brown sandy GRAVEL well is fine to coarse round	ded sandstor	ne and mudstone.		0.00	13.73							-
(REWORKED FLU	IVIO GLACIAL DEPOSIT	S).											1
Proun candy CD	AVEL Croval is fine to		ad candatons and mudatons		0.60	13.25							-
(POSSIBLE FLUV	IO GLACIAL DEPOSITS).	ed sandstone and mudstone.										-
													=
Proun your cand	v gravally raunded COP	IDLEC Crovo	Lis fine to seems rounded	0 9	1.00	12.85							1 -
sandstone and m	nudstone. (FLUVIO GLA	CIAL DEPOSI	I is fine to coarse rounded ITS).	0 a . D a . a . O a . a . o a . D a . a .]
	EOH at 1.20m - Ac	chieved target	depth.		1.20	12.65		VAIDA!					=
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Observations / Re	emarks			1				1					
 Groundwater not No visual or olfact 	tory evidence of contamina	ition encounte	red.										
3. Upon completion	exploratory hole backfilled	with arisings.											
												Project Numb	
												A089434	-1



Plate 48 TP1602 - Spoil





Plate 49 TP1602 - Pit

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Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

	Project: FRM	F. W.		cation Deta		S	tatus	Pit Nun	Pit Number		
wa.	Location: St Asaph	Easting: Level:	303482 13.89m		ing: 3743 : 2.10		PR	ELIM	TP16	603	
00		Logger:		Туре:		,,,,	1 11	LLIII	11.10	11 1005	
	Client: Natural Resources Wales								Sheet 1	of 1	
	Hole Information				roundw				Scale:	1:25	
	Pit Dimensions Orientation: ° Shoring: None	Strike (m)	Rose To (m)	Afte	r (mins)	Re	emarks	Checked By: Approved By:	LK	
	0.35m Stability: Stable.								Start Date:	17/03/2016	
	1.80m Plant: 3t Tracked Excavator								Finish Date:	17/03/2016	
	Strata Description	Legend	Depth (m	Reduced Level	Water	Backfill		Si	amples and Testing		
		Legend	Берат (п	(mAOD)	Level (m)	Ducium .	Depth (m)	Ref	Tests / Results		
MADE GROUND: (TOPSOIL).	Brown slightly clayey organic SILT with many roots and rootlets		0.10	13.79						-	
MADE GROUND:	Firm brown CLAY with rare subangular fine to coarse gravel of]	
mudstone.										-	
MADE GROUND:	Stiff red brown sandy slightly gravelly CLAY. Gravel is coarse		0.55	13.34						-	
subangular sands	stone. (REWORKED GLACIAL TILL).]	
										-	
Brown slightly cla	eyey slightly silty sandy GRAVEL with moderate rounded to high		0.90	12.99							
(FLUVIO GLACIA	Gravel is fine to coarse rounded sandstone and mudstone. L DEPOSITS).									1 -	
							1.20 - 1.50	B1		-	
]	
										-	
										-	
	FOUL IO 40 A LIVE I LIV		2.10	11.79						2 -	
	EOH at 2.10m - Achieved target depth.									-	
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										5 -	
Observations / D	marks										
Observations / Re 1. Groundwater not											
2. No visual or olfact	ory evidence of contamination encountered. exploratory hole backfilled with arisings.										
	, , , , , , , , , , , , , , , , , , , ,							\vdash	Project Numb	er	
									A089434-		



Plate 50 TP1603 - Spoil







Plate 51 TP1603 - Pit

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Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

	Project: FRM			Location Details State Easting: 303473.85 Northing: 374385.57							ıs Pit Number		
wa.	Location: St Asaph			Easting: Level:	3034/3.				PRELIM			TP1	604
00				Logger:		Type:		JIII	1 18	L L 1	111		004
	Client: Natural I	Resources V	Vales									Sheet	1 of 1
		Hole Inform						vater	Remarks			Scale:	1:25
	Pit Dimensions	Orientation: Shoring:	None	Strike ((m)	Rose To (m)	Afte	er (mins)	R	emarks		Checked By: Approved By:	LK
	0.30m	Stability:	Stable.									Start Date:	17/03/2016
	2.00m	Plant:	3t Tracked Excavator									Finish Date:	17/03/2016
	Churche D				Double (co	Reduced	Water	Backfill			Sample	s and Testing	
	Strata D	escription		Legend	Depth (m	(mAOD)	Level (m)	васкии	Depth (m)	Ref		Tests / Results	
	ndy gravelly organic SIL unded sandstone and m		roots and rootlets. Gravel is		0.10	14.11							
MADE GROUND:	Firm grey CLAY with ra	re subangula	r fine to coarse gravel of		0.10	1							-
mudstone.]
MADE GROUND:	Dark brown black ashy	silty very sar	ndy GRAVEL with low cobble		0.40	13.81					HV 0.45m,	(p)=120 kPa (r)=n/a	kPa -
content. Gravel is glass and pottery	s fine to coarse subang	ular to subrou	inded brick, coal, mudstone,						0.50	B1		., .,	-
At 0.45m bgl firm).).]
													-
					٥٥٠	12.26							-
Brown grey silty	sandy GRAVEL with low ne and mudstone. (FLU	cobble conte	ent. Gravel is fine to coarse	0 - 0 0 0	0.95	13.26			0.95	ES1			1 -
rounded Sandston	ne and mudstone. (FLO	VIO GLACIAL	. DEPOSITS).	0 - 0 0 0									-
	EOH at 1.20m - Ac	hieved target o	depth.		1.20	13.01		V/X/V/X/]
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Observations / Re													
Groundwater not No visual or olfact	ory evidence of contamina	tion encounter	ed.										
3. Upon completion	exploratory hole backfilled	with arisings.											
												Project Num	
												A089434	i-1





Plate 52 TP1604 - Spoil







Plate 53 TP1604 - Pit

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Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

	Project: FRM	Location Details St Easting: 303467.87 Northing: 374388.48								Pit Number			
wg.	Location: St Asaph			Level:	13.26m				PRELIM			TP16	505
00		Resources \	Wales	Logger:	LK	Туре							
	Circinal Francis	Hole Inform					Ground	water				Scale:	1:25
	Pit Dimensions	Orientation:		Strike ((m)	Rose To (m)		er (mins)	R	emarks		Checked By:	LK
		Shoring:	None Unstable from 0.70 to 1.40m									Approved By:	
	1.00m	Stability: Plant:	bgl. 3t Tracked Excavator									Start Date: Finish Date:	17/03/2016 17/03/2016
	1.00111	Platit:	St Tracked Excavator			Reduced					Sampl	es and Testing	17/03/2016
	Strata D	escription		Legend	Depth (n	n) Level (mAOD)	Water Level (m)	Backfill	Depth (m)	Ref		Tests / Results	
			roots and rootlets. Gravel is										-
MADE GROUND:	unded sandstone and m Dark brown black grave	elly silty SAN	D. Gravel is medium to		0.15	13.11							-
coarse angular to	subrounded glass, coa	l and mudsto	one.						0.30 - 0.40	B1			-
													- -
													-
Brown arev slight	tly clavey slightly silty s	andv GRAVE	L with moderate cobble		0.70	12.56							-
content. Gravel is GLACIAL DEPOSI	s fine to coarse rounded	sandstone	and mudstone. (FLUVIO										-
GLACIAL DEI OSI	113).												1
									1.10 - 1.20	B2			-
									1.20 - 1.30	В3			-
					1.40	11.86]
	EOH at 1.40m - Ac	hieved target	depth.										=
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Observations / Re	marks									\Box			
1. Groundwater not	observed.												
2. No visual or olfact 3. Upon completion	tory evidence of contamina exploratory hole backfilled	tion encounter with arisings.	red.										
												Project Numb	per
												A089434	-1



Plate 54 TP1605 - Spoil



Plate 55 TP1605 - Pit

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Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

	Project: FRM		Easting:	Loc 303526.5	ation Deta	iils ing: 3745!	S	tatus	Pit Nui	Pit Number		
wg.	Location: St Asap	h			13.38mA				PR	ELIN	/ TP16	606
00		Resources Wale	·c	Logger:	LK	Туре:	TP				-	
	Cherter Fraction										Sheet :	
	Pit Dimensions	Hole Information Orientation: °	n	Strike (m) [Rose To (m)	Froundwa After	(mins)	Re	emarks	Scale: Checked By:	1:25 LK
	THE DIFFICUSIONS	Shoring: Non	ie	ounc (,	1000 10 (111)	7				Approved By:	LK
	0.60m	Stability: Stab	ole.								Start Date:	16/03/2016
	1.90m	Plant: 3t T	racked Excavator								Finish Date:	16/03/2016
	Strata	Description		Legend	Depth (m)	Reduced Level	Water Level (m)	Backfill			Samples and Testing	
Brown clavey can	ody gravelly organic Si	II T with many roots	s and rootlets. Gravel is	X//XX//X		(mAOD)	. ,	//8\\//	Depth (m)	Ref	Tests / Results	
fine to coarse rou	unded sandstone and	mudstone. (TOPSO	IL).		0.10	13.28]
subangular to sul	MADE GROUND: Brown slightly gravelly clayey SILT. Gravel is fine to coarse subangular to subrounded brick glass, stone, pottery. (SUBSOIL).								0.30 - 0.80	B1		-
MADE GROUND:	Light brown mottled b	olack sandy GRAVE	L with moderate cobble as (up to 20-30cm) of		0.30	13.08			0.30 - 0.80	BI]
sandy slightly gra	avelly CLAY. Gravel is	fine to coarse suba	ngular to subrounded									_
mudstone, sands	tone, brick, pottery, g	lass and metal frag	ments.]
												-
					0.90	12.48			0.90 - 1.00	B2]
rounded sandstor	'n slightly gravelly silty ne. (ALLUVIUM).	very sandy CLAY.	Gravel is fine to coarse	×								1 -
				××]
				<u>×</u> - <u>×</u>								-
				××	1.40	11.98]
	AVEL with moderate on the contract of the cont											-
]
					1.00	11 50						-
	EOH at 1.80m - A	Achieved target depth	l.		1.80	11.58]
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]
												-
							-					5 -
Observations / Re	marks			<u> </u>								
Groundwater not of the control	observed. tory evidence of contamir	nation encountered										
	exploratory hole backfille											
											Project Numl	ber
										A089434	-1	



Plate 56 TP1606 - Spoil





Plate 57 TP1606 - Pit

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Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

	Project:	FRM			Location Details Easting: 303527.91 Northing: 374575.56								Pit Number	
wya.	Location:	St Asaph	1		_	12.82mA				PR	ELI	м	TP16	507
00	Client:		Resources V	Nales	Logger:	LK	Type:	TP						
	Circita												Sheet 1	
	Pit Dime	encione	Hole Inforn Orientation:		Strike (m)	Rose To (m)	Groundw Afte	r (mins)	l Re	emarks		Scale: Checked By:	1:25 LK
	TIC DIIII		Shoring:	None	Dame (,	1000 10 ()	7400	. (orridi no		Approved By:	LK
		0.60m	Stability:	Unstable from 0.90 to 1.55m bgl.									Start Date:	16/03/2015
	1.40m		Plant:	3t Tracked Excavator									Finish Date:	16/03/2015
		Strata D	Description		Legend	Depth (m)	Reduced Level	Water Level (m)	Backfill	5 11 ()		Sample	es and Testing	
Brown clayey san	ndy gravelly	X//XX///X		(mAOD)	. ,	X//XX//X	Depth (m)	Ref		Tests / Results				
fine to coarse rou	unded sands	tone and m	nudstone. (TO	OPSOIL).		0.15	12.67]
MADE GROUND: angular to round	Grey brown ed brick, san	clayey silty ndstone and	/ sandy GRAV d mudstone.	/EL. Gravel is fine to coarse										-
										0.40 - 0.70	B1			_
														-
Stiff dark brown	CLAY with bl	lack inclusion	ons. (ALLUVI	UM).	××××××××××××××××××××××××××××××××××××××	0.70 0.75	12.12 12.07			0.75 - 0.85	B2			-
(FLUVIO GLACIA)	L DEPOSITS	ine to coa).	irse rounded	sandstone and mudstone.	×					0.90 - 1.20	В3			_
					^` . × . × .									1 -
					×××	4.20	44.62							-
				ntent. Gravel is fine to GLACIAL DEPOSITS).	0 - 0 0 0 0	1.20	11.62			1.30 - 1.55	B4			-
coarse rounded s	anustone an	ia muuston	ie. (FLOVIO d	SLACIAL DEPOSITS).	0 - 0 0 0									-
					0 - 0 0 0	1.55	11.27							
	EOH a	at 1.55m - Ac	chieved target	deptn.										-
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														4 -
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]
														-
														1 5 –
Observations / Re	marks													-
1. Groundwater not	observed.													
No visual or olfact Upon completion	visual or olfactory evidence of contamination encountered. on completion exploratory hole backfilled with arisings.													
											ļ		Project Numb	per
													A089434	-1



Plate 58 TP1607 - Spoil





Plate 59 TP1607 - Pit

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Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

	Project:	FRM			Location Details Easting: 303531.53 Northing: 374602.09						Status		Pit Number	
wg.	Location:	St Asaph	1		Level:	12.79mA				PR	ELII	мΙ	TP16	808
00	Client:	Natural F	Resources V	Vales	Logger:	LK	Type:	TP						
	Chiche							· · · · · · · · · · · · · · · · · · ·					Sheet 1	
	Pit Dimer	ncione	Hole Inform		Strike (m)	Rose To (m)	Froundwa After	mins)	Ré	emarks		Scale: Checked By:	1:25 LK
	THE DIFFICE	1310113	Shoring:	None	ou me (,	1000 10 (111)	7.1.00.	(5)				Approved By:	LK
		1.10m	Stability:	Stable.									Start Date:	16/03/2016
	2.20m	_	Plant:	3t Tracked Excavator									Finish Date:	16/03/2016
		Strata D	escription		Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Depth (m)	Ref	Sample	rests / Results	
fine to coarse rou	unded sandsto	roots and rootlets. Gravel is PSOIL).		0.15	12.64						rests / Results			
of brick and meta	of brick and metal fragments. Gravel is fine to coarse subangular to subrounded glass, pottery, sandstone and mudstone.									0.20 - 0.30 0.30 - 0.50 0.60 - 0.70	B2 B3			- - - - -
MADE GROUND:	At 0.65m bgl drain, no outlet on other side of pit, possibl rubbish? MADE GROUND: Orange brown sandy GRAVEL with low cobble content. Gravel i fine to medium subangular.													-
low cobble conte	MADE GROUND: Grey brown mottled black slightly gravelly very sandy CLAY wit low cobble content. Gravel is fine to medium subangular.									0.95 - 1.10 1.10 - 1.45	B4 B5	HV 1.00m,	, (p)=76 kPa (r)=n/a kP	a 1 _
sandstone. (ALLL	JVIUM).	•		e to medium rounded		1.10	11.69			1.10 1.10	55			
Grev sandy GRAV	/FI with low o	obble con	ntent Gravel	is fine to coarse rounded	$\times \times \times \times$	1.45	11.34							_
sandstone and m	udstone. (FLL	JVIO GLA		TS).		1.60	11.19]
														2
														4-
														5 -
	servations / Remarks Groundwater not observed.										\dashv			
2. No visual or olfact	oundwater not observed. o visual or olfactory evidence of contamination encountered. a gravel encountered at western side of pit between 1.25m and 1.40m bgl. Suspected t						to surround service (sewer). Dit extended to east to avoid service							
4. Upon completion						(50)	,c.	0			-		Project Numb	er
													A089434-	
														-



Plate 60 TP1608 - Spoil 1

Plate 61 TP1608 - Spoil 2

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Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales



Plate 62 TP1608 - Pit northern side





Plate 63 TP1608 - Pit southern side

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Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales



Plate 64 TP1608 - Pit eastern side



Plate 65 TP1608 - Pit western side

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Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

	Project: FRM			Location Details Statu Easting: 303378.05 Northing: 374978.50							s Pit Number		
wg.	Location: St Asaph			Easting: Level:	11.42m				PRELIM			TP16	509
00		Resources V	Vales	Logger:	LK	Type:	TP						
	Circina Practical	Hole Inform					Groundy	wator				Sheet 1	l of 1 1:25
	Pit Dimensions	Orientation:		Strike (m)	Rose To (m)		er (mins)	Re	emarks		Checked By:	LK
		Shoring:	None									Approved By:	
	0.50m	Stability:	Stable.									Start Date:	17/03/2016
	2.10m	Plant:	3t Tracked Excavator			Datasat					Sample	Finish Date: es and Testing	17/03/2016
	Strata D	escription		Legend	Depth (m	Reduced Level (mAOD)	Water Level (m)	Backfill	Depth (m)	Ref		Tests / Results	
			roots and rootlets. Gravel is		0.40	44.00							-
fine to coarse rou Brown grey silty	unded sandstone and m sandy GRAVEL. Gravel i	<u>iudstone. (TO</u> is fine to coar	PPSOIL). rse rounded sandstone and	× ×	0.10	11.32							-
mudstone. (ALLU				^ × ×					0.30 - 0.40	B1			-
Soft brown grey	slightly gravelly very silt	ty CLAY. (ALL	UVIUM).	^×	0.40	11.02							-
			tent. Gravel is fine to coarse		0.50	10.92			0.60 - 0.70	B2			-
rounded sandston	ne and mudstone. (FLU	VIO GLACIAL	. DEPOSITS).						0.00 0.70				- -
	EOH at 0.80m - Ac	hieved target o	depth.		0.80	10.62							-
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Observations / Re				ı	I	1		ı	1				
 Groundwater not No visual or olfact 	tory evidence of contamina	tion encountere	ed.										
3. Upon completion	exploratory hole backfilled	with arisings.											
												Project Numb	
												A089434-	-1



Plate 66 TP1609 - Spoil



Plate 67 TP1609 - Pit

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Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

	Project: FRM							tatus	Pit Number
(JUG)		Easting: 303277.60 Northing: 375062.61 Level: Depth: 0.80m					DD	⊏ 1 T	M TP1610
	-	Levei: Logger:	LK	рерtп Туре:		UM	PK	ELI	IAI INTOTO
	Client: Natural Resources Wales			.,,,					Sheet 1 of 1
	Hole Information			G	Groundv	water			Scale: 1:25
	Pit Dimensions Orientation: °	Strike ((m)	Rose To (m)	Afte	er (mins)	R	emarks	· ·
	Shoring: None								Approved By:
	0.30m Stability: Stable. 1.90m Plant: 3t Tracked Excavator								Start Date: 17/03/2016 Finish Date: 17/03/2016
	rand Striatica Excatator			Reduced					Samples and Testing
	Strata Description	Legend	Depth (m) Level (mAOD)	Water Level (m)	Backfill	Depth (m)	Ref	Tests / Results
Brown clayey sar	ndy gravelly organic SILT with many roots and rootlets. Gravel is					XXXX			
fine to coarse rou	unded sandstone and mudstone. (TOPSOIL). sandy GRAVEL. Gravel is fine to coarse rounded sandstone and	× × × ×	0.10						
mudstone. (ALLL	IVIUM).	X X X X	•						HV 0.25m, (p)=91 kPa (r)=n/a kPa
		X X X X	•				0.40	B1	<u>.</u>
		X	•						-
Brown grey sand	y GRAVEL. Gravel is fine to medium rounded sandstone and	<u> </u>	0.60						
mudstone. (FLU\	/IO GLACIAL DEPOSITS).		0.00				0.70 - 0.80	B2	
	EOH at 0.80m - Achieved target depth.		0.80						
									1 -
									2 -
									-
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									3 -
									;
									-
									:
									4-
									-
									:
									:
									-
									5 -
Observations / Re									
 Groundwater not No visual or olfact 	tory evidence of contamination encountered.								
3. Upon completion	exploratory hole backfilled with arisings.								
									Project Number
									A089434-1



Plate 68 TP1610 - Spoil





Plate 69 TP1610 - Pit

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Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

	Project: FRM						Location Details Sta Easting: 303497.00 Northing: 374225.00							mber
wg.	Location: St Asaph					Level: Depth: 1.80m						М	TT16	601
00	Client:	-	Resources \	Wales	Logger:	JB	Type:			' ' '		•		
	- Circinei		Hole Inforr					Ground	water				Scale:	1 of 1 1:25
	Pit Dim	ensions	Orientation:		Strike (m)	Rose To (m)		er (mins)	R	emarks		Checked By:	LK
			Shoring:	None									Approved By:	
		m	Stability:	Stable.									Start Date:	21/03/2016
	m	_	Plant:	8t Tracked Excavator			T						Finish Date: s and Testing	21/03/2016
		Strata I	Description		Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Depth (m)	Ref		Tests / Results	
TOPSOIL: Grass coarse subangula			very silty san	dy CLAY with rare fine to										 - -
subrounded to a occasional subro	ngular brick, ounded to sul	sandstone bangular s	e, pottery and andstone cob	very sandy fine to coarse river deposit GRAVEL with bles and boulders. als towards already open historic		0.20				0.20 - 0.40 0.40 - 1.00	B1 B2			
MADE GROUND:	otos). Stiff red, lig	ht brown v	very gravelly (CLAY. Gravel of fine to osits and pottery.										- - - -
						1.00				1.00 - 1.20	В3			1-
coarse subround fill).	led to angula	ır glass, br	ick, river depo	avelly CLAY. Gravel of fine to osits and pottery. (mid 19thC		1.20				1.20 - 1.40	B4			1 .
coarse subround	led to angula	ır glass, br	ick, river depo	CLAY. Gravel of fine to osits and pottery. rounded to subangular fine		1.40				1.40 - 1.60	B5			
to coarse river de	eposit, coke	and brick (GRAVEL.	ided sandstone and river		1.60				1.60 - 1.80	В6			- - -
deposit GRAVEL.			POSITS).	depth.		1.80								
														2 -
														- - -
														3 -
														- - - -
														: : -
														- - -
														- - - - 4 -
														- -
														- - - -
Observations / Re	emarks									-				5 -
Groundwater not No visual or olfac Drainage channel	observed. ctory evidence I encountered	red.												
4. Upon completion	exploratory ho	ole backfilled	d with arisings.	upervised by Clwyd Powys Archaeo	logical Trus	st.							Project Numb	ber
													A089434	-1



Plate 72 TT1601 - Spoil 1



Plate 73 TT1601 - Spoil 2

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Environmental Consultancy Ground Technologies & Investigation



Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales



Plate 74 TT1601 - Spoil 3



Plate 75 TT1601 - Pit western side

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Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales



Plate 76 TT1601 - Pit eastern side



Plate 77 TT1601 - Pit northern side

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Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

Location Details Status Borehole Number Project: FRM Northing: 374377.16 303479.70 Easting: **PRELIM** WS1601A Location: St Asaph Level: 15.16mAOD Depth: 4.00m LK Type: WS Logger: Client: **Natural Resources Wales** Sheet 1 of 1 Inclination: 90° Method, Plant and Crew Diameter Casing Groundwater Scale: 1:50 Dian Casing Sealed (m) (m) Rose To (m) From (m) To (m) Plant Used Depth (m) Depth(m) Checked By: LK Type Crew Remarks (mm) (mm) (m) 0.00 Tracked Rig J.Bibby dow Sample Approved By: Start Date: 15/03/2016 15/03/2016 Finish Date: Samples and Testing Reduced Level Water Strata Description Leaend Depth (m Level (m) Backfill (mAOD) Depth (m) Ref Tests / Results TOPSOIL: Soft to firm brown silty CLAY with many roots and rootlets. 0.15 15.01 0.15 - 0.67 В1 MADE GROUND: Firm brown CLAY with rare subangular fine to coarse gravel of mudstone. 0.30 - 0.40 D1 0.67 14.49 0.67 - 0.90 ES1 MADE GROUND: Firm brown mottled black sandy gravelly SILT. Gravel is fine to coarse subangular to subrounded brick, coal and mudstone.

MADE GROUND: Stiff red brown sandy slightly gravelly CLAY. Gravel is coarse subangular 0.90 14.26 0.90 - 1.96 B2 ES2 1.96 13.20 1.96 - 2.80 MADE GROUND: Dark brown black gravelly silty SAND. Gravel is medium to coarse angular to subrounded glass, coal and mudstone. 2.80 2.80 - 4.00 ВЗ Brown grey sandy GRAVEL. Gravel is fine to coarse subangular to rounded sandstone. (FLUVIO GLACIAL DEPOSITS). 12.36 4.00 11.16 EOH at 4.00m - Achieved target depth. 6 8 9 10 -Observations / Remarks Sampling Runs Hammer Information Groundwater not observed.
 No visual or olfactory evidence of contamination encountered. From (m) To (m) Diam (mm) Remarks Serial No. Energy Ratio % 1.00 2.00 3.00 4.00 100 100 40 70 90 72 72 60 3. Upon completion window sample backfilled with bentonite. Project Number A089434-1

	Project: FRM							Locatio 303479.70		ils ng: 374377.16	Status	Prob	Probe Number	
W	19	Location:	St Asaph				Easting: Level: Logger:	15.16mAOD	Depth:	: 4.00m	PRELII	М	DP1	
		Client:	Natural F	Resources Wales			1331						eet 1 of 1	
			Prohe 1	Hole Information		ermination	Strike (m)	Rises to (m) Tir		Groundwater	Remarks	Scale: Checked By:	1:50 LK	
Δ	GS	Fall Height:	750mm	Cone Base Diameter:		ieved target			,			Approved By		
	u.e	Hammer Weigh		Rod Diameter:	35mm	depth.						Start Date:	15/03/2016	
Donth		Probe Type:	DPSH-B				Blows /	100mm				Finish Date:	15/03/2016	
Depth (m)		10		20 3	0	40		0	60	7	0 8	0 9	0	
	0													
_	1 2													
	1 2 2													
_ _ 1	1 2													
- 1	2 2													
E	2 2 2 2													
_	3 3 3													
_ 2	3 3													
E	1 2													
	1 1													
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Observa	l itions / Re	emarks										Hammer I	nformation	
												Hammer Serial No.	Energy Ratio %	
													Number	
												A089	434-1	



Plate 1 WS1601A undisturbed



Plate 2 WS1601A disturbed

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Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

Location Details Status Borehole Number FRM Project: 303478.97 Northing: 374378.32 Easting: **PRELIM** WS1601B Location: St Asaph Level: 15.16mAOD Depth: 3.40m LK Type: WS Logger: Client: **Natural Resources Wales** Sheet 1 of 1 Inclination: 90° Method, Plant and Crew Diameter Casing Groundwater Scale: 1:50 Dian Casing Sealed (m) (m) Rose To (m) From (m) To (m) Plant Used Depth (m) Depth(m) Checked By: LK Type Crew Remarks (mm) (mm) (m) 0.00 dow Sample Tracked Rig J.Bibby Approved By: Start Date: 15/03/2016 15/03/2016 Finish Date: Samples and Testing Reduced Water Strata Description Leaend Depth (m Level (m) Backfill (mAOD) Depth (m) Ref Tests / Results Tarmacadam. 0.02 15.14 Tarmacadam.

MADE GROUND: Grey sandy GRAVEL fine to medium angular. (SUBBASE).

MADE GROUND: Firm brown CLAY with rare subangular fine to coarse gravel of mudstone. 15.09 14.89 0.07 0.27 B1 B2 HV 0.40m, (p)=62 kPa (r)=n/a kPa Core broke. HV 0.50m, (p)=44 kPa (r)=n/a kPa (only 2/3 in soil gravel), core. 0.70 14.46 0.70 - 0.94 В1 MADE GROUND: Firm brown mottled black sandy gravelly SILT. Gravel is fine to coarse subangular to subrounded brick, coal and mudstone.

MADE GROUND: Stiff red brown sandy slightly gravelly CLAY. Gravel is coarse subangular 0.94 14 22 1 sandstone. HV 1.25m, (p)=70 kPa (r)=n/a kPa Sample core broke. 13.16 2.00 2 NO RECOVERY. 2.40 12.76 B2 MADE GROUND: Dark brown black gravelly silty SAND. Gravel is medium to coarse angular to subrounded glass, coal and mudstone. 3.00 12.16 ВЗ 3.00 - 3.40 Brown grey sandy GRAVEL. Gravel is fine to coarse subangular to rounded sandstone. (FLUVIO GLACIAL DEPOSITS). 3 3.40 11.76 EOH at 3.40m - Achieved target depth. 6 8 9 10 -Observations / Remarks Sampling Runs Hammer Information 1. Groundwater not observed. From (m) To (m) Diam (mm) Remarks Serial No. Energy Ratio % 2. No visual or olfactory evidence of contamination encountered. 1.00 2.00 3.00 3.40 80 80 76 62 3. Upon completion window sample backfilled with bentonite. Project Number A089434-1



Plate 3 WS1601B undisturbed



Plate 4 WS1601B disturbed

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Project :-

St Asaph Additional Ground Investigation

Client: Natural Resources Wales

Location Details Status Borehole Number Project: FRM 303478.13 Northing: 374379.77 Easting: 15.18mAOD **PRELIM** WS1601C Location: St Asaph Level: Depth: 3.20m LK Type: WS Logger: Client: **Natural Resources Wales** Sheet 1 of 1 Inclination: 90° Method, Plant and Crew Diameter Casing Groundwater Scale: 1:50 Dian Casing (m) From (m) To (m) Plant Used Depth (m) Depth(m) LK Type Crew Remarks Checked By: (m) (mm) (mm) 0.00 Tracked Rig J.Bibby 3.20 ow Sample Approved By: Start Date: 15/03/2016 15/03/2016 Finish Date: Samples and Testing Reduce Wate Strata Description Leaend Depth (n Level (m) Backfill (mAOD) Depth (m) Ref Tests / Results Tarmacadam. 0.05 15 13 0.15 - 1.00 В1 MADE GROUND: Grey sandy GRAVEL fine to medium angular. (SUBBASE). 0.15 15.03 MADE GROUND: Firm brown CLAY with rare subangular fine to coarse gravel of mudstone. HV 0.60m, (p)=74 kPa (r)=n/a kPa Sample broke HV 0.80m, (p)=52 kPa (r)=n/a kPa Sample broke 1.00 14.18 1.00 - 2.00 MADE GROUND: Stiff red brown sandy slightly gravelly CLAY. Gravel is coarse subangular HV 1.50m, (p)=54 kPa (r)=n/a kPa Sample broke, 1/3 of vane in. 2 13.13 MADE GROUND: Grey brown gravelly silty SAND with fragments of china. 2.50 - 2.55 2.55 - 3.00 2.55 12.63 MADE GROUND: Dark brown black gravelly silty SAND. Gravel is medium to coarse angular to subrounded glass, coal and mudstone.

Between 2.70 and 2.95m bgl sample is wet. ВЗ 3.00 12.18 3.00 - 3.20 3 Brown sandy GRAVEL. Gravel is fine to coarse subangular to rounded sandstone. (FLUVIO GLACIAL DEPOSITS). 3.20 11.98 EOH at 3.20m - Achieved target depth. 6 8 9 10 -Observations / Remarks Sampling Runs Hammer Information 1. Arisings are wet between 2.70m and 2.95m bgl. From (m) To (m) Diam (mm) Remarks Serial No. Energy Ratio % 2. No visual or olfactory evidence of contamination encountered. 0.00 1.00 2.00 3.00 1.00 2.00 3.00 3.20 70 100 60 100 80 76 62 60 3. Hand vane measurements attempted at 0.60m, 0.80m and 1.50m bgl. However, sample broken by test. 4. Upon completion window sample backfilled with bentonite. Project Number A089434-1



Plate 5 WS1601C

BLANK

Plate 6

WYG Environment 5th Floor, Longcross Court 47 Newport Road Cardiff CF24 0AD

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Environmental Consultancy Ground Technologies & Investigation



Project :-

St Asaph Additional Ground Investigation

Client: Natural Resources Wales

Location Details Status Borehole Number FRM Project: 303476.99 Northing: 374380.86 Easting: **PRELIM** WS1601D Location: St Asaph Level: 15.13mAOD Depth: 4.00m LK Type: WS Logger: Client: **Natural Resources Wales** Sheet 1 of 1 Inclination: 90° Method, Plant and Crew Diameter Casing Groundwater Scale: 1:50 Dian Casing Sealed (m) (m) From (m) To (m) Plant Used Depth (m) Depth(m) LK Type Crew Remarks Checked By: (mm) (mm) 0.00 Tracked Rig J.Bibby ow Sample Approved By: Start Date: 15/03/2016 15/03/2016 Finish Date: Samples and Testing Reduced Water Strata Description Leaend Depth (m Level (m) Backfill (mAOD) Depth (m) Ref Tests / Results NO RECOVERY 0.15 14.98 Wood 0.30 0.35 14.83 14.78 0.35 - 1.60 В1 Brown clayey sandy gravelly organic SILT with many roots and rootlets. Gravel is fine to coarse rounded sandstone and mudstone. (TOPSOIL).

MADE GROUND: Firm brown CLAY with rare subangular fine to coarse gravel of mudstone. HV 0.50m, (p)=88 kPa (r)=n/a kPa Sample core broke. 1 HV 1.30m, (p)=62 kPa (r)=n/a kPa Sample core broke. 1.60 1.70 13.53 13.43 MADE GROUND: Stiff red brown sandy slightly gravelly CLAY. Gravel is coarse subangular (sandstone. MADE GROUND: Soft grey brown very silty CLAY. MADE GROUND: Stiff red brown sandy slightly gravelly CLAY. Gravel is coarse subangular 2 2.00 13.13 sandstone.
NO RECOVERY. MADE GROUND: Grey brown gravelly SAND with tile fragments. Black MADE GROUND as before. 2.55 - 2.90 B2 2.55 12.58 From 2.70 to 2.90m bgl sample is wet. 2.90 3.00 12.23 12.13 MADE GROUND: Soft brown grey gravelly CLAY with glass fragments.

Brown grey sandy GRAVEL. Gravel is fine to coarse subangular to rounded sandstone. 3.00 - 4.00 ВЗ FLUVIO GLACIAL DEPOSITS). 4.00 11.13 EOH at 4.00m - Achieved target depth. 6 10 -Observations / Remarks Sampling Runs Hammer Information Arisings are wet between 2.70m and 2.95m bgl.
 No visual or olfactory evidence of contamination. From (m) To (m) Diam (mm) Remarks Serial No. Energy Ratio % 1.00 2.00 3.00 4.00 80 90 50 60 85 72 72 60 3. Upon completion window sample backfilled with bentonite. Project Number A089434-1



Plate 7 WS1601D



Plate 8 WS1601 disturbed

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Project :-

St Asaph Additional Ground Investigation

Client: Natural Resources Wales

	Project:		Location Details							Pit	Number			
Culia.	Location: St Asaph						Easting: 303531.51 Northing: 374658.58 Level: 12.84mAOD Depth: 1.10m					√ ws	L602-HD	
00					Logger:		Туре		JIII	FIX	ELIN	,	1002-110	
	Client:	Natural I	Resources \									Sheet 1 of 1		
			Hole Inforn					Groundy		ı		Scale:	1:10	
	Pit Dim	ensions	Orientation: Shoring:	o None	Strike ((m)	Rose To (m)	Afte	er (mins)	R	emarks	Checked By:		
		0.20m	Stability:	Unstable from 1.00m bgl								Approved By: Start Date:	15/03/20:	16
	0.30m		Plant:	Hand Excavated								Finish Date:		
		Charle D					Reduced	Water	B 1511			Samples and Testing		
		Strata D	escription		Legend	Depth (m)	Level (mAOD)	Level (m)	Backfill	Depth (m)		Tests / Res	sults	
Light brown silty GRAVEL with occ DEPOSITS).	ed to rounde D-GLACIAL D	gravelly find sandston (EPOSITS).	e to coarse S le and occasi se subrounde distone cobb	EAND. Gravel is fine to onal subrounded sandstone ed to rounded sandstone les. (FLUVIO-GLACIAL		1.10	12.44 11.74			0.40 - 1.10 0.40 - 1.10	B2 D2	Tests / Res		1
														2 -
Observations / Re														
 Groundwater not No visual or olfact Upon completion 	tory evidence	of contamina ble backfilled	ition encounter with arisings.	red.										
												Project N	Number	
												A0894	34-1	



Plate 43 WS1602-HD - Spoil



Plate 44 WS1602-HD - Pit

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Environmental Consultancy Ground Technologies & Investigation



Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

	Project: FRM		Location Details State Easting: 303531.53 Northing: 374658.58							s Pit Number			
wg.	Location: St Asaph		Level: 12.84mAOD Depth: 1.10m					PRELIM			WS160)2-TP	
00		Resources \	Wales	Logger:	JB	Type:							
		Hole Inforn					Groundy	vator				Sheet 1	1:25
	Pit Dimensions	Orientation:		Strike (m)	Rose To (m)		er (mins)	Re	emarks		Checked By:	LK
		Shoring:	None									Approved By:	
	0.60m	Stability:	Unstable from 1.00m bgl.									Start Date:	15/03/2016
	2.80m	Plant:	3t Tracked Excavator			Reduced	 				Sample	Finish Date: es and Testing	15/03/2016
	Strata D	escription		Legend	Depth (m	Level (mAOD)	Water Level (m)	Backfill	Depth (m)	Ref		Tests / Results	
Brown clayey sar	ndy gravelly organic SIL unded sandstone and m	T with many	roots and rootlets. Gravel is										
Title to coarse rot	unded sandstone and m	iuustone. (10	5F301L).										-
Brown grey grave	elly SILT. Gravel is fine	to medium r	ounded sandstone.	(× × × ×	0.30	12.54 12.44			0.30 - 0.40 0.40 - 1.10	B1 B2			-
(ALLUVIUM). Grey brown silty	sandy GRAVEL. Gravel	is fine to coa	rse rounded sandstone.	×××	0.40	12.44			0.40 - 1.10	52			-
(FLUVIO GLACIA	L DEPOSITS).			××××									-
				× ×									=
				×××									-
At 1.00m bgl pit	walls collapsing.			× × ×					1.00 - 1.10	В3			1
	EOH at 1.10m - Ac	chieved target	depth.		1.10	11.74		<i>Y//</i>) <i>X</i> ///					-
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Observations / Re						*							
Groundwater not No visual or olfact	tory evidence of contamina	red.											
3. Upon completion	exploratory hole backfilled	with arisings.										Droiget No	or
												Project Numb	
İ												T	



Plate 70 WS1602-TP - Spoil



Plate 71 WS1602-TP - Pit

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Project :-St Asaph Additional Ground Investigation

Client: Natural Resources Wales

Location Details Status Borehole Number FRM Project: 303240.51 Northing: 375962.20 Easting: PRFI TM WS1603 Location: St Asaph Level: 10.29mAOD Depth: 4.40m LK Type: WS Logger: **Natural Resources Wales** Client: Sheet 1 of 1 Inclination: 90° Method, Plant and Crew Diameter Casing Groundwater Scale: 1:50 Dian To (m) Plant Used epth (m) Depth(m) From (m) Type Crew Remarks Checked By: LK (mm) (mm) (m) (m) 0.00 Tracked Rig J.Bibby Arisings are wet Arisings are wet Approved By: Start Date: 18/03/2016 18/03/2016 Finish Date: Samples and Testing Reduce Wate Inst / Strata Description Leaend Depth (n Level (m) Backfill (mAOD) Depth (m) Ref Tests / Results Soft to firm dark brown silty sandy organic CLAY with many roots and rootlets. (TOPSOIL). 0.10 - 0.63 В1 0.10 10.19 MADE GROUND: Firm brown sandy fine to medium slightly gravelly CLAY with occasional HV 0.30m, (p)=44 kPa (r)=n/a kPa Core broke apart. roots and plant remains. Gravel is fine to medium subangular to rounded coal, mudstone and sandstone. 0.63 9.66 MADE GROUND: Brown silty very gravelly SAND fine to medium. Gravel is fine to medium 0.70 9.59 angular to subrounded mudstone.

MADE GROUND: Firm yellowish brown mottled grey sandy slightly gravelly CLAY. Gravel is 1.00 9.29 medium rounded mudstone. NO RECOVERY. 1.40 8.89 Brown slightly gravelly slightly clayey organic SILT. (POSSIBLE RELICT TOPSOIL). 1.70 8.59 MADE GROUND: Grey clayey sandy GRAVEL. Gravel is fine to medium angular to subrounded mudstone and coal. 1.95 8.34 2.00 - 3.30 2 At 1.70m bgl concrete cobble and mudstone cobble.

Firm red brown slightly sandy slightly gravelly CLAY with bands of medium sand. Gravel is HV 2.20m, (p)=68 kPa (r)=n/a kPa Core broke apart. fine to medium rounded mudstone and sandstone. (GLACIAL TILL). . HV 2.50m, (p)=68 kPa (r)=n/a kPa Core broke apart. 造造造 At 2.80 to 2.90m bal SAND. HV 3.00m, (p)=100 kPa (r)=n/a kPa 3 At 3.40 to 3.50m bgl SAND and sample is wet. 3.90 6.39 Soft grey CLAY with plant relicts. (GLACIAL DEPOSITS)/ 4.00 - 4.40 ВЗ 4.00 . Soft brown grey very sandy gravelly CLAY. Gravel is fine to medium rounded mudstone and sandstone. (GLACIAL DEPOSITS).

From 4.00 to 4.40m bgl sample is wet.

At 4.25 to 4.30m bgl sand band.

EOH at 4.40m - Achieved target depth. . 4 40 5 89 6 8 9 10 Observations / Remarks Sampling Runs Hammer Information 1. Arisings are wet between 3.40m and 3.50m and between 4.00m and 4.40m bgl. From (m) To (m) Diam (mm Remarks Serial No. Energy Ratio % 2. No visual or olfactory evidence of contamination encountered. 100 60 100 70 100 82 45 62 55 55 3. Hand vane measurements attempted at 0.30m, 2.20m and 2.50m bgl. However, sample broken by test. 4. Upon completion window sample backfilled with bentonite. Project Number A089434-1



Plate 9 WS1603



Plate 10 WS1603 disturbed

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Project :-

St Asaph Additional Ground Investigation

Client: Natural Resources Wales

Location Details Status Borehole Number Project: FRM Northing: 375962.20 303240.50 Easting: 10.30mAOD **PRELIM** WS1604 Location: St Asaph Level: Depth: 5.00m LK Type: WS Logger: Client: **Natural Resources Wales** Sheet 1 of 1 Inclination: 90° Method, Plant and Crew Diameter Casing Groundwater Scale: 1:50 Dian Casing (m) From (m) To (m) Plant Used epth (m) Depth(m) LK Type Crew Remarks Checked By: (mm) (mm) (m) 0.00 Tracked Rig J.Bibby Approved By: Start Date: 18/03/2016 18/03/2016 Finish Date: Samples and Testing Reduce Wate Strata Description Leaend Depth (n Level (m) (mAOD) Depth (m) Ref Tests / Results TOPSOIL: Firm dark brown slightly sandy gravelly CLAY with many roots and rootlets. 0.05 10.25 0.05 - 0.65 В1 MADE GROUND: Soft to firm brown sandy gravelly CLAY. Gravel is fine to coarse subangular to rounded coal, mudstone and sandstone. 0.65 9.65 0.65 - 1.70 MADE GROUND: Firm to stiff red brown very sandy fine CLAY with occasional gravel up to HV 0.70m, (p)=118 kPa (r)=n/a kPa 1.7m bgl. Gravel is fine to medium rounded sandstone and mudstone. 1.70 - 3.70 ВЗ 3 HV 3.50m, (p)=120 kPa (r)=n/a kPa Core broke apart. 3.70 6.60 3.70 - 4.65 В4 Slightly lightly red brown slightly clayey medium grained SAND. (PROBABLEE GLACIAL DEPOSITS). Between 4.00 - 4.60m bgl sample is wet. 4.65 5.65 4.65 - 5.00 B5 Stiff brown sandy gravelly CLAY. Gravel is fine to coarse rounded mudstone and sandstone. (PROBABLE GLACIAL TILL). 5.00 5 30 EOH at 5.00m - Achieved target depth. 9 10 -Observations / Remarks Sampling Runs Hammer Information 1. Arisings are wet between 4.00m and 4.60m bgl. From (m) To (m) Diam (mm) Remarks Serial No. Energy Ratio % 2. No visual or olfactory evidence of contamination encountered. 100 80 85 100 100 80 72 65 53 3. Hand vane measurements attempted at 0.70m and 3.50m bgl. However, sample broken by test. 4. Upon completion window sample backfilled with bentonite. Project Number A089434-1



Plate 11 WS1604



Plate 12 WS1604 disturbed

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Environmental Consultancy Ground Technologies & Investigation



Project :-

St Asaph Additional Ground Investigation

Client: Natural Resources Wales

Borehole Number Location Details Status Project: FRM 303227.65 Northing: 376038.25 Easting: 7.84mAOD **PRELIM** WS1605 Location: St Asaph Level: Depth: 2.00m JB Type: WS Logger: Client: **Natural Resources Wales** Inclination: ° Sheet 1 of 1 Method, Plant and Crew Diameter Casing Groundwater Scale: 1:50 Dian Casing Sealed (m) (m) Rose To (m) From (m) To (m) Type Plant Used Crew Depth (m) Depth(m) Checked By: LK Remarks (mm) (mm) (m) 0.00 2.00 dow Sample Tracked Rig J.Bibby Approved By: Start Date: 17/03/2016 17/03/2016 Finish Date: Samples and Testing Reduced Level Water Strata Description Legend Depth (n Level (m) Backfill (mAOD) Depth (m) Ref Tests / Results Dark brown very clayey sandy SILT (TOPSOIL).
MADE GROUND: Firm red silty very gravelly SAND. Gravel of fine to coarse subrounded to 7.79 7.72 0.05 0.12 - 0.45 В1 0.12 subangular sub base material.

MADE GROUND: Light brown silty very sandy fine to coarse rounded to subangular 0.45 7.39 0.45 - 1.48 B2 \sandstone GRAVEL.

MADE GROUND: Firm brown silty sandy gravelly CLAY. Gravel of fine to coarse subrounded to subrounded sandstone. From 0.45 to 1.48m bgl black staining in clay from roots. 1.48 6.36 1.48 - 2.00 ВЗ MADE GROUND: Light brown, grey very clayey silty sandy fine to coarse rounded to subangular sandstone GRAVEL. 2.00 At 1.95m bgl becoming very sandy.

EOH at 2.00m - Exploratory hole achieved target depth 5.84 10 -Observations / Remarks Sampling Runs Hammer Information Groundwater not observed.
 No visual or olfactory evidence of contamination encountered. From (m) To (m) Diam (mm) Remarks Serial No. Energy Ratio % 3. Upon completion window sample backfilled with bentonite. Project Number A089434-1



Plate 13 WS1605

BLANK

Plate 14

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Environmental Consultancy Ground Technologies & Investigation



Project :-

St Asaph Additional Ground Investigation

Client: Natural Resources Wales

Location Details Status Borehole Number Project: FRM Northing: 376035.89 303217.77 Easting: 9.88mAOD **PRELIM** WS1606 Location: St Asaph Level: Depth: 4.00m JB Type: WS Logger: Client: **Natural Resources Wales** Inclination: ° Sheet 1 of 1 Method, Plant and Crew Diameter Casing Groundwater Scale: 1:50 Dian Casing (m) Sealed (m) Rose To (m) From (m) To (m) Plant Used Depth (m) Depth(m) Type Crew Remarks Checked By: LK (mm) (mm) (m) 0.00 Tracked Rig J.Bibby low Sample Approved By: Start Date: 15/03/2016 15/03/2016 Finish Date: Samples and Testing Reduced Water Inst / Strata Description Leaend Depth (n Level (m) Backfill (mAOD) Depth (m) Ref Tests / Results Brown very clayey SILT (TOPSOIL). 0.18 9.70 MADE GROUND: Firm light brown reddish mottled grey silty sandy slightly gravelly CLAY. Gravel of fine to coarse subangular to subrounded sandstone and quartz. (BUND). 0.20 - 2.00 В1 HV 0.40m, (p)=66 kPa (r)=n/a kPa From 0.18 to 2.30m bgl becoming redder in colour and more silty with depth. HV 0.80m, (p)=88 kPa (r)=n/a kPa HV 1.20m, (p)=72 kPa (r)=n/a kPa HV 1.60m, (p)=58 kPa (r)=n/a kPa 7.58 MADE GROUND: Black dark brown clayey silty sandy fine to coarse angular limestone GRAVEL 2.50 7.38 2.50 - 3.00 B2 MADE GROUND: Firm light brown reddish mottled grey very silty sandy slightly gravelly CLAY. Gravel of fine to coarse subrounded to subangular sandstone and river deposit. From 2.50 to 3.00m bgl orange water staining in clay. 3.00 6.88 3.00 - 4.00 ВЗ Light brown grey reddish very clayey silty sandy fine to coarse subangular to subrounded GRAVEL. (FLUVIO-GLACIAL DEPOSITS). 4.00 5.88 EOH at 4.00m - Exploratory hole achieved target depth 6 8 9 10 -Observations / Remarks Sampling Runs Hammer Information 1. Groundwater not observed. From (m) To (m) Diam (mm) Remarks Serial No. Energy Ratio % 2. No visual or olfactory evidence of contamination encountered. 1.00 2.00 3.00 4.00 100 90 95 80 90 76 76 62 3. Hand vane measurements attempted at 0.40m, 0.80m, 1.20m and 1.60m bgl. However, sample broken by test. 4. Upon completion window sample backfilled with bentonite. Project Number A089434-1

Project: FRM							Easting:	Locat 303217.77	tion Detai	ils ng: 376035.89	Status		oe Number
Land A	G.	Location:	St Asaph				Level: Logger:	LK	Depth: Type:		PRELII	М	DP2
		Client:	Naturai i	Resources Wales Hole Information						iroundwater		Sh Scale:	eet 1 of 1
	-		Probe	Information		Termination	Strike (m)	Rises to (m)		iounuwater	Remarks	Checked By:	
A	GS	Fall Height:	750mm	Cone Base Diameter:		Achieved target depth.						Approved By	
		Hammer Weigh Probe Type:	DPSH-B	Rod Diameter:	35mm							Start Date: Finish Date:	15/03/2016 15/03/2016
Depth							Blows /	100mm				·	
(m)	0	10		20 3	0	40	į	50	60	7	0 8	0 9	0
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Observa	tions / Re	emarks										Hammer I	Information Energy Ratio %
												Project	Number
												A089	434-1



Plate 15 WS1606



Plate 16 WS1606 detail disturbed

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Project :-

St Asaph Additional Ground Investigation

Client: Natural Resources Wales

Project No.: A089434-1 Date : 9th May 2016

Location Details Status Borehole Number Project: FRM 303220.71 Northing: 376054.41 Easting: 7.79mAOD **PRELIM** WS1607 Location: St Asaph Level: Depth: 2.00m LK Type: WS Logger: Client: **Natural Resources Wales** Sheet 1 of 1 Inclination: 90° Method, Plant and Crew Diameter Casing Groundwater Scale: 1:50 Dian Casing Sealed (m) (m) Rose To (m) From (m) To (m) Plant Used Crew Depth (m) Depth(m) Checked By: LK Type Remarks (mm) (mm) (m) 0.00 2.00 Tracked Rig J.Bibby dow Sample Approved By: Start Date: 18/03/2016 18/03/2016 Finish Date: Samples and Testing Reduced Level (mAOD) Water Inst / Strata Description Leaend Depth (m Level (m) Backfill Depth (m) Ref Tests / Results Dark brown sandy gravelly organic SILT. Gravel is fine subangular to rounded sandstone 0.15 0.24 and mudstone with many roots and rootlets. (TOPSOIL).
MADE GROUND: Orange very sandy GRAVEL. Gravel is fine angular.
MADE GROUND: Black dark brown clayey very gravelly fine to coarse grained SAND with 0.24 - 0.65 0.24 - 0.65 B1 ES1 occasional cobble. Gravel is fine to coarse fine to coarse angular to subrounded coal, brick, 0.65 7.14 0.65 - 1.00 B2 conglomerate, sandstone and mudstone.

Soft to firm brown slightly gravelly CLAY. Gravel is fine to medium rounded sandstone and 1.00 6.79 1.00 - 2.00 ВЗ Greenish grey clayey sandy fine to coarse GRAVEL. Gravel is fine to coarse subangular to rounded mudstone and sandstone. 2.00 5.79 EOH at 2.00m - Achieved target depth. 9 10 -Observations / Remarks Sampling Runs Hammer Information Groundwater not observed.
 No visual or olfactory evidence of contamination encountered. From (m) To (m) Diam (mm) Remarks Serial No. Energy Ratio % 3. Upon completion window sample backfilled with bentonite. Project Number A089434-1



Plate 17 WS1607



Plate 18 WS1607 disturbed

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Project :-

St Asaph Additional Ground Investigation

Client: Natural Resources Wales

Project No.: A089434-1 Date : 9th May 2016

St Asaph FRMS Additional Ground Investigation



Appendix C – Geotechnical Laboratory Testing Results





Contract Number: 30365

Client's Reference: A089434-1 PO: C16/154 Report Date: 18-04-2016

Client WYG Group
Arndale Court
Headingly
Leeds
LS6 2UJ

Contract Title: St Asaph

For the attention of: Luzia Kathriner

Date Received: **22-03-2016**Date Commenced: **22-03-2016**Date Completed: **18-04-2016**

Test Description	Qty
Moisture Content	6
1377 : 1990 Part 2 : 3.2 - * UKAS	
4 Point Liquid & Plastic Limit (LL/PL)	6
1377 : 1990 Part 2 : 4.3 & 5.3 - * UKAS	
PSD Wet Sieve method	24
1377 : 1990 Part 2 : 9.2 - * UKAS	
Determination of Permeability in a triaxial cell	1
BS1377 Part 6 :1990 Clause 6 - * UKAS	
Extra Over Item (4 Days Over)	6
CD 100mm Consolidated drained Triaxial compression test on a single 100 mm diameter specimens Multistage loading with the measurement of volume change and pore water pressure	5
including saturation and consolidation, test duration FOUR days.	
BS1377 : Part 8 : Clause 7 : 1990 - @ Non Accredited Test	
Extra over items for test duration in excess of four days.	6
Discussed of Communication Dunings	

- Disposal of Samples on Project
 Notes: Observations and Interpretations are outside the UKAS Accreditation
 - * denotes test included in laboratory scope of accreditation
 - # denotes test carried out by approved contractor
 - @ denotes non accredited tests

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Approved Signatories:

Alex Wynn (Associate Director) - Benjamin Sharp (Contracts Manager) - Emma Sharp (Office Manager) Paul Evans (Quality/Technical Manager) - Vaughan Edwards (Managing Director)

Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk

Client ref: A089434-1
Location: St Asaph
Contract Number: 36365-300316

Hole	Sample			
Number	Number	Туре	Depth (m)	Description of Sample*
WS1601A	1	В	0.15 - 0.67	Brown silty CLAY.
WS1601A	2	В		Brown gravelly sandy fine to medium silty CLAY.
WS1601B	1	В		Brown silty CLAY.
WS1601B	1	В		Brown gravelly sandy fine to medium silty CLAY.
WS1601C	2	В		Brown gravelly sandy fine to medium silty CLAY.
WS1601D	1	В	0.35 - 1.60	Brown silty CLAY.
	-			

Note: Results on this table are in summary format and may not meet the requirements of the relevant standards, additional information is held by the laboratory



For and behalf of GEO Site & Testing Services Ltd

Authorised By:

Emma Sharp (Office Manager)



Test Report: Method of the Determination of the plastic limit and plasticity index

BS 1377: Part 2: 1990 Method 5

Client ref: A089434-1
Location: St Asaph
Contract Number: 36365-300316

Hole/			Moisture	Liquid	Plastic	Plasticity	%	
Sample	Sample	Depth	Content	Limit	Limit	Index	Passing	Remarks
Number	Туре	m	%	%	%	%	.425mm	
			CI. 3.2	CI. 4.3/4.4	CI. 5.	CI. 6.		
WS1601A/1	В	0.15 - 0.67	28	57	29	28	100	CH High Plasticity
WS1601A/2	В	0.90 - 1.96	11	29	16	13	85	CL Low Plasticity
WS1601B/1	В	0.27 - 0.70	29	57	27	30	100	CH High Plasticity
WS1601B/1	В	0.70 - 0.94	16	35	15	20	97	CL/I Low/Inter. Plasticity
WS1601C/2	В	1.00 - 2.00	16	39	19	20	91	CI Intermediate Plasticity
WS1601D/1	В	0.35 - 1.60	24	55	26	29	100	CH High Plasticity

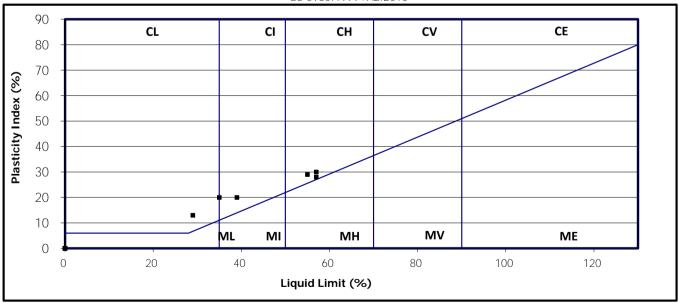
Symbols:

NP : Non Plastic

#: Liquid Limit and Plastic Limit Wet Sieved

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

BS 5930:1999+A2:2010





For and behalf of GEO Site & Testing Services Ltd

Authorised By:

Emma Sharp (Office Manager)





Particle Size Distribution Test BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 1

 Contract Number:
 30365-300316
 Depth from (m):
 0.34

 Hole Number:
 TP1601
 Depth to (m):
 0.40

 Sample Type:
 B

Location: St Asaph

Description: Brown silty clayey sandy fine to coarse GRAVEL with few cobbles.

		-		Fine	Mediu	ım Coars	e Fi	ne Me	edium (Coarse	Fine	Medium	Coarse		
		CLA	·Υ		SILT	Ī		SA	AND			GRAVEL	=	COBBLES	
BS Test	%														
Sieve	Passing		0.002	9000		0:030	0.060	0.200	0.600	9			07 09	200	
125	100		Č			- i	ö	Ö	Ö		1 4	· · · · ·	7 9	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	100
90	100				Ш		Ш						+		
75	100				Ш		Ш						$-\!\!\!-\!\!\!\!-\!\!\!\!\!-\!$		90
63	94				Ш		Ш						$\perp \! \! \perp \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \!$		
50	81				Ш		Ш						$\perp \!\!\! \perp \!\!\!\! \perp \!\!\!\! \perp \!\!\!\! \perp$		80
37.5	69				Ш		Ш						$\perp \! \! \perp \! \! \! / \! \! \perp$		
28	59				Ш		Ш						$\perp I \perp$		70
20	48														
14	36												_/		60
10	28	sing													
6.3	20	Pas											/		50
5.0	16	ge										<i> </i>			
3.35	15	enta													40
2.00	13	Percentage Passing.										/			40
1.18	11	۵													
0.60	9														30
0.425	8				Ш		Ш								
0.300	7														20
0.212	5														
0.150	4														10
0.063	4	J					 								
D 11 1	0.4	0.0	001		0.01		0.1			1		10		100	1000

Particle	%				
Diameter	Passing				
0.02	#				
0.006	#				
0.002	#				

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
4	9	81	6	Total Percentage

Particle Size (mm).

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Emma Sharp (Office Manager)





Particle Size Distribution Test BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 2

 Contract Number:
 30365-300316
 Depth from (m):
 1.00

 Hole Number:
 TP1601
 Depth to (m):
 1.10

 Sample Type:
 B

Location: St Asaph

Description: Brown silty clayey sandy fine to coarse GRAVEL with many cobbles.

				Fine	Mediu	m Coarse	Fine	е Ме	edium Co	oarse	Fine	Medium	Coarse			
		CLA'	Y		SILT			SA	AND			GRAVE	L	COBBLES		
BS Test	%					_										
Sieve	Passing		0.002	900.0		0.030	0.060	0.200	0.600	2.00			02 09	200		
125	100	۱,	Ö	0		0 0	э ттг	0	- O	2	1 1		., ,	N		100
90	100						Ш								Ш	
75	83														Ш	90
63	68				Ш							Ш			Ш	
50	57														Ш	80
37.5	54				Ш		Ш					Ш			Ш	
28	50														Ш	70
20	42															/0
14	34															60
10	29	sing														00
6.3	24	Pas														50
5.0	21	ge					Ш									50
3.35	20	Percentage Passing.											/			40
2.00	17	erce														40
1.18	15	٦														0.0
0.60	11				Ш										\Box	30
0.425	7														$\forall \exists$	
0.300	5	l													+++	20
0.212	3														$\dagger \dagger \dagger$	
0.150	2														+++	10
0.063	2	J					#	_							$\dagger \dagger$	
Dortiolo	0/	0.00	01		0.01		0.1		1			10		100	100	0

Particle	%			
Diameter	Passing			
0.02	#			
0.006	#			
0.002	#			

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
2	15	51	32	Total Percentage

Particle Size (mm).

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Emma Sharp (Office Manager)





Particle Size Distribution Test BS 1377 Part 2:1990.

Medium Coarse

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 3

 Contract Number:
 30365-300316
 Depth from (m):
 1.10

 Hole Number:
 TP1601
 Depth to (m):
 1.20

 Sample Type:
 B

Medium Coarse

Fine

Medium Coarse

Location: St Asaph

Fine

Description: Brown gravelly sandy fine to medium silty CLAY.

Fine

		CLAY	SILT	Si	AND	GRAVEL	COBBLES	
BS Test	%]						
Sieve	Passing		0.030	0.060	0.600	6.0	60 200	
125	100		<u> </u>	o o	0	7 9 2	7 6	100
90	100							
75	100							90
63	100							
50	100							80
37.5	100							
28	100							70
20	100							
14	98	ا اـٰـ						60
10	96	sing						
6.3	92	Percentage Passing.						50
5.0	89	age						
3.35	85	enta						40
2.00	80	erco						40
1.18	76							30
0.60	71							30
0.425	69							20
0.300	66							20
0.212	61							1
0.150	56							10
0.063	51							
Dortiolo	0/	0.001	0.01	0.1	1	10	100	1000

Particle	%				
Diameter	Passing				
0.02	#				
0.006	#				
0.002	#				

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
51	29	20	0	Total Percentage

Particle Size (mm).

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Emma Sharp (Office Manager)





Particle Size Distribution Test BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 1

 Contract Number:
 30365-300316
 Depth from (m):
 1.20

 Hole Number:
 TP1603
 Depth to (m):
 1.30

 Sample Type:
 B

Location: St Asaph

Description: Brown silty clayey sandy fine to coarse GRAVEL with many cobbles.

			Fine	Mediur	m Coarse	e Fine	Me	dium Coars	e Fine	Mediu	m Coars				
		CLAY		SILT			SA	ND		GRAV	EL	COBBI	LES		
BS Test	%	1													
Sieve	Passing		0.006		0.030	- 090'0	0.200	0.600	2.00	0.0	20		200		
125	100) 0		0.0	0.0	0	0.0	2	0	7	9	×		100
90	100														100
75	100														90
63	74														
50	70													Ш	80
37.5	56														
28	49											/			70
20	43										$\perp \perp \downarrow I$				1
14	40	<u>.</u>									$\perp \perp \prime \perp \prime \perp$				60
10	37	sing													
6.3	31	Percentage Passing.													50
5.0	30	age													30
3.35	29	ants									/				40
2.00	26	erce													40
1.18	25														30
0.60	22														30
0.425	21														20
0.300	18														20
0.212	15					سلللا									10
0.150	13														10
0.063	10	J [] _
Particle	%	0.001		0.01		0.1		1		10		100		10	000
Planata	/0 D!							Particle Size	(mm).						

raiticle	70
Diameter	Passing
0.02	#
0.006	#
	#
0.002	#

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
10	16	48	26	Total Percentage

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Emma Sharp (Office Manager)





Particle Size Distribution Test BS 1377 Part 2:1990.

Medium Coarse

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 1

 Contract Number:
 30365-300316
 Depth from (m):
 0.50

 Hole Number:
 TP1604
 Depth to (m):
 0.70

 Sample Type:
 B

Medium Coarse

Fine

Medium Coarse

Location: St Asaph

Fine

Description: Brown silty clayey sandy fine to coarse GRAVEL.

Fine

		CLAY	SILT		S	AND	(GRAVEL	COBBLES	ò	
BS Test	%										
Sieve	Passing	5	0.030	040	0.200	0.600	6.0	20	200		
125	100		j 0 0		j 0	<u> </u>	, 9	· · · · · · · · · · · · · · · · · · ·	2 6		100
90	100							$\parallel \parallel $		Ш	
75	100										90
63	100										Щ
50	100										80
37.5	90										
28	82										70
20	74										
14	71	<u>.</u>									60
10	66	sing									
6.3	58	Passing.									50
5.0	56	ıge									
3.35	53	enta									$\prod_{i=1}^{n}$
2.00	48	Percentage									40
1.18	44	4									
0.60	38										30
0.425	35										
0.300	32										20
0.212	26										111
0.150	24										10
0.063	22										##
_	T	0.001	0.01		0.1	1		10	100		1000
Particle	%				•	Particle Size (r	mm).	-			

Particle	%
Diameter	Passing
0.02	#
0.006	#
0.002	#

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
22	26	52	0	Total Percentage

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Emma Sharp (Office Manager)





Particle Size Distribution Test BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 2

 Contract Number:
 30365-300316
 Depth from (m):
 1.10

 Hole Number:
 TP1605
 Depth to (m):
 1.20

 Sample Type:
 B

Location: St Asaph

Description: Brown silty clayey sandy fine to coarse GRAVEL with many cobbles.

				Fine	Mediu	m Coarse	Fin	e Me	dium Co	arse	Fine	Medium	Coarse				
		CLA'	Y		SILT			SA	ND			GRAVE	L	COBBLES	1		
·		1															
BS Test	%					0		0									
Sieve	Passing		0.002	900.0		0.030	090.0	0.200	0.600	2.00			09	200			
125	100	lr	0		Ш		о ППП	<u> </u>				Ш		 	$\neg \neg$	П	100
90	100	lŀ													$-\!\!+\!\!+\!\!+$	Щ	
75	82	l ŀ													$-\!\!+\!\!+\!\!\!+$	+++	90
63	76	l ⊦													$\perp \!\!\! \perp \!\!\! \perp$	Щ	
50	68	I ⊦												/	$+\!\!+\!\!\!+$		80
37.5	58	l ⊦											$\sqcup \sqcup \sqcup J$		$\perp \! \! \perp \! \! \perp$		
28	47	l ⊦											$\sqcup \sqcup A$		$\perp \!\!\! \perp \!\!\! \perp$	Ш	70
20	40											Ш					
14	35	اخا										Ш	/		$\perp \! \! \perp \! \! \perp$	Ш	60
10	29	sing															00
6.3	23	Pas															50
5.0	21	age															50
3.35	19	Percentage Passing											/				40
2.00	16	erce															40
1.18	13	۵													\Box		00
0.60	10														\top	Ш	30
0.425	9														$\top \Box$	\Box	
0.300	7	l													\top	\top	20
0.212	5	-			HH										+	+++	l
0.150	4	I ⊦			\Box							111			+++	+++	10
0.063	4]													+	++	
Dortinia	0/	0.00)1		0.01		0.1		1			10		100		100	0

Particle	%
Diameter	Passing
0.02	#
0.006	#
0.002	#

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
4	12	60	24	Total Percentage

Particle Size (mm).

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Emma Sharp (Office Manager)





Particle Size Distribution Test BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 3

 Contract Number:
 30365-300316
 Depth from (m):
 1.20

 Hole Number:
 TP1605
 Depth to (m):
 1.30

 Sample Type:
 B

Location: St Asaph

Description: Brown silty clayey sandy fine to coarse GRAVEL with many cobbles.

				Fine	Medi	um Coarse	e Fin	ne Me	dium C	oarse	Fine	Medium	Coarse			
		CLA	Υ		SIL	Т		SA	ND			GRAVEI	_	COBBLES		
	I .	1														
BS Test	%					0		0								
Sieve	Passing		0000	0.000		0:030	090.0	0.200	0.600	00	3 0		R 9	200		
125	100	lı			1111	$\frac{1}{1}$	ПП							/	ПП	100
90	100														+	
75	100												+++		+	90
63	90												$-\!\!+\!\!\!+\!\!\!\!+\!\!\!\!\!+\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!$		+	
50	70												++H		+	80
37.5	59												$-\!\!+\!\!+\!\!\!+\!\!\!+$		Ш	
28	44												$+\!\!+\!\!\!\!+\!$		Щ	70
20	36												$\perp \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \!$		Щ	
14	25	ந்											-H		Щ	60
10	20	sing			Ш		Ш						$\perp \! \! / \! \! \perp \! \! \! \perp$		Ш	
6.3	15	Pas			Ш		Ш						$-\mu$		Ш	50
5.0	13	age			Ш		ШШ						$\perp \!\!\! \perp \!\!\! \perp \!\!\! \perp$		Ш	00
3.35	11	Percentage Passing.					ШШ								Ш	40
2.00	9	erc											<u>/ </u>			40
1.18	7	"													Ш	30
0.60	5															30
0.425	4															20
0.300	3														\prod	20
0.212	2														\prod	10
0.150	2				Ш										Ш	10
0.063	1	J			Ш		Ш-								$\parallel \parallel$	0
Darticla	0/	0.0	01		0.01		0.1			1		10		100	100	0

Particle	%
Diameter	Passing
0.02	#
0.006	#
0.002	#

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
1	8	81	10	Total Percentage

Particle Size (mm).

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Emma Sharp (Office Manager)





Particle Size Distribution Test BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 1

 Contract Number:
 30365-300316
 Depth from (m):
 0.30

 Hole Number:
 TP1606
 Depth to (m):
 0.80

 Sample Type:
 B

Location: St Asaph

Description: Brown sandy silty clayey fine to coarse GRAVEL with many cobbles.

		-		Fine	Mediu	um Coarse	F	ine Me	edium Co	oarse	Fine	Medi	um Co	arse				
		CLAY			SILT	Γ		S	AND			GRA\	/EL		COBBL	ES		
																_		
BS Test	%	1																
Sieve	Passing		0.002	900.0		0.030	090.0	0.200	0.600	2.00)	20	09	002)		
125	100	l _	0:0	0.0		0	Ö	0	ŏ		i <	, , , ,	- 2	9	7	i		n 100
90	100																Ш	
75	78																Ш	90
63	78																	1 /
50	71														$H \rightarrow$		Ш	80
37.5	66													∐/ †				
28	59																	70
20	54																	'0
14	52												/					60
10	50	ing																
6.3	48	Pass					Ш											
5.0	46	ge																50
3.35	45	n ta															Ш	1
2.00	44	Percentage Passing.																40
1.18	43	٥													Ш			
0.60	41						_										Ш	30
0.425	40						Ш											1
0.300	37						Ш								11 1		Ш.	20
0.212	35																	1
0.150	32																+++	10
0.063	27	J																Ħ .
	0.1	0.001			0.01		0.	.1	1			10			100		1	₩ 0 000
Particle	%								Particle S	Size (n	nm).							

Particle	%
Diameter	Passing
0.02	#
0.006	#
0.002	#

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
27	17	34	22	Total Percentage

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Emma Sharp (Office Manager)





Particle Size Distribution Test BS 1377 Part 2:1990.

Medium Coarse

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 2

 Contract Number:
 30365-300316
 Depth from (m):
 0.90

 Hole Number:
 TP1606
 Depth to (m):
 1.00

 Sample Type:
 B

Medium Coarse

Fine

Medium Coarse

Location: St Asaph

Fine

Description: Brown gravelly sandy fine to medium silty CLAY.

Fine

		CLAY	SILT		SA	ND	GRAVEL	COBBLES	
BS Test	%	1							
Sieve	Passing	9	- 77 30 30	 	0	9	l	ı	
125	100		0.030	090.0	0.200	0.600	6.0	500	100
90	100								100
75	100								
63	100								90
50	100								
37.5	100								80
28	100								70
20	100								70
14	97	<u>.</u>							60
10	97	sing							
6.3	96	Percentage Passing							50
5.0	96	age							
3.35	96	ent?							40
2.00	96	erc							40
1.18	95								30
0.60	91								
0.425	86								20
0.300	81								
0.212	73								10
0.150 0.063	66 60								
0.003	00	,							
Dorticlo	0/	0.001	0.01	0).1	1	10	100	1000

Particle	%
Diameter	Passing
0.02	#
0.006	#
0.002	#

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
60	36	4	0	Total Percentage

Particle Size (mm).

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Emma Sharp (Office Manager)





Particle Size Distribution Test BS 1377 Part 2:1990.

Medium Coarse

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 1

 Contract Number:
 30365-300316
 Depth from (m):
 0.40

 Hole Number:
 TP1607
 Depth to (m):
 0.70

 Sample Type:
 B

Medium Coarse

Fine

Medium Coarse

Location: St Asaph

Fine

Description: Brown silty clayey sandy fine to coarse GRAVEL.

Fine

		CLAY	SILT	•		SAND		(GRAVEL		COBBLES			
BS Test	%	1												
Sieve	Passing		900.00	0.030	000	0.200	00	0.9	0	_	500			
125	100		0 0	0.0	5	0.6	0	. 9	20	09	72			100
90	100									$\perp \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \!$			Ш	100
75	100									$\perp \prime \perp$			Ш,	90
63	100													70
50	89									$I \sqcup I$			Щ	80
37.5	75									$I \sqcup I$			Ш '	50
28	59									$I \sqcup \sqcup$			Ш.	70
20	49									$H \cap H$				70
14	46								$\sqcup \sqcup I$				Ш.	60
10	43	sing							$\parallel \parallel \parallel / \parallel$					30
6.3	39	Pas							$\parallel \parallel / \parallel$				Ш	50
5.0	35	ge												30
3.35	33	en ta												40
2.00	30	Percentage Passing.											∭ '	40
1.18	28												\prod	20
0.60	26						_						$\prod \int_{-\infty}^{\infty} dx$	30
0.425	24												\prod	20
0.300	22												Ⅲ ·	20
0.212	20												\prod	10
0.150	18											\Box		10
0.063	15	J											Ш.	^
Particle	%	0.001	0.01		0.1	Parti	1 cle Size (n	nm)	10		100		1000	0
D:	D!					raitio	oic Size (ii							

Particle	%
Diameter	Passing
0.02	#
0.006	#
0.002	#

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
15	15	70	0	Total Percentage

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Emma Sharp (Office Manager)





Particle Size Distribution Test BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 2

 Contract Number:
 30365-300316
 Depth from (m):
 0.75

 Hole Number:
 TP1607
 Depth to (m):
 0.85

 Sample Type:
 B

Location: St Asaph

Description: Brown silty clayey gravelly fine to medium SAND.

			Fine	Medium	Coarse	Fine	Medi	ium Coarse	Fine	Medium	Coarse		-	
		CLAY		SILT			SAN	ND		GRAVEL		COBBLE	S	
													-	
BS Test	%	1												
Sieve	Passing	S	0.006		0.030	000.0	0.200	0.600	3 0	20	0	200		
125	100				0	<u>.</u>	0	0:6	, ,	, ā	99	7		100
90	100													
75	100										$I \sqcup \!\!\! \perp$			90
63	100													
50	100													80
37.5	100													
28	90													70
20	85													Ш
14	81													60
10	78	sing												
6.3	74	Percentage Passing.												50
5.0	71	age												
3.35	70	ant a					/							40
2.00	67	er c												\prod 40
1.18	64													30
0.60	59													$\prod_{i=1}^{30}$
0.425	54													\prod_{α}
0.300	49													20
0.212	43													1
0.150	38													10
0.063	32	J												\prod_{α}
Doublel	0/	0.001		0.01		0.1		1		10		100		1000
Particle	%						F	Particle Size (r	nm).					

Particle	%				
Diameter	Passing				
0.02	#				
0.006	#				
0.002	#				

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
32	35	33	0	Total Percentage

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Emma Sharp (Office Manager)





Particle Size Distribution Test BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 3

 Contract Number:
 30365-300316
 Depth from (m):
 0.90

 Hole Number:
 TP1607
 Depth to (m):
 1.20

 Sample Type:
 B

Location: St Asaph

Description: Brown silty clayey sandy fine to coarse GRAVEL.

			Fine	Mediu	m Coarse	Fine	Med	dium Coars	e Fii	ne l	Medium	Coarse		
		CLAY		SILT			SA	ND		G	RAVEL		COBBLES	
BS Test	%	1												
Sieve	Passing		0.002	3	0.030	0000	0.200	0.600	2.00	0.9	20	99	200	
125	100	l	0.0	Ś	0 0	5	0	ŏ	2.	9	2	- J	×	 100
90	100			Ш		Ш				ШШ				Ш
75	100			Ш		Ш						\perp / \perp		90
63	100													
50	96											$/ \sqcup$		80
37.5	87													Ш
28	77										$\parallel \parallel /$			70
20	66										/			
14	50	l .l									/			60
10	43	ing									\parallel / \parallel			
6.3	35	Pas									\parallel / \parallel			
5.0	32	ge				Ш								50
3.35	29	enta												1
2.00	26	Percentage Passing.												40
1.18	24													
0.60	21													30
0.425	18			Ш		Ш								
0.300	15			Ш										20
0.212	12													լ.
0.150	11				1									10
0.063	9	J												∭ _
<u> </u>	0.4	0.001		0.01		0.1		1			10		100	1000
Particle	%							Particle Size	(mm).					

Diameter	Passing			
0.02	#		Silt and Clay	Sand
0.006	#		9	17
0.002	#			

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Gravel

74

Authorised By: Emma Sharp (Office Manager)

Date: 14.4.16



Cobbles

0



Soil Fraction

Total Percentage

Particle Size Distribution Test BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 4

 Contract Number:
 30365-300316
 Depth from (m):
 1.30

 Hole Number:
 TP1607
 Depth to (m):
 1.55

 Sample Type:
 B

Location: St Asaph

Description: Brown sandy fine to coarse GRAVEL with many cobbles.

			Fine Medium Coarse		Fine	Med	dium Coarse	e Fine	e Med	dium Co	arse				
		CLAY		SILT			SA	ND		GRA	AVEL		COBBLES		
										<u> </u>					
BS Test	%]													
Sieve	Passing	5	1 5 8	3	0.030	- 090.0	0.200	00	2.00	0			0		
125	100		0.00	5	0.0	0.0	0.2	0.600	2.0	0.9	20	09	200		1 00
90	100														100
75	93														90
63	88														90
50	86														80
37.5	73											/			00
28	63														70
20	50														70
14	37	<u>.</u>													60
10	29	sing													00
6.3	20	Pas									/ /				50
5.0	14	age													30
3.35	11	enta													40
2.00	8	Percentage Passing													40
1.18	6														30
0.60	3														30
0.425	2														20
0.300	2														20
0.212	0									/					10
0.150	0														
0.063	0	J L													
Dortiolo	%	0.001		0.01		0.1		1		10			100	10	000
Particle	%							Particle Size	(mm).						

Diameter	Passing
0.02	#
0.006	#
0.002	#

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
0	8	80	12	Total Percentage

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Emma Sharp (Office Manager)





Particle Size Distribution Test BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 2

 Contract Number:
 30365-300316
 Depth from (m):
 0.20

 Hole Number:
 TP1608
 Depth to (m):
 0.30

 Sample Type:
 B

Location: St Asaph

Description: Brown sandy fine to coarse GRAVEL with many cobbles.

			Fine	Mediur	m Coarse	Fine	Med	lium Coarse	Fine	Medium	Coarse			
		CLAY		SILT			SAI	ND		GRAVEI	_	COBBLES	5	
			-											
BS Test	%	1												
Sieve	Passing		700.0		0.030	090:0	0.200	0.600	2:00	, ج	07 09	500		
125	100	l	5 6		Ö	0.0	Ö	0.6	2. 7		07 09	7		100
90	100													
75	80													90
63	80													Ш ~
50	80													80
37.5	67										$\perp \mid / \mid \perp$			Ш
28	57										$\perp \prime \prime \perp$			70
20	47													
14	44										$J \sqcup \bot$			60
10	40	sing												
6.3	37	Percentage Passing.									/			50
5.0	35	ge												
3.35	33	ants.												40
2.00	31	erc												T 40
1.18	29													30
0.60	26													
0.425	25													
0.300	23													20
0.212	21													10
0.150	18													10
0.063	16	J [
Dortiols	0/	0.001		0.01		0.1		1		10		100		1000
Particle	%							Particle Size (mm).					

raiticle	70
Diameter	Passing
0.02	#
0.006	#
	#
0.002	#

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
16	15	49	20	Total Percentage

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Emma Sharp (Office Manager)





Particle Size Distribution Test BS 1377 Part 2:1990.

Medium Coarse

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 3

 Contract Number:
 30365-300316
 Depth from (m):
 0.30

 Hole Number:
 TP1608
 Depth to (m):
 0.50

 Sample Type:
 B

Medium

Coarse

Fine

Medium Coarse

Location: St Asaph

Fine

Description: Brown silty clayey sandy fine to coarse GRAVEL.

Fine

		CLAY		SILT	•		SA	ND		GF	RAVEL	COI	BBLES		
BS Test	%				0 6		0	0							
Sieve	Passing		0.002		0.030	0.000	0.200	0.600	2.00	6.0	20	09	200		
125	100			Ш		<u> </u>		- ^	$\overline{}$			 		ПП	100
90	100	l 										 / /		+++	H
75	100											 		+++	90
63	100											 			\mathbf{H}
50	93											//		+++	80
37.5	72											/			\mathbb{H}
28	59											/		+++	70
20	44													+++	\mathbf{H}
14 10	39	<u> </u>								- 	— <i> </i>			+++	60
	34	Percentage Passing.												+++	\mathbb{H}
6.3	29 27	- Pa			-						-			+++	50
5.0 3.35	25	tage												+++	\mathbf{H}
2.00	22	- Sen			-									+++	40
1.18	19	Per												+++	\mathbf{H}
0.60	17													+++	30
0.425	16													+++	\mathbf{H}
0.423	15									4					20
0.300	13					+++								+++	\coprod
0.212	12													+++	10
0.063	10					+++-								+++	\mathbf{H}
0.000	.0	' <u> </u>		Щ		Щ									Що
Particle	%	0.001		0.01		0.1		1 Particle Siz	ze (m	10 m).	0	100			1000

Particle	%
Diameter	Passing
0.02	#
0.006	#
0.002	#

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
10	12	78	0	Total Percentage

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Emma Sharp (Office Manager)





Particle Size Distribution Test BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 3

 Contract Number:
 30365-300316
 Depth from (m):
 0.60

 Hole Number:
 TP1608
 Depth to (m):
 0.70

 Sample Type:
 B

Location: St Asaph

Description: Brown sandy gravelly fine to medium silty CLAY.

				Fine	Mediu	m Coarse	Fine	e Me	edium Coa	arse	Fine	Mediu	m Coa	arse		•		
		CLAY			SILT			Si	AND			GRAV	EL		COBBLE	S		
																•		
BS Test	%																	
Sieve	Passing		0.002	0.006		0.030	0.060	0.200	0.600	2.00		!	20	09	200			
125	100	I —	0.0			0 0	j 1111	O.	Ö	2	1 4		~	9	N N			100
90	100				Ш									/Ш			Щ	
75	100												$\perp \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \!$			Ш	Ш	90
63	100				Ш							Ш		Ш			Щ	
50	100				Ш							Ш.,	/	$\perp \! \! \perp \! \! \perp$			Ш	80
37.5	91																Ш	-
28	87				Ш							1111		Ш			Ш	70
20	81													Ш			Ш	, ,
14	79	ا نا												Ш			Ш	60
10	77	Sing															Ш	
6.3	74	Pas																50
5.0	73	ge																30
3.35	72	ants																40
2.00	71	Percentage Passing.												Ш			Ш	40
1.18	69																Ш	20
0.60	67																	30
0.425	65													Ш			Ш	
0.300	62											Ш		Ш			Ш	- 20
0.212	58				Ш									$\top \Box$			++++	1
0.150	53				Ш									+			1111	10
0.063	46	J			$\parallel \parallel$												+++	1
Dortiolo	0/	0.001			0.01		0.1		1			10			100		1(4 0

Particle	%
Diameter	Passing
0.02	#
0.006	#
0.002	#

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
46	25	29	0	Total Percentage

Particle Size (mm).

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Emma Sharp (Office Manager)





Particle Size Distribution Test BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 4

 Contract Number:
 30365-300316
 Depth from (m):
 0.95

 Hole Number:
 TP1608
 Depth to (m):
 1.00

 Sample Type:
 B

Location: St Asaph

Description: Brown gravelly sandy fine to medium silty CLAY.

				Fine	Mediu	m Coarse	Fine	Med	dium Coars	e Fine	Mediu	ım Coai					
		CLAY	′		SILT			SA	ND		GRAV	EL	CO	BBLES			
	ı																
BS Test	%								_								
Sieve	Passing		0.002	900.00		0.030	5	0.200	0.600	2.00	0.0	20	09	200			
125	100	lr	<u> </u>	<u>.</u>	Ш) 	0	<u> </u>		_	''	 	- 11	$\overline{}$		100
90	100												+++++		+	+++	
75	100												+++++		+	+++	90
63	100	l ⊦						+							##	+	
50	100	l	-					$+/\!\!\!/$							+		80
37.5	100							$\mathcal{I} \perp$				\perp	+++++		Ш	Ш	
28	100							1				\perp	+++++		$\perp \! \! \perp \! \! \perp$		70
20	100															Ш	
14	99	ا ج					Ш								Ш	Щ	60
10	99	sing			Ш		Ш									Ш	00
6.3	98	Pas														Ш	50
5.0	98	age															30
3.35	97	enta															40
2.00	96	Percentage Passing															40
1.18	95																30
0.60	93																30
0.425	90														\prod		20
0.300	86														\top		20
0.212	75														TTT		10
0.150	72														\top	$\parallel \parallel$	10
0.063	71]														111	
Dortiolo	0/	0.00	1		0.01		0.1		1		10		100)		10	0 00

Particle	%
Diameter	Passing
0.02	#
0.006	#
0.002	#

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
71	25	4	0	Total Percentage

Particle Size (mm).

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Emma Sharp (Office Manager)





Particle Size Distribution Test BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 5

 Contract Number:
 30365-300316
 Depth from (m):
 1.10

 Hole Number:
 TP1608
 Depth to (m):
 1.30

 Sample Type:
 B

Location: St Asaph

Description: Brown gravelly sandy fine to medium silty CLAY.

			Fine	Mediu	m Coarse	Fine	Medi	um Coarse	Fine	Medium	Coarse			
		CLAY		SILT			SAN	ID		GRAVEL	_	COBBLES	5	
			1											
BS Test	%	1												
Sieve	Passing		0.002		0.030	200	0.200	0.600	0.9	000		500		
125	100	l	0.0		0	<u> </u>	0	0.6	, 4		3 9	8		100
90	100			Ш		Ш								Ш
75	100			Ш		Ш								90
63	100			Ш		Ш		11111						Ш ″
50	100			Ш		Ш				Ш				80
37.5	100													Ш
28	100			Ш										70
20	100													
14	100	l <u>.</u>				Ш								60
10	100	Sing												Ш
6.3	100	Percentage Passing.												50
5.0	100	ge												
3.35	100													40
2.00	99	erc				Ш								\prod 40
1.18	97													\prod_{α}
0.60	91					Ш								30
0.425	88					Ш								\prod_{α}
0.300	85					Ш								20
0.212	82					Ш								11
0.150	77			1111										10
0.063	73	J		\square										\parallel
Dential	0/	0.001		0.01		0.1		1		10		100		1000
Particle	%						P	article Size (n	nm).					

Particle	%
Diameter	Passing
0.02	#
0.006	#
0.002	#

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
73	26	1	0	Total Percentage

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Emma Sharp (Office Manager)





Particle Size Distribution Test BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 1

 Contract Number:
 30365-300316
 Depth from (m):
 0.30

 Hole Number:
 TP1609
 Depth to (m):
 0.40

 Sample Type:
 B

Location: St Asaph

Description: Brown sandy silty clayey fine to coarse GRAVEL.

			Fine	Mediu	m Coarse	Fine	Med	dium Co	arse	Fine	Ме	dium C	oarse		-	
		CLAY		SILT			SA	ND			GR4	AVEL		COBBLE:	S	
			1	JILI			5/1				010	111		ļ	-	
BS Test	%	1														
Sieve	Passing	ç	 	2	90	 	0	0)	_			I		
125	100		0.002	5	0.030	090:0	0.200	0.600	2.00	,	0.0	20	99	200		
90	100			Ш									7			100
75	100												/			
63	100											-	\top			90
50	100										Ш		+			#
37.5	100											1/	\top			80
28	85												+			#
20	73															70
14	60											7	1111			11
10	51	gi									Ш	/	\top			60
6.3	41	ass											\top			11
5.0	37	ge F											\top			50
3.35	32	l ta											\Box			1
2.00	24	Percentage Passing														40
1.18	21	ا م											\Box			
0.60	19															30
0.425	18															
0.300	17															20
0.212	16															10
0.150	15															10
0.063	14	J [
D 11 1	0/	0.001		0.01		0.1		1			10			100		1000
Particle	%							Particle S	ize (n	nm).						

Diameter	Passing
0.02	#
0.006	#
0.002	#

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
14	10	76	0	Total Percentage

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Emma Sharp (Office Manager)





Particle Size Distribution Test BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 2

 Contract Number:
 30365-300316
 Depth from (m):
 0.60

 Hole Number:
 TP1609
 Depth to (m):
 0.70

 Sample Type:
 B

Location: St Asaph

Description: Brown silty clayey sandy fine to coarse GRAVEL with many cobbles.

				Fine	Mediun	Coarse	Fine	Med	dium Coars	se I	Fine	Medium	Coarse				
		CLA'	′		SILT			SA	ND			GRAVEL		COBBLES			
BS Test	%																
Sieve	Passing		0.002	900.0		0.030	0.000	0.200	0.600	2.00	0.9	20	99	200			
125	100		Ö	<u> </u>		<u> </u>	э ТПТ	o	o .	7		(N	9	N N	—		100
90	100	l ⊦									$\perp \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \!$			/	Щ	Щ	
75	93	I ⊦									$\perp \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \!$				$\perp \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \!$	Щ	90
63	76	l ⊦									$\perp \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \!$				Ш	Щ	
50	67	I ⊦									$\perp \downarrow \downarrow$					Щ	80
37.5	50										Ш					Ш	00
28	40						Ш				$\perp \! \! \perp \! \! \perp$		$\Box I$			Щ	70
20	31																, ,
14	23	ان ا														Ш	60
10	19	sing														Ш	00
6.3	14	Pas															50
5.0	11	age															50
3.35	9	en ta											/				40
2.00	6	Percentage Passing														\prod	40
1.18	5															П	20
0.60	3																30
0.425	3															\prod	00
0.300	2															Ш	20
0.212	1																10
0.150	1															$\parallel \parallel$	10
0.063	1	J														$\parallel \parallel$	_
Darticla	0/	0.00)1		0.01		0.1		1			10		100		10	000

Particle	%
Diameter	Passing
0.02	#
0.006	#
0.002	#

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
1	5	70	24	Total Percentage

Particle Size (mm).

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Emma Sharp (Office Manager)





Particle Size Distribution Test BS 1377 Part 2:1990.

Medium Coarse

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 1

 Contract Number:
 30365-300316
 Depth from (m):
 0.40

 Hole Number:
 TP1610
 Depth to (m):

Hole Number: TP1610 Depth to (m): Sample Type: B

Medium Coarse

Fine

Medium Coarse

Location: St Asaph

Fine

Description: Brown sandy silty clayey fine to coarse GRAVEL.

Fine

		CLAY	SILT			SAND		(GRAVEL		COBBLES		
BS Test	%	l											
Sieve	Passing		0.006	0.030	3	0.600	00	0.9	0	_	500		
125	100		0.	0 0	i è	0.6	~	. 9	20	99	75		100
90	100												100
75	100									$I \sqcup$			90
63	100												70
50	94								$\parallel \parallel \parallel I$				80
37.5	89												00
28	77												70
20	64												70
14	51	<u>.</u>											60
10	45	sing											00
6.3	39	Pas							$\parallel / \parallel \perp$				50
5.0	36	age											50
3.35	34	ant:											40
2.00	31	Percentage Passing.											40
1.18	28												20
0.60	25											\Box	30
0.425	24											\prod	20
0.300	22											\Box	20
0.212	20											\square	10
0.150	19												10
0.063	18												0
Particle	%	0.001	0.01		0.1	Partic	1 le Size (n	nm).	10		100	100	0

Particle	%
Diameter	Passing
0.02	#
0.006	#
0.002	#

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
18	13	69	0	Total Percentage

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Emma Sharp (Office Manager)





Particle Size Distribution Test BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 2

 Contract Number:
 30365-300316
 Depth from (m):
 0.70

 Hole Number:
 TP1610
 Depth to (m):
 0.80

 Sample Type:
 B

Location: St Asaph

Description: Brown silty clayey sandy fine to coarse GRAVEL.

			Fine	Mediur	m Coarse	Fine	Med	lium Coar	se	Fine	Medium	Coarse			
		CLAY		SILT			SAI	ND			GRAVEL		COBBLES		
													<u> </u>		
BS Test	%	1													
Sieve	Passing		7 000		0.030	000.0	0.200	0.600	2.00	0.9			200		
125	100		, ,		0	<u></u>	0	9.0	2.	9		09	7		T 100
90	100											$\perp \! \! \perp \! \! \! \! \perp \! \! \! \! \! \! \! \! \! \! \!$			
75	100											$\perp \! \! \perp \! \! \! \! \! \! \! \perp \! \! \! \! \! \! \! \!$			90
63	100											$\perp \! \! \perp \! \! \! \perp \! \! \! \! \! \! \! \perp \! \! \! \!$			J ~
50	73											$\perp \! \! \perp \! \! \! \! \! \perp \! \! \! \! \! \! \! \! \! \!$			80
37.5	63											$\perp \! \! \perp \! \! \! \perp \! \! \! \! \! \perp \! \! \! \! \! \perp$			
28	49											$\perp \! \! \perp \! \! \! \perp \! \! \! \perp$			70
20	31											$\perp \prime \prime \perp$			1 ′ °
14	22											$\perp \! \! / \! \! \perp \! \! \! \! \! \perp$			60
10	16	sing													
6.3	11	Percentage Passing										$I\sqcup \sqcup$			50
5.0	9	age													
3.35	8	en ta										$I \sqcup \sqcup$			40
2.00	8	erc										/			40
1.18	7										<i> </i>				30
0.60	7] 30
0.425	6														1 20
0.300	4														20
0.212	3														1
0.150	2								_						10
0.063	1	J				 _									1
5	0.1	0.001		0.01		0.1		1			10		100	1	₩ 0 1000
Particle	%							Particle Size	e (m i	m).					

i di ticio	, 0
Diameter	Passing
0.02	#
0.006	#
0.002	#

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
1	7	92	0	Total Percentage

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Emma Sharp (Office Manager)





Particle Size Distribution Test BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 2

 Contract Number:
 30365-300316
 Depth from (m):
 0.40

 Hole Number:
 WS1612
 Depth to (m):
 0.50

 Sample Type:
 B

Location: St Asaph

Description: Brown silty clayey sandy fine to coarse GRAVEL with many cobbles.

				Fine	Mediu	m Coarse	Fine	e Me	dium Co	oarse	Fine	Mediu	m Coarse	<u>;</u>	_		
		CLAY	′		SILT			SA	AND			GRAVE	EL	COBBLE	ES		
															_		
BS Test	%																
Sieve	Passing		0.002	900.0		0.030	0.060	0.200	0.600	2.00)	20	300			
125	100	_ ا	0			0 0	j TII	0	Ö	7	1 4	· · · · · · · · · · · · · · · · · · ·	7)			100
90	100						Ш							$\perp \parallel \perp \perp$		Щ	
75	82															Щ	90
63	82													\coprod		Ш	
50	82	I ⊦												-		Ш	80
37.5	81								ШШ				\perp / \perp	Ш		Ш	
28	72								ШШ				$\perp / \perp \perp$	Ш		Ш	70
20	60															Ш	, ,
14	45	اخا														Ш	60
10	34	sing										Ш	$/\!\!\perp\perp\perp\!\!\perp$			Ш	
6.3	25	Pas										 /				Ш	50
5.0	24	ge															30
3.35	22	anta										/					40
2.00	21	Percentage Passing.					Ш					/					40
1.18	18															$\prod \prod_{i \in I} f_i$	20
0.60	11											/					30
0.425	8															Ш	00
0.300	6																20
0.212	4															Ш	
0.150	3	l ⊦														111	10
0.063	2	J						_									
Dortiolo	0/	0.00)1		0.01		0.1		1			10		100		10	000

Particle	%
Diameter	Passing
0.02	#
0.006	#
0.002	#

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
2	19	61	18	Total Percentage

Particle Size (mm).

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Emma Sharp (Office Manager)





Particle Size Distribution Test BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 3

 Contract Number:
 30365-300316
 Depth from (m):
 1.00

 Hole Number:
 WS1612
 Depth to (m):
 1.10

 Sample Type:
 B

Location: St Asaph

Description: Brown silty clayey sandy fine to coarse GRAVEL with many cobbles.

				Fine	Mediu	m Coarse	Fine	Med	dium Coa	irse	Fine	Medium	Coarse				
		CLA	Y		SILT			SA	ND			GRAVE	L	COBBLES			
BS Test	%	1															
Sieve	Passing		0.002	900.0		0.030	0000	0.200	0.600	2.00	0 9	!	07 99	200			
125	100	Ι,	C			0 0	j	Ö.	Ö	2	1 4		9	N N			100
90	100						Ш								$\perp \!\!\! \perp \!\!\! \perp$	Щ	
75	85			$\perp \downarrow \downarrow \downarrow \downarrow$												Ш	90
63	82				Ш											Ш	, °
50	79			$\perp \downarrow \downarrow \downarrow \downarrow$	Ш											Ш	80
37.5	71				Ш											Ш	00
28	57				Ш								\perp / \perp			Ш	70
20	43																70
14	33	انا														Ш	60
10	24	sing															00
6.3	17	Pas															50
5.0	15	ge											/				50
3.35	13	ants															40
2.00	11	Percentage Passing.														\prod	40
1.18	9																20
0.60	7																30
0.425	6														\top	\prod	00
0.300	4	li			Ш										\top	\prod	20
0.212	3														\top	\prod	
0.150	3														\top	$\dagger \dagger \dagger$	10
0.063	2	J					#								\top	$\parallel \parallel$	
Dortiolo	0/	0.0	01		0.01		0.1		1			10		100		10	000

Particle	%
Diameter	Passing
0.02	#
0.006	#
0.002	#

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
2	9	71	18	Total Percentage

Particle Size (mm).

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Emma Sharp (Office Manager)





BS 1377 : Part 6 : 1990 Clause 6

Specimen Details

Borehole		TP1601
Sample No.		2
Depth	m	1.00
Date		15/04/2016
Disturbed / Undisturbed		Disturbed (Remoulded)

Description of Specimen

Light greyish brown fine-medium sub-rounded gravelly sl clayey silty fine-coarse SAND

Initial Specimen Conditions

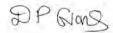
Height	mm	115.50
Diameter	mm	104.80
Area	mm ²	8626.06
Volume	cm ³	996.31
Mass	g	2358.70
Dry Mass	g	2208.00
Density	Mg/m ³	2.37
Dry Density	Mg/m ³	2.22
Moisture Content	%	6.8
Voids Ratio		0.196
Specific Gravity	kN/m ³	2.65
	(assumed/measured)	assumed

Final Specimen Conditions

Tillal Specimen conditi	0113	
Moisture Content	%	7.65
Density	Mg/m ³	2.42
Dry Density	Mg/m³	2.24

Test Setup

1est setup	
Date started	04/04/2016
Date Finished	14/04/2016
Top Drain Used	У
Base Drain Used	У
Pressure System Number	PPerm 1
Cell Number	CPerm 1



Checked and Approved By

15/04/16 Date

Client Ref A089434-1 Contract No



St Asaph

30365-300316



BS 1377: Part 6: 1990 Clause 6

Specimen Details

Borehole		TP1601
DOI ELIDIE		171001
Sample No.		2
Depth	m	1.00
Date		15/04/2016

Saturation

Cell Pressure Incr.	kPa	100.00
Back Pressure Incr.	kPa	99.00
Differential Pressure	kPa	1.00
Final Cell Pressure	kPa	300.00
Final Pore Pressure	kPa	294.00
Final B Value		0.99

Consolidation

- O I I O I I I I I I I I I I I I I I I		
Effective Pressure	kPa	100.00
Cell Pressure	kPa	300.00
Back Pressure	kPa	200.00
Excess Pore Pressure	kPa	94.00
Pore Pressure at End	kPa	200.00
Consolidated Volume	cm ³	983.91
Consolidated Height	mm	115.02
Consolidated Area	mm ²	8554.49
Vol. Compressibility	m ² /MN	1.4162
Consolidation Coef.	m²/yr.	0.1324
Final Voids Ratio	-	0.181

Permeability

Cell Pressure	kPa	300.00
Effective Cell Pressure	kPa	100.00
Back Pressure Diff.	kPa	20.00
Mean Rate of Flow	ml/min	0.01147
Average Temperature	'C	20

Vertical Permeability Kv	m/s	1.25 x 10-9

2P Gons

Checked and Approved By

15/04/16 Date

St Asaph

Client Ref A089434-1

Contract No



30365-300316

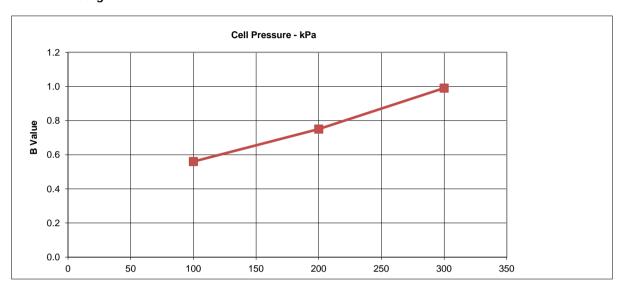
GEO Site & Teeting Services Limited

BS 1377: Part 6: 1990 Clause 6

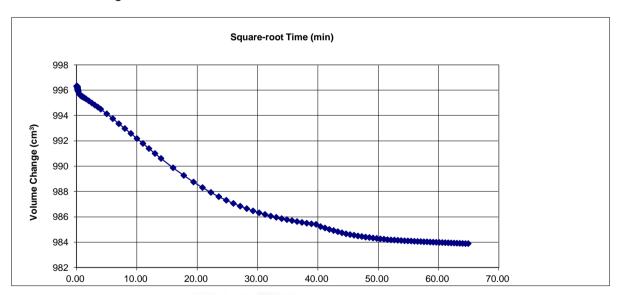
Specimen Details

Borehole	TP1601
Sample No.	2
Depth m	1.00
Date	15/04/2016

Saturation Stage



Consolidation Stage



DP Gions

15/04/16 Date

Checked and Approved By

St Asaph

Client Ref A089434-1 Contract No

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GEO Site & Testing Services Limited

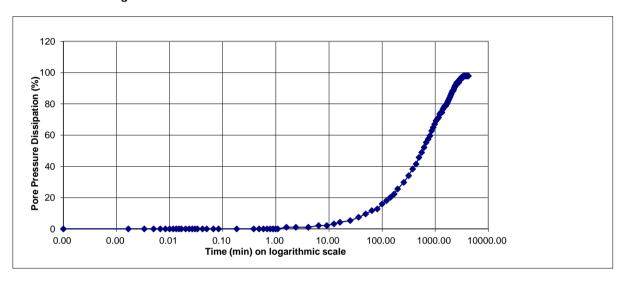
30365-300316

BS 1377 : Part 6 : 1990 Clause 6

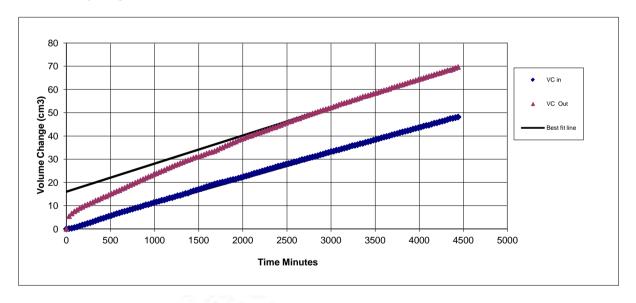
Specimen Details

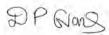
Borehole		TP1601
Sample No.		2
Depth	m	1.00
Date		15/04/2016

Consolidation Stage



Permeability Stage





Checked and Approved By

15/04/16 **Date**

Client Ref A089434-1 **Contract No**



St Asaph

Consolidated Drained Triaxial Compression Test

BS 1377: Part 8: 1990

Specimen Details

Borehole		WS1601A
Sample No.		2
Depth	m	0.90
Date		14/03/2016
Disturbed / Undisturbed		Disturbed (Remoulded)

Description of Specimen

Reddish Brown Slightly Gravelly Slightly Silty CLAY

St Asaph

Initial Specimen Conditions

Height	mm	205.00
Diameter	mm	104.00
Area	mm^2	8494.87
Volume	cm ³	1741.45
Mass	g	3828.70
Dry Mass	g	3378.60
Density	Mg/m ³	2.20
Dry Density	Mg/m ³	1.94
Moisture Content	%	13
Specific Gravity	kN/m ³	2.65
(assumed/measured)		assumed

Final Specimen Conditions

Moisture Content	%	15
Density	Mg/m ³	2.34
Dry Density	Mg/m ³	2.04

Checked and Approved By

2 P Gons

18/04/16 Date

Client Ref

A089434-1

Contract No

30365-300316

GS TIL

BS 1377: Part 8: 1990

Specimen Details

Borehole		WS1601A
Sample No.		2
Depth	m	0.90
Date		14/03/2016

Test Setup

100t ootup	
Date started	09/04/2016
Date Finished	13/04/2016
Top Drain Used	У
Base Drain Used	У
Side Drains Used	У
Pressure System Number	P3
Cell Number	C3

Saturation

Cell Pressure Incr.	kPa	100.00
Back Pressure Incr.	kPa	107.00
Differential Pressure	kPa	-7.00
Final Cell Pressure	kPa	300.00
Final Pore Pressure	kPa	302.00
Final B Value		1.07

Consolidation

Effective Pressure	kPa	30.00
Cell Pressure	kPa	300.00
Back Pressure	kPa	270.00
Excess Pore Pressure	kPa	32.00
Pore Pressure at End	kPa	270.00
Consolidated Volume	cm ³	1656.75
Consolidated Height	mm	201.68
Consolidated Area	mm^2	1656.75
Vol. Compressibility	m ² /MN	0.18014
Consolidation Coef.	m²/yr.	1.36330

DP GIONS

Checked and Approved By

18/04/16 Date

Client Ref A089434-1

Contract No

30365-300316

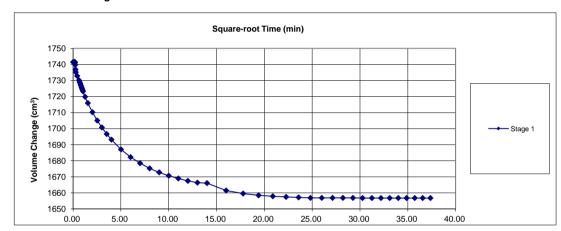
GS 1/1 600 Site & Texting Services Limited

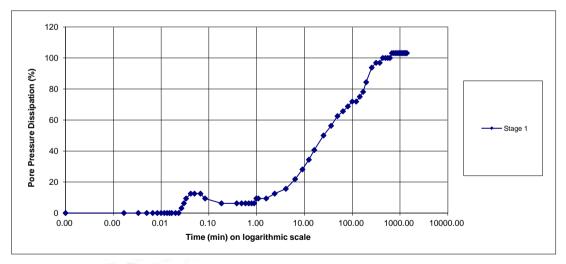
BS 1377 : Part 8 : 1990

Specimen Details

Borehole		WS1601A
Sample No.		2
Depth	m	0.90
Date		14/03/2016

Consolidation Stage





2 P Glons

Checked and Approved By

18/04/16 Date

Client Ref A089434-1

Contract No

30365-300316

GEO Site & Texting Services United

BS 1377: Part 8: 1990

Specimen Details

Borehole		WS1601A
Sample No.		2
Depth	m	0.90
Date		14/03/2016

Shearing		
Initial Cell Pressure	kPa	300
Initial Pore Pressure	kPa	270
Rate of Strain	mm/min	0.0039
Max Deviator Stress		
Axial Strain		5.360
Axial Stress	kPa	84.860
Cor. Deviator stress	kPa	81.812
Effective Major Stress	kPa	110.812
Effective Minor Stress	kPa	30.000
Effective Stress Ratio		3.694
s'	kPa	70.406
t'	kPa	40.406
Max Effective Priciple S	tress Ratio	0
Axial Strain		4.993
Axial Stress	kPa	82.646
Cor. Deviator stress	kPa	78.625
Effective Major Stress	kPa	108.625
Effective Minor Stress	kPa	30.000
Effective Stress Ratio		3.621
s'	kPa	69.313
t'	kPa	39.313
Shear Resistance Angle	degs	
Cohesion c'	kPa	

2 P Gans

Checked and Approved By

18/04/16 Date

Client Ref
A089434-1
Contract No

St Asaph

30365-300316

GEO Site & Testing Services United

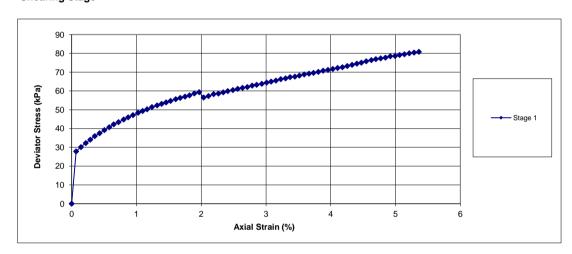
BS 1377: Part 8: 1990

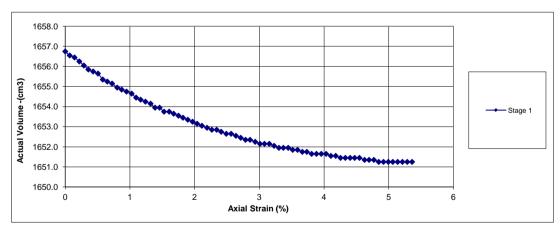
Stage 1

Specimen Details

Borehole		WS1601A
Sample No.		2
Depth	m	0.90
Date		14/03/2016

Shearing Stage





2 P Glons

Checked and Approved By

18/04/16

Date

Client Ref A089434-1

Contract No

30365-300316

St Asaph

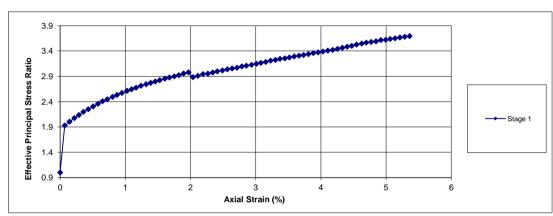
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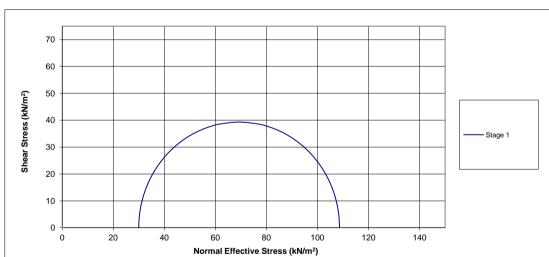
BS 1377 : Part 8 : 1990

Specimen Details

Opconnen Details		
Borehole		WS1601A
Sample No.		2
Depth	m	0.9
Date		14/03/2016

Shearing Stage





2 P Gons

Checked and Approved By

18/04/16 Date

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Client Ref A089434-1 Contract No

St Asaph

30365-300316

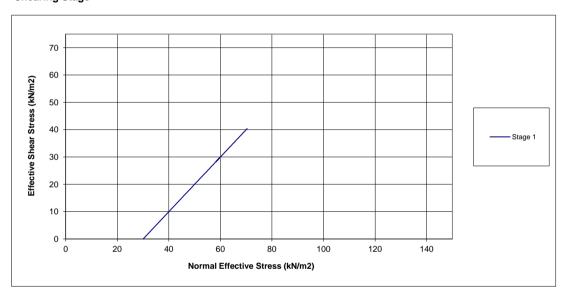
GASTIL.

BS 1377: Part 8: 1990

Specimen Details

Borehole		WS1601A
Sample No.		2
Depth	m	0.9
Date		14/03/2016

Shearing Stage



DP Rons

Checked and Approved By

18/04/16 Date

Client Ref

A089434-1

Contract No

30365-300316

GEO Sile & Texting Services Limited

BS 1377: Part 8: 1990

Specimen Details

Borehole		WS1601B
Sample No.		1
Depth	m	0.27
Date		14/03/2016
Disturbed / Undisturbed		Disturbed (Remoulded)

Description of Specimen

Brown Slightly Fine Gravelly Firm CLAY

Initial Specimen Conditions

Height	mm	205.00
Diameter	mm	103.00
Area	mm^2	8332.29
Volume	cm ³	1708.12
Mass	g	3268.60
Dry Mass	g	2566.90
Density	Mg/m ³	1.91
Dry Density	Mg/m ³	1.50
Moisture Content	%	27
Specific Gravity	kN/m ³	2.65
(assumed/measured)		assumed

Final Specimen Conditions

Moisture Content	%	30
Density	Mg/m ³	1.98
Dry Density	Mg/m ³	1.52

DP Roy Checked and Approved By

18/04/16 Date

Client Ref

A089434-1

Contract No

30365-300316

GS 57/1

BS 1377: Part 8: 1990

Specimen Details

Borehole		WS1601B
Sample No.		1
Depth	m	0.27
Date		14/03/2016

Test Setup

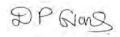
1 COL OCLUP	
Date started	09/04/2016
Date Finished	13/04/2016
Top Drain Used	У
Base Drain Used	У
Side Drains Used	У
Pressure System Number	P2
Cell Number	C2

Saturation

Cell Pressure Incr.	kPa	100.00
Back Pressure Incr.	kPa	96.00
Differential Pressure	kPa	4.00
Final Cell Pressure	kPa	300.00
Final Pore Pressure	kPa	296.00
Final B Value		0.96

Consolidation

Consolidation		
Effective Pressure	kPa	20.00
Cell Pressure	kPa	300.00
Back Pressure	kPa	280.00
Excess Pore Pressure	kPa	16.00
Pore Pressure at End	kPa	280.00
Consolidated Volume	cm ³	1683.32
Consolidated Height	mm	204.01
Consolidated Area	mm^2	1683.32
Vol. Compressibility	m ² /MN	0.05185
Consolidation Coef.	m²/yr.	1.33721



Checked and Approved By

18/04/16 Date

Client Ref A089434-1 Contract No

30365-300316

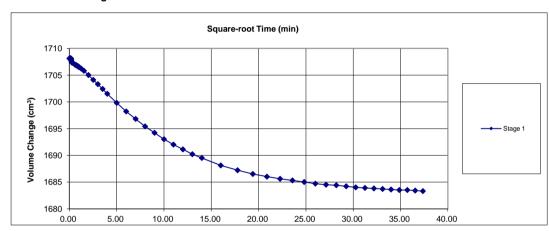
GS ST. L. COUNTY Services Limited

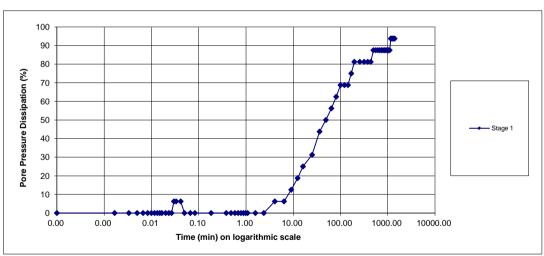
BS 1377 : Part 8 : 1990

Specimen Details

Borehole		WS1601B
Sample No.		1
Depth	m	0.27
Date		14/03/2016

Consolidation Stage





2 P Rons

Checked and Approved By

18/04/16 Date

Client Ref A089434-1

Contract No

St Asaph

30365-300316

GEO Site & Testing Services Limited

BS 1377: Part 8: 1990

Specimen Details

Borehole	_	WS1601B
Sample No.		1
Depth	m	0.27
Date		14/03/2016

Shearing		
Initial Cell Pressure	kPa	300
Initial Pore Pressure	kPa	280
Rate of Strain	mm/min	0.0039
Max Deviator Stress		
Axial Strain		8.965
Axial Stress	kPa	53.507
Cor. Deviator stress	kPa	50.181
Effective Major Stress	kPa	69.181
Effective Minor Stress	kPa	20.000
Effective Stress Ratio		3.459
s'	kPa	44.591
t'	kPa	24.591
Max Effective Priciple S	itress Ra	
Axial Strain		8.965
Axial Stress	kPa	53.507
Cor. Deviator stress	kPa	49.181
Effective Major Stress	kPa	69.181
Effective Minor Stress Effective Stress Ratio	kPa	20.000
s'	kPa	3.459 44.591
S +'	кРа kPa	44.591 24.591
Shear Resistance Angle		27.571
Cohesion c'	kPa	
CONCION C	Ki u	

2 P Gons

Checked and Approved By

18/04/16 Date

St Asaph

Client Ref A089434-1

Contract No

30365-300316

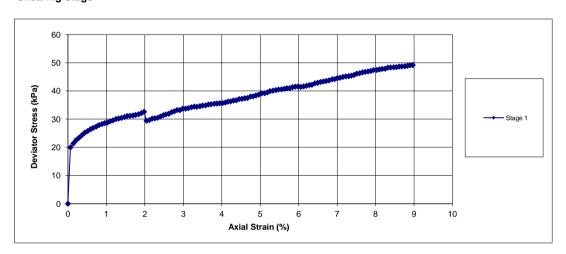
BS 1377: Part 8: 1990

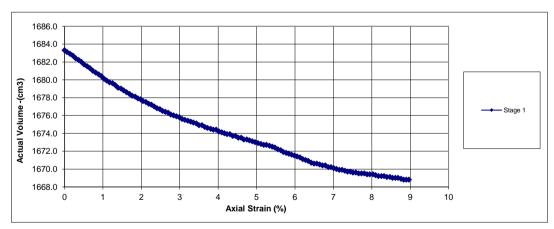
Stage 1

Specimen Details

Borehole		WS1601B
Sample No.		1
Depth	m	0.27
Date		14/03/2016

Shearing Stage





2 P Glons

Checked and Approved By

18/04/16

Date

Client Ref A089434-1

St Asaph

Contract No

30365-300316

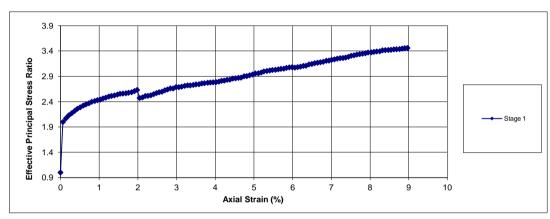
GEO Site & Tealing Services Umited

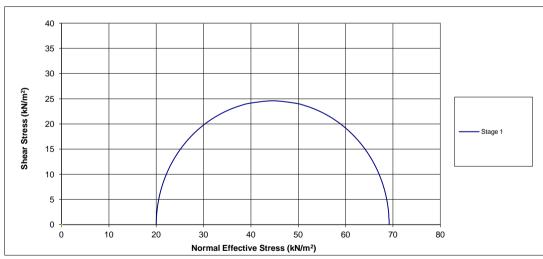
BS 1377 : Part 8 : 1990

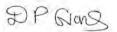
Specimen Details

Borehole		WS1601B
Sample No.		1
Depth	m	0.27
Date		14/03/2016

Shearing Stage







Checked and Approved By

18/04/16 Date

Client Ref

St Asaph

Contract No 30365-300316

A089434-1

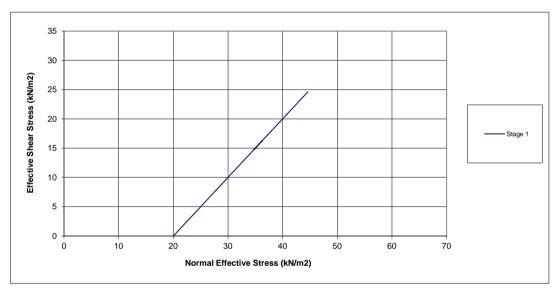


BS 1377: Part 8: 1990

Specimen Details

Borehole		WS1601B
Sample No.		1
Depth	m	0.27
Date		14/03/2016

Shearing Stage



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18/04/16 Date

Client Ref A089434-1

St Asaph Contract No

30365-300316

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BS 1377: Part 8: 1990

Specimen Details

Borehole		WS1601B
Sample No.		1
Depth	m	0.70
Date		14/04/2016
Disturbed / Undisturbed		Disturbed (Remoulded)

Description of Specimen

Brown sandy fine-medium gravelly silty CLAY

Initial Specimen Conditions

Height	mm	202.00
Diameter	mm	104.00
Area	mm^2	8494.87
Volume	cm ³	1715.96
Mass	g	3628.80
Dry Mass	g	3089.00
Density	Mg/m ³	2.11
Dry Density	Mg/m ³	1.80
Moisture Content	%	17
Specific Gravity	kN/m ³	2.65
(assumed/measured)		assumed

Final Specimen Conditions

Moisture Content	%	19
Density	Mg/m ³	2.17
Dry Density	Mg/m ³	1.82

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Contract No

30365-300316

GS 5/1/ east site in Testing Services United

BS 1377 : Part 8 : 1990

Specimen Details

Borehole		WS1601B
Sample No.		1
Depth	m	0.70
Date		14/04/2016

Test Setup

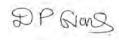
1 cot octup	
Date started	09/04/2016
Date Finished	13/04/2016
Top Drain Used	У
Base Drain Used	У
Side Drains Used	У
Pressure System Number	P8
Cell Number	C8

Saturation

Cell Pressure Incr.	kPa	100.00
Back Pressure Incr.	kPa	96.00
Differential Pressure	kPa	4.00
Final Cell Pressure	kPa	400.00
Final Pore Pressure	kPa	391.00
Final B Value		0.96

Consolidation

Oonsonaation		
Effective Pressure	kPa	20.00
Cell Pressure	kPa	400.00
Back Pressure	kPa	380.00
Excess Pore Pressure	kPa	11.00
Pore Pressure at End	kPa	380.00
Consolidated Volume	cm ³	1694.26
Consolidated Height	mm	201.15
Consolidated Area	mm^2	1694.26
Vol. Compressibility	m ² /MN	0.03328
Consolidation Coef.	m²/yr.	0.01963



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Client Ref A089434-1 Contract No

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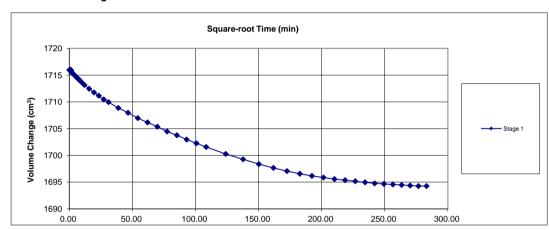
GS7/L

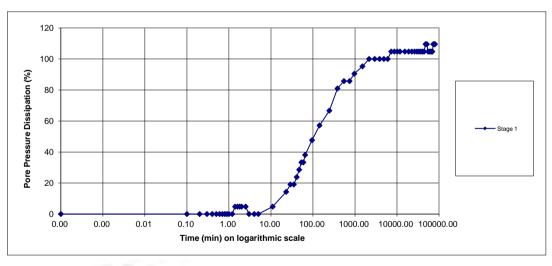
BS 1377 : Part 8 : 1990

Specimen Details

Borehole		WS1601B
Sample No.		1
Depth	m	0.70
Date		14/04/2016

Consolidation Stage





2 P Gons

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18/04/16 Date

Client Ref A089434-1

saph Contract No

30365-300316

GEO Site & Testing Services Umited

BS 1377: Part 8: 1990

Specimen Details

Borehole	_	WS1601B
Sample No.		1
Depth	m	0.70
Date		14/04/2016

Shearing		
Initial Cell Pressure	kPa	400
Initial Pore Pressure	kPa	380
Rate of Strain	mm/min	0.0001
		<u> </u>
Max Deviator Stress		
Axial Strain	,	5.270
Axial Stress	kPa	98.967
Cor. Deviator stress	kPa	95.926
Effective Major Stress	kPa	114.926
Effective Minor Stress	kPa	20.000
Effective Stress Ratio	,	5.746
s'	kPa	67.463
t'	kPa	47.463
Max Effective Priciple S	Stress Ra	itio
Axial Strain		4.146
Axial Stress	kPa	96.044
Cor. Deviator stress	kPa	92.087
Effective Major Stress	kPa	112.087
Effective Minor Stress	kPa	20.000
Effective Stress Ratio	,	5.604
s'	kPa	66.044
t'	kPa	46.044
Shear Resistance Angle	degs	
Cohesion c'	kPa	1
i	,	1

St Asaph

DP Glors

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18/04/16 Date

Client Ref A089434-1 Contract No

30365-300316

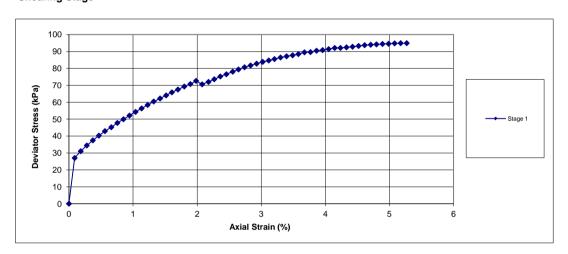
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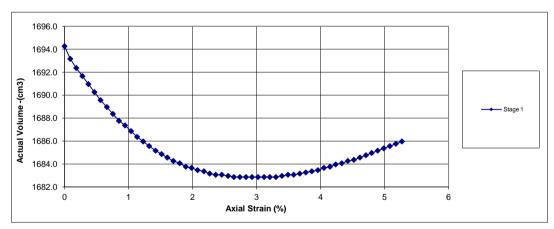
Stage 1

Specimen Details

Borehole		WS1601B
Sample No.		1
Depth	m	0.70
Date		14/04/2016

Shearing Stage





2 P Glons

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18/04/16

Date

Client Ref A089434-1

Contract No

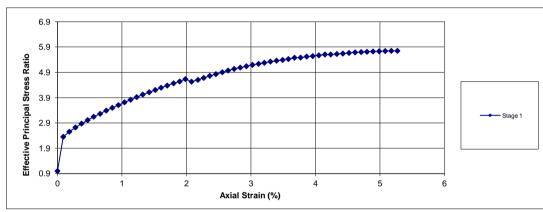
30365-300316

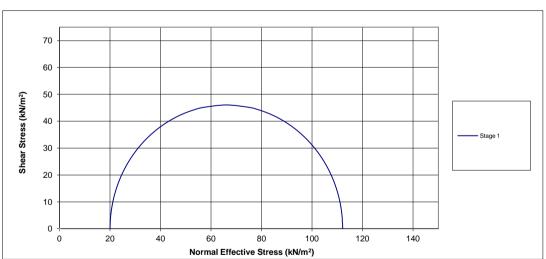
BS 1377 : Part 8 : 1990

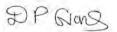
Specimen Details

Borehole		WS1601B
Sample No.		1
Depth	m	0.70
Date		14/04/2016

Shearing Stage







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Client Ref A089434-1

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Contract No

30365-300316

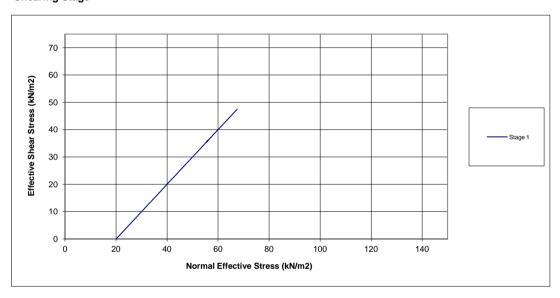
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BS 1377: Part 8: 1990

Specimen Details

Borehole		WS1601B
Sample No.		1
Depth	m	0.70
Date		14/04/2016

Shearing Stage



2 P Glors

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18/04/16 Date

Client Ref A089434-1

Contract No

30365-300316

GS Sile & Testing Services Uniford

BS 1377: Part 8: 1990

Specimen Details

Borehole		WS1601C
Sample No.		2
Depth	m	1.00
Date		18/04/2016
Disturbed / Undisturbed		Disturbed (Remoulded)

Description of Specimen

Reddish brown sI fine gravelly silty firm CLAY

Initial Specimen Conditions

Height	mm	205.00
Diameter	mm	103.00
Area	mm^2	8332.29
Volume	cm ³	1708.12
Mass	g	3871.00
Dry Mass	g	3331.90
Density	Mg/m ³	2.27
Dry Density	Mg/m ³	1.95
Moisture Content	%	16
Specific Gravity	kN/m ³	2.65
(assumed/measured)		assumed

Final Specimen Conditions

Moisture Content	%	16
Density	Mg/m ³	2.29
Dry Density	Mg/m ³	1.98

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Client Ref

A089434-1

Contract No

30365-300316

GST/L east site in Testing Services United

BS 1377: Part 8: 1990

Specimen Details

Borehole		WS1601C
Sample No.		2
1 '		1.00
Depth	m	1.00
Date		18/04/2016

Test Setup

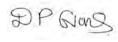
. oot ootup	
Date started	09/04/2016
Date Finished	15/04/2016
Top Drain Used	У
Base Drain Used	У
Side Drains Used	У
Pressure System Number	P4
Cell Number	C4

Saturation

Cell Pressure Incr.	kPa	100.00
Back Pressure Incr.	kPa	96.00
Differential Pressure	kPa	4.00
Final Cell Pressure	kPa	500.00
Final Pore Pressure	kPa	491.00
Final B Value		0.96

Consolidation

Consolidation		
Effective Pressure	kPa	30.00
Cell Pressure	kPa	500.00
Back Pressure	kPa	470.00
Excess Pore Pressure	kPa	21.00
Pore Pressure at End	kPa	470.00
Consolidated Volume	cm ³	1685.92
Consolidated Height	mm	204.11
Consolidated Area	mm^2	1685.92
Vol. Compressibility	m ² /MN	0.02765
Consolidation Coef.	m²/yr.	1.33721



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18/04/16 Date

Client Ref A089434-1 Contract No

30365-300316

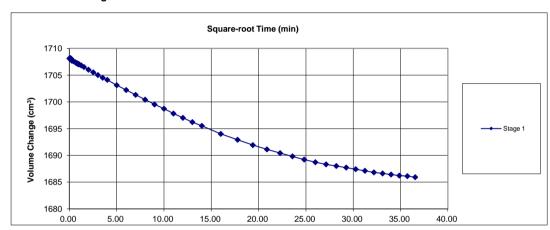
GS7// GEO Site & Testing Services Umited

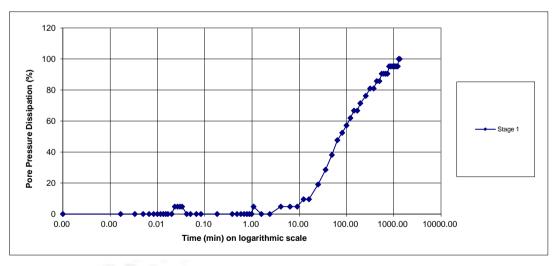
BS 1377 : Part 8 : 1990

Specimen Details

Borehole		WS1601C
Sample No.		2
Depth	m	1.00
Date		18/04/2016

Consolidation Stage





2 P Gons

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Client Ref

A089434-1 Contract No

St Asaph

30365-300316

GEO Site & Tecting Services Limited

BS 1377: Part 8: 1990

Specimen Details

Borehole	_	WS1601C
Sample No.		2
Depth	m	1.00
Date		18/04/2016

Shearing		
Initial Cell Pressure	kPa	500
Initial Pore Pressure	kPa	470
Rate of Strain	mm/min	0.0039
Max Deviator Stress		
Axial Strain		6.805
Axial Stress	kPa	58.105
Cor. Deviator stress	kPa	54.943
Effective Major Stress	kPa	83.943
Effective Minor Stress	kPa	30.000
Effective Stress Ratio		2.798
s'	kPa	56.971
t'	kPa	26.971
Max Effective Priciple S	tress Ra	tio
Axial Strain		5.928
Axial Stress	kPa	55.121
Cor. Deviator stress	kPa	51.025
Effective Major Stress	kPa	81.025
Effective Minor Stress	kPa	30.000
Effective Stress Ratio		2.701
s'	kPa	55.513
t'	kPa	25.513
Shear Resistance Angle	degs	
Cohesion c'	kPa	

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18/04/16 Date

Client Ref A089434-1 Contract No

St Asaph

30365-300316

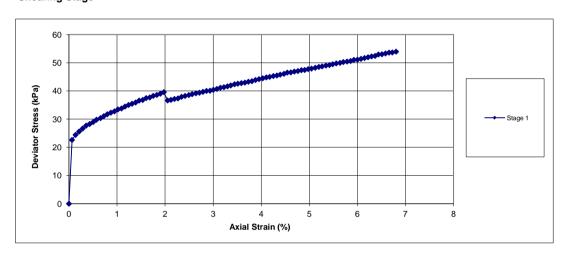
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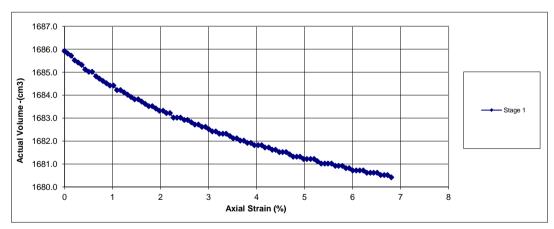
Stage 1

Specimen Details

Borehole		WS1601C
Sample No.		2
Depth	m	1.00
Date		18/04/2016

Shearing Stage





2 P Glons

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Date

Client Ref A089434-1

Contract No

30365-300316

St Asaph

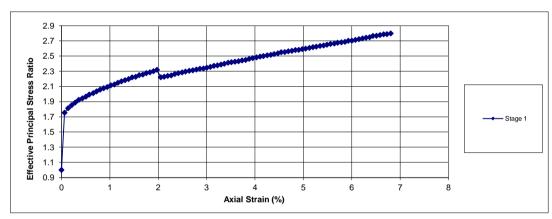
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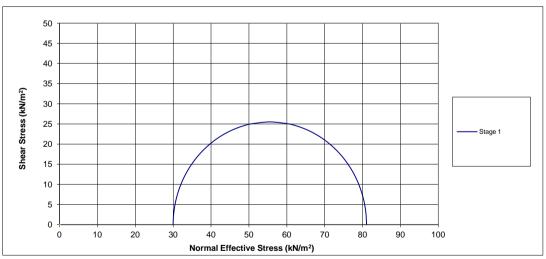
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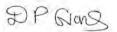
Specimen Details

Borehole		WS1601C
Sample No.		2
Depth	m	1.00
Date		18/04/2016

Shearing Stage







Checked and Approved By

18/04/16 Date

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A089434-1 Contract No

Client Ref

St Asaph

30365-300316

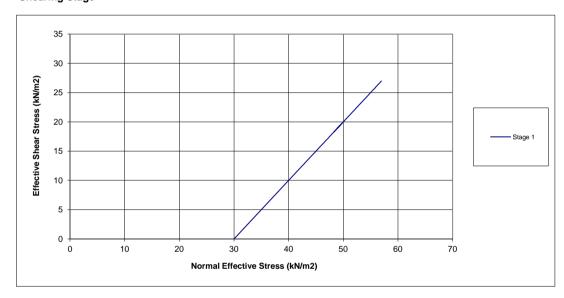
GSSTL 600 Site & Testing Services United

BS 1377: Part 8: 1990

Specimen Details

Borehole		WS1601C
Sample No.		2
Depth	m	1.00
Date		18/04/2016

Shearing Stage



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18/04/16

Date Client Ref

Contract No

St Asaph

30365-300316

A089434-1

GSTL,

BS 1377: Part 8: 1990

Specimen Details

Borehole		WS1601D
Sample No.		1
Depth	m	0.35
Date		14/03/2016
Disturbed / Undisturbed		Disturbed (Remoulded)

Description of Specimen

Greyish orange brown sI silty CLAY

Initial Specimen Conditions

Height	mm	205.00
Diameter	mm	103.00
Area	mm ²	8332.29
Volume	cm ³	1708.12
Mass	g	3390.40
Dry Mass	g	2693.50
Density	Mg/m ³	1.98
Dry Density	Mg/m ³	1.58
Moisture Content	%	26
Specific Gravity	kN/m³	2.65
(assume	d/measured)	assumed

Final Specimen Conditions

Moisture Content	%	27
Density	Mg/m ³	2.02
Dry Density	Mg/m ³	1.59

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2 P Gons

18/04/16 Date

Client Ref

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Contract No

30365-300316

GST/L east site in Testing Services United

BS 1377 : Part 8 : 1990

Specimen Details

Borehole		WS1601D
Sample No.		1
Depth	m	0.35
Date		14/03/2016

Test Setup

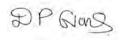
1 COL OCTUP	
Date started	09/04/2016
Date Finished	13/04/2016
Top Drain Used	У
Base Drain Used	У
Side Drains Used	У
Pressure System Number	P5
Cell Number	C5

Saturation

Cell Pressure Incr.	kPa	100.00
Back Pressure Incr.	kPa	97.00
Differential Pressure	kPa	3.00
Final Cell Pressure	kPa	400.00
Final Pore Pressure	kPa	391.00
Final B Value		0.97

Consolidation

- Octoonaation		
Effective Pressure	kPa	20.00
Cell Pressure	kPa	400.00
Back Pressure	kPa	380.00
Excess Pore Pressure	kPa	11.00
Pore Pressure at End	kPa	380.00
Consolidated Volume	cm ³	1690.52
Consolidated Height	mm	204.30
Consolidated Area	mm^2	1690.52
Vol. Compressibility	m ² /MN	0.02712
Consolidation Coef.	m²/yr.	1.33721



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Client Ref A089434-1 Contract No

30365-300316

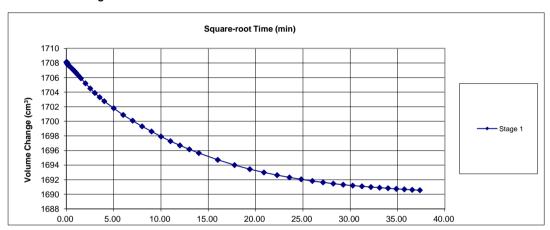
GS7/L GEO Site & Texting Services Umiland

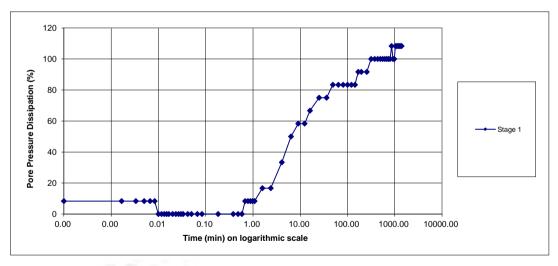
BS 1377 : Part 8 : 1990

Specimen Details

Borehole		WS1601D
Sample No.		1
Depth	m	0.35
Date		14/03/2016

Consolidation Stage





2 P Glors

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18/04/16 Date

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Contract No

30365-300316

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BS 1377: Part 8: 1990

Specimen Details

Borehole		WS1601D
Sample No.		1
Depth	m	0.35
Date		14/03/2016

Shearing		
Initial Cell Pressure	kPa	400
Initial Pore Pressure	kPa	380
Rate of Strain	mm/min	0.0039
Max Deviator Stress		
Axial Strain		10.132
Axial Stress	kPa	62.120
Cor. Deviator stress	kPa	55.524
Effective Major Stress	kPa	77.706
Effective Minor Stress	kPa	20.000
Effective Stress Ratio	P	3.885
s'	kPa	48.853
t'	kPa	28.853
Max Effective Priciple	Stress Ra	ıtio
Axial Strain		6.065
Axial Stress	kPa	50.969
Cor. Deviator stress	kPa	46.862
Effective Major Stress	kPa	66.862
Effective Minor Stress	kPa	20.000
Effective Stress Ratio	P	3.343
s'	kPa	43.431
t'	kPa	23.431
Shear Resistance Angle		i
Cohesion c'	kPa	ĺ
i	ļ	1

2 P Gons

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18/04/16 Date

Client Ref A089434-1 Contract No

St Asaph

30365-300316

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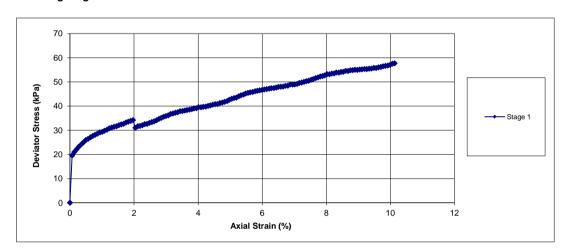
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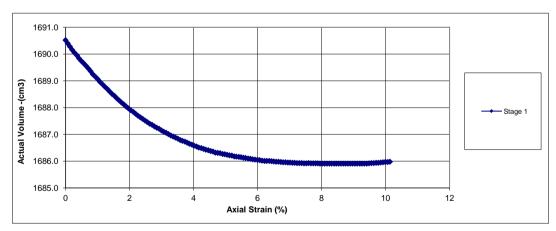
Stage 1

Specimen Details

Borehole		WS1601D
Sample No.		1
Depth	m	0.35
Date		14/03/2016

Shearing Stage





2 P Glons

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18/04/16

Date

Client Ref A089434-1

Contract No

30365-300316

St Asaph

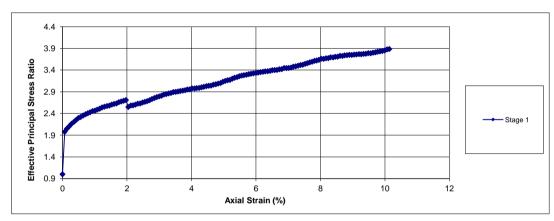
GEO Site A Teeting Services Limited

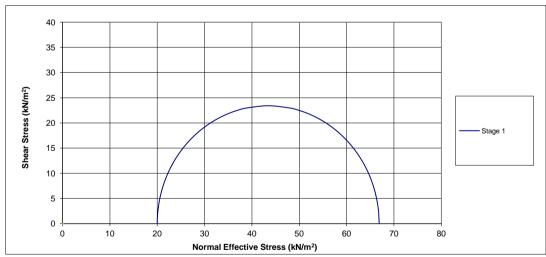
BS 1377 : Part 8 : 1990

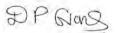
Specimen Details

Borehole		WS1601D
Sample No.		1
Depth	m	0.35
Date		14/03/2016

Shearing Stage







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18/04/16

Date

A089434-1 Contract No

Client Ref

St Asaph

30365-300316

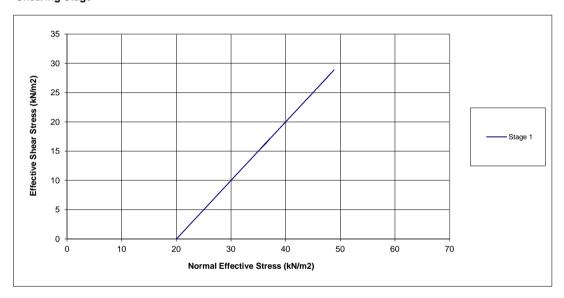
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BS 1377: Part 8: 1990

Specimen Details

Borehole		WS1601D
Sample No.		1
Depth	m	0.35
Date		14/03/2016

Shearing Stage



DP Glons

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18/04/16 Date

Client Ref A089434-1

Contract No

30365-300316

GS Site & Texting Services Limited





Contract Number: 30539

Client's Reference: **A089434-1** Report Date: **20-04-2016**

Client WYG Group
5th Floor

Longcross Court 47 Newport Road

Cardiff CF24 0AD

Contract Title: St Asaph

For the attention of: Luzia Kathriner

Date Received: **08-04-2016**Date Commenced: **08-04-2016**Date Completed: **20-04-2016**

Test Description	Qty
Moisture Content 1377 : 1990 Part 2 : 3.2 - * UKAS	6
4 Point Liquid & Plastic Limit (LL/PL) 1377: 1990 Part 2: 4.3 & 5.3 - * UKAS	5
PSD Wet Sieve method 1377 : 1990 Part 2 : 9.2 - * UKAS	11
PSD: Sedimentation by pipette carried out with Wet Sieve 1377 : 1990 Part 2 : 9.4 - * UKAS	4
pH Value of Soil 1377: 1990 Part 3: 9 - @ Non Accredited Test	3
Water Soluble Sulphate 2:1 extract 1377: 1990 Part 3: 5 - @ Non Accredited Test	3

Notes: Observations and Interpretations are outside the UKAS Accreditation

- * denotes test included in laboratory scope of accreditation
- # denotes test carried out by approved contractor
- @ denotes non accredited tests

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Approved Signatories:

Alex Wynn (Associate Director) - Benjamin Sharp (Contracts Manager) - Emma Sharp (Office Manager) Paul Evans (Quality/Technical Manager) - Vaughan Edwards (Managing Director)

Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk





Contract Number: 30539

Test Description	Qty
Consolidated Drained Peak and Residual Shear Strength - set of 3 60 x 60mm Shear Box Specimens (5 days) 1377: 1990 Part 7: 4 - * UKAS	1
Disposal of Samples on Project	1

Notes: Observations and Interpretations are outside the UKAS Accreditation

- * denotes test included in laboratory scope of accreditation
- # denotes test carried out by approved contractor
- @ denotes non accredited tests

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Approved Signatories:

Alex Wynn (Associate Director) - Benjamin Sharp (Contracts Manager) - Emma Sharp (Office Manager) Paul Evans (Quality/Technical Manager) - Vaughan Edwards (Managing Director)

GEO Site & Testing Services Ltd

Unit 4, Heol Aur, Dafen Ind Estate, Dafen, Llanelli, Carmarthenshire SA14 8QN

Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk

Client ref: A089434-1 Location: St Asaph

Contract Number: 30539-080416

Hole	Sample			
	Number	Туре	Depth (m)	Description of Sample*
		•		·
BH1604	5	D	0.50	Brown sandy gravelly (fine-coarse) silty CLAY
BH1604		D		Brown sandy gravelly (fine-coarse) silty CLAY
BH1604	9	D	1.70	Brown sandy gravelly (fine-coarse) silty CLAY

Note: Results on this table are in summary format and may not meet the requirements of the relevant standards, additional information is held by the laboratory



For and behalf of GEO Site & Testing Services Ltd

Authorised By:

Jon Tatam (Office/Quality Assistant)





Test Report: Method of the Determination of the plastic limit and plasticity index

BS 1377 : Part 2 : 5 : 1990

Client ref: A089434-1
Location: St Asaph
Contract Number: 30539-080416

llala (Malakuw	1 : : -1	Disatis	Disableit	%	
Hole/			Moisture	Liquid	Plastic	Plasticity		
Sample	Sample	Depth	Content	Limit	Limit	Index	Passing	Remarks
Number	Туре	m	%	%	%	%	.425mm	
			CI. 3.2	CI. 4.3/4.4	CI. 5.3	CI. 5.4		
BH1601/4	В	0.70 - 1.20	8.9					
BH1602/4	В	0.30 - 0.60	25	50	22	28	96	CI/H Inter/High Plasticity
BH1603/4	В	0.40 - 0.60	16	44	19	25	61	CI Intermediate Plasticity
BH1604/5	D	0.50	12	49	17	32	83	CI Intermediate Plasticity
BH1604/7	D	1.20 - 1.65	11	48	18	30	61	CI Intermediate Plasticity
BH1604/9	D	1.70	16	48	17	31	67	CI Intermediate Plasticity

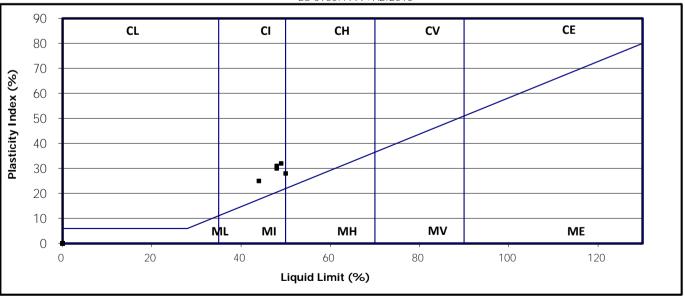
Symbols:

NP : Non Plastic

: Liquid Limit and Plastic Limit Wet Sieved

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

BS 5930:1999+A2:2010





For and on behalf of GEO Site & Testing Services Ltd

Authorised By:

Jon Tatam (Office/Quality Assistant)





Particle Size Distribution Test

BS 1377: Part 2: 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Medium Coarse

 Client ref:
 A089434-1
 Sample Number:
 2

 Contract Number:
 30539-080416
 Depth from (m):
 0.00

 Hole Number:
 BH1601
 Depth to (m):
 0.70

 Sample Type:
 B

Medium Coarse

Medium Coarse

Fine

Location: St Asaph

Fine

Description: Brown sandy silty clayey GRAVEL (fine-coarse)

Fine

		CLAY	SILT	1	SAND	GRAVEL	COBBLES	
BS Test	%							
Sieve	Passing		0.006	0.060	0.600	6.0	500	
125	100			o c	· · · · ·	· · · · · · · · · · · · · · · · · · ·	11111 1 1 1	100
90	100					<i></i> /		
75	100					//		90
63	100							
50	100							80
37.5	94							
28	87							70
20	79							
14	74	<u>.</u>						60
10	71	sing						
6.3	67	Passing.						50
5.0	65	ıge						
3.35	64	enta						
2.00	60	Percentage						40
1.18	58	4						
0.60	55							30
0.425	53							
0.300	51							20
0.212	49							
0.150	47							10
0.063	44							+++++
Particle	%	0.001	0.01	0.1	1	10	100	1000
Particle	70				Particle Size (r	nm).		

Particle	%
Diameter	Passing
0.02	35
0.006	28
0.002	24

Clay	Silt	Sand	Gravel	Cobbles	Soil Fraction
24	20	16	40	0	Total Percentage

Remarks:

Cl 9.4.8 - Sample has not been pretreated



For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Jon Tatam (Office/Quality Assistant)





Particle Size Distribution Test

BS 1377: Part 2: 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

 Client ref:
 A089434-1
 Sample Number:
 4

 Contract Number:
 30539-080416
 Depth from (m):
 0.70

 Hole Number:
 BH1601
 Depth to (m):
 1.20

 Sample Type:
 B

Location: St Asaph

Description: Brown clayey silty sandy GRAVEL (fine-coarse)

			Fine	Mediu	um Coars	e Fine	Med	dium Coarse	Fine	Medium	Coarse			
		CLAY		SILT	Γ		SA	ND		GRAVEL		COBBLES		
			_											
BS Test	%													
Sieve	Passing		0.002	3	0.030	- 090.0	0.200	0.600	3	300		500		
125	100		0 0	5	0.0	0.0	Ö	0.6	, ,		9	- 75		n 100
90	100						$\perp \perp$				$\perp \! \! \perp \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \!$			100
75	100			Ш			$\perp \perp$				$\perp \mid I \mid$			90
63	100						$\perp \perp$				$\perp \! \! \perp \! \! / \! \! \perp$, ,
50	92						$\perp \perp$			Ш	$\perp \prime \perp$			80
37.5	74						$\perp \perp$				$\perp I \perp \downarrow$			1
28	67						$\perp \perp$							70
20	55										$/\!\!\!/\!\!\!/\!\!\!/\!\!\!\!/$			1 / 0
14	52	_انـ ا					$\perp \perp$				/			60
10	46	sing								<i> </i>				
6.3	40	Pas					$\perp \perp$							50
5.0	36	age] 30
3.35	32	enta												40
2.00	28	Percentage Passing.												40
1.18	24	<u> </u>												30
0.60	20													30
0.425	17													20
0.300	15													20
0.212	13													10
0.150	12				_									10
0.063	11													0
Doublel	0/	0.001		0.01		0.1		1		10		100	10	000
Particle	%							Particle Size (r	nm).					

Particle	%
Diameter	Passing
0.02	8
0.007	_
0.006	5
0.002	4

Clay	Silt	Sand	Gravel	Cobbles	Soil Fraction
4	7	17	72	0	Total Percentage

Remarks:

CI 9.4.8 - Sample has not been pretreated

GS7L

GEO SITE & TESTING SERVICES LTD

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Jon Tatam (Office/Quality Assistant)





Particle Size Distribution Test

BS 1377: Part 2: 1990

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 9

 Contract Number:
 30539-080416
 Depth from (m):
 2.00

 Hole Number:
 BH1601
 Depth to (m):
 2.50

 Sample Type:
 B

Location: St Asaph

Description: Brown clayey silty sandy GRAVEL (fine-coarse)

			Fine	Mediu	ım Coarse	Fine	Med	dium Coarse	Fine	Medium	Coarse			
		CLAY		SILT	-		SA	ND		GRAVEL		COBBLES	5	
BS Test	%	1												
Sieve	Passing		0.002	3	0.030	000.0	0.200	0.600		2 2	9	200		
125	100	l _	0.0	5	o o	5	0	0.0	, <u> </u>) (- 5	7		100
90	100			Ш							$\perp / \mid \perp \mid$			
75	100			Ш							$H \sqcup H$			90
63	100			Ш							$/\!\!\perp\perp\!\!\perp$			Щ <i>7</i> °
50	100										$/\!\!\perp\!\!\perp\!\!\perp\!\!\perp$			80
37.5	100			Ш						$\bot \!\!\! \bot \!\!\!\! \bot \!\!\!\! J$				
28	87			Ш						$\coprod \coprod$				70
20	74			Ш						$\parallel \parallel \perp \parallel$				
14	55	╽╺┝		Ш						$\perp \!\!\! \perp \!\!\! \perp \!\!\! \perp \!\!\! \perp$				60
10	43	sing		Ш						$\sqcup \!\!\! \sqcup \!\!$				
6.3	31	Percentage Passing.		Ш						$\square \!\!\! \square \!\!\! / \!\!\! \perp$				50
5.0	26	age								$\square \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \!$				
3.35	21	ent?		Ш						$\perp \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \!$				40
2.00	15	erc												40
1.18	11	Ⅰ "匚		Ш						/				30
0.60	8													
0.425	6			Ш										20
0.300	6													
0.212	5													10
0.150	4													
0.063	4	J 🗀												
Particle	%	0.001		0.01		0.1		Particle Size (r	mm).	10		100		1000

1 01 11010	, 0
Diameter	Passing
0.02	#
0.006	#
0.002	#

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
4	11	85	0	Total Percentage

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Jon Tatam (Office/Quality Assistant)





Particle Size Distribution Test

BS 1377: Part 2: 1990

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 2

 Contract Number:
 30539-080416
 Depth from (m):
 0.00

 Hole Number:
 BH1602
 Depth to (m):
 0.30

 Sample Type:
 B

Location: St Asaph

Description: Brown gravelly (fine-coarse) sandy silty CLAY

			Fine	Medium	Coarse	Fine	Mediu	m Coarse	Fine	Medium	Coarse			
		CLAY		SILT			SANI			GRAVEL		COBBLES	3	
						-						<u> </u>	•	
BS Test	%	1												
Sieve	Passing		700.0		0.030	8	0.200	0.600	0.0	' -		200		
125	100		0		0.0	3	0.0	0.6	, 9	50	9	72		100
90	100										I			Ш
75	100													90
63	100													
50	100													80
37.5	100													Ш
28	93													70
20	93					Ш.,								Ш
14	92	<u>.</u>												60
10	92	sing												
6.3	90	Pas												50
5.0	89	age												
3.35	88	anta 📗												40
2.00	86	Percentage Passing.												40
1.18	85													30
0.60	81													
0.425	78													20
0.300	74													$\prod_{i=1}^{20}$
0.212	66													10
0.150	64													10
0.063	57	J												
Particle	%	0.001		0.01		0.1		1		10		100		1000
Planticle	/O						Pa	rticle Size (r	nm).					

Particle	%
Diameter	Passing
0.02	#
0.006	#
0.002	#

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
57	29	14	0	Total Percentage

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Jon Tatam (Office/Quality Assistant)





Particle Size Distribution Test

BS 1377: Part 2: 1990

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 4

 Contract Number:
 30539-080416
 Depth from (m):
 0.30

 Hole Number:
 BH1602
 Depth to (m):
 0.60

 Sample Type:
 B

Location: St Asaph

Description: Brown sandy silty CLAY

			Fine	Mediur	m Coarse	Fine	Mediu	um Coarse	Fine	Medium	Coarse	COBBLES		
		CLAY		SILT			SAN	D		GRAVEI	_			
												 		
BS Test	%	1												
Sieve	Passing	9	0.002	3	0.030	090:0	0.200	0.600	3 0	2	07 09	200		
125	100			2	0 0	5	0	Ö °	, ,) (ý 30	×		1 00
90	100			Ш		Ш								1
75	100					Ш			$\perp \perp \perp \perp$					90
63	100						$1 \sqcup 1$							
50	100													80
37.5	100													
28	100													70
20	100													,,,
14	100													60
10	100	sing												00
6.3	100	Pas												50
5.0	100	age												30
3.35	100	ant:												40
2.00	100	Percentage Passing.												40
1.18	99													30
0.60	98													30
0.425	96													1
0.300	94													20
0.212	90													1
0.150	87													10
0.063	82													1
		0.001		0.01		0.1		1		10		100	10	4 0
Particle	%						Pa	article Size (r	nm).					

Particle	%
Diameter	Passing
0.02	#
0.006	#
0.002	#

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
82	18	0	0	Total Percentage

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Jon Tatam (Office/Quality Assistant)





Particle Size Distribution Test

BS 1377: Part 2: 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

 Client ref:
 A089434-1
 Sample Number:
 6

 Contract Number:
 30539-080416
 Depth from (m):
 0.60

 Hole Number:
 BH1602
 Depth to (m):
 1.20

 Sample Type:
 B

Location: St Asaph

Description: Brown clayey silty sandy GRAVEL (fine-coarse) with cobble content

			F	ine	Mediun	n Coar	se	Fine	Med	lium	Coarse	Fine	Mediu	ım Co	oarse					
		CLAY			SILT				SAI	ND			GRAV	EL		COB	BLES			
BS Test	%	1																		
Sieve	Passing		0.002	900.0		0:030	090.0		0.200	0.600	8	0.9		20	99		200			
125	100	I —	<u>Ö</u>	<u>_</u>		- i	Ö		O.	Ö	7	1 9	·	7	9		7			100
90	100						Ш		Щ.						Ш	Ш_		Ш	Ш	
75	100				Ш		Ш		Ш						$\perp \! \! \! \! \! \! \! \! \perp \! \! \! \! \! \! \! \! \! \!$			Ш	Ш	90
63	84						Ш								$\perp \!\!\! \perp \!\!\! \downarrow \!\!\! \downarrow \!\!\! \downarrow \!\!\! \downarrow \!\!\! \downarrow$			Ш	Ш	, 0
50	69						Ш								$\perp \! \! \perp \! \! \! \! \! \! \! \perp \! \! \! \! \! \! \! \!$			Ш	Ш	80
37.5	62						Ш		Ш						$\perp \mu$	Ш		Ш	Ш	00
28	57						Ш	Ш	Ш						Ш	Ш		Ш	Ш	70
20	53																			70
14	49														/Ш					60
10	47	sing																		00
6.3	43	Pas																		50
5.0	42	ge					Ш											Ш		50
3.35	41	inta																		40
2.00	40	Percentage Passing.					Ш													40
1.18	36	4									1									20
0.60	31						Ш													30
0.425	28						Ш									Ш				00
0.300	26																	Ш	Ш	20
0.212	23				11 _		111	Ш								Ш			Ш	
0.150	20				+		††							\top	+++	Ш			Ш	10
0.063	17	J					Ш	Ш										H	$\dagger \dagger$	
_	1	0.001			0.01			0.1			1		10	1		100			100	0
Particle	%	2.001								Particl	e Size (n	nm).							. 00	-

1 01 11010	, 0
Diameter	Passing
0.02	11
0.006	8
0.002	6

Clay	Silt	Sand	Gravel	Cobbles	Soil Fraction
6	11	23	44	16	Total Percentage

Remarks:

CI 9.4.8 - Sample has not been pretreated

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GEO SITE & TESTING SERVICES LTD

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Jon Tatam (Office/Quality Assistant)





Particle Size Distribution Test

BS 1377: Part 2: 1990

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 8

 Contract Number:
 30539-080416
 Depth from (m):
 1.20

 Hole Number:
 BH1602
 Depth to (m):
 1.70

 Sample Type:
 B

Location: St Asaph

Description: Brown sandy clayey silty GRAVEL (fine-coarse) with cobble content

			Fine	Mediur	Fine Medium Coarse			dium Coars	se	Fine 1	/ledium	Coarse			
		CLAY		SILT			SA	 ND			RAVEL		COBBLES	;	
				OILI											
BS Test	%	1													
Sieve	Passing	5	1 %	}	0.030	I 26	00	00	9	0			0		
125	100		0.006		0.0	0.00	0.200	0.600	2.00	0.9	20	09	200		100
90	74														100
75	74														90
63	74] 90
50	68														
37.5	61														80
28	48														70
20	42														70
14	37														
10	34	ging										711			60
6.3	30	Pass										7			
5.0	27	ge										/			50
3.35	23	enta													40
2.00	19	Percentage Passing													1 40
1.18	16														
0.60	14														30
0.425	14														
0.300	13								/						20
0.212	12														10
0.150	11														10
0.063	10	J []													
D 11.1	0/	0.001		0.01		0.1		1			10		100	1	₩ 0 1000
Particle	%							Particle Size	e (mı	m).					

Diameter	Passing
0.02	#
0.006	#
0.002	#

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
10	9	55	26	Total Percentage

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Jon Tatam (Office/Quality Assistant)





Particle Size Distribution Test

Medium Coarse

BS 1377: Part 2: 1990

Wet Sieve, Clause 9.2

Client ref: A089434-1 Sample Number: 12 **Contract Number:** 30539-080416 Depth from (m): 2.00 Hole Number: BH1602 2.50 Depth to (m): Sample Type: В

Medium Coarse

Medium Coarse

Fine

Location: St Asaph

Fine

Brown clayey silty sandy GRAVEL (fine-coarse) Description:

Fine

		CLAY	•	SILT				1	AND		(GRAVEL	304.00	COBBL	ES _		
BS Test	%	1															
Sieve	Passing		0.002	900.0		0.030	090.0	0.200	0.600	2.00	0.9	20	0	200			
125	100	_ ا	0.0	0.0		Ö	0	0	9.0	2.	9	7	99	7			100
90	100						Ш									Ш	1
75	100												Ш			Ш	90
63	100												$I \sqcup I$			Ш] '`
50	100												$H \perp$			Ш	80
37.5	96						Ш									Ш	
28	76											$\parallel \perp \parallel /$				Ш	70
20	57						Ш					$\parallel \parallel $				Ш	1 , ,
14	48	ا خ					Ш					$\perp \!\!\! \perp \!\!\! \perp \!\!\! \perp$				Ш	60
10	40	sing					Ш									Ш	
6.3	30	Pas														Ш	50
5.0	24	age										\parallel / \perp					30
3.35	17	ent										V				Ш	40
2.00	11	Percentage Passing															40
1.18	9	IĽL									$\bot \bot \bot \diagup$					Ш	30
0.60	7																30
0.425	6																20
0.300	5																20
0.212	4																10
0.150	4																10
0.063	4	J [
Particle	%	0.001			0.01		0.1		1 Particle S	Size (m	m).	10		100		10	000

0.02	#		Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
0.006	#		4	7	89	0	Total Percentage

Particle Size (mm).

Remarks:

0.002

Diameter

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Jon Tatam (Office/Quality Assistant)





Particle Size Distribution Test

BS 1377: Part 2: 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Medium Coarse

 Client ref:
 A089434-1
 Sample Number:
 4

 Contract Number:
 30539-080416
 Depth from (m):
 0.40

 Hole Number:
 BH1603
 Depth to (m):
 0.60

 Sample Type:
 B

Medium Coarse

Medium Coarse

Fine

Location: St Asaph

Fine

Description: Brown silty clayey sandy GRAVEL (fine-coarse)

Fine

		CLAY	SILT	•	S	SAND	GR	AVEL	COBBLES	
BS Test Sieve	% Passing		0.002	0.030	0.200	0.900	2.00	20	5000	
125	100					 	``			100
90	100							//		
75	100	-						-++//		90
63	100									
50	90	-								80
37.5	80						 	$\mathcal{A} + \cdots$		
28	80	-								70
20 14	77 73									
10	73	<u>ğ</u>								60
6.3	69	ssir			$\parallel \parallel / \parallel$					
5.0	68	B Ba								50
3.35	66	tag								
2.00	65	Percentage Passing.			1111		 			40
1.18	63	Per					 			
0.60	62						 			30
0.425	61						+ + + + + + + + + + + + + + + + + + + +			
0.300	60		 				 			20
0.212	56		 			 	 	- 		+++++
0.150	52		 			 	+ + + + + + + + + + + + + + + + + + + +			10
0.063	41									+++++
		0.001	0.01		0.1	1	10	<u> </u>	100	1000
Particle	%	0.001	0.01		U. I	Particle Size		J	100	1000

Particle	%
Diameter	Passing
0.02	32
0.006	26
0.002	23

Clay	Silt	Sand	Gravel	Cobbles	Soil Fraction
23	18	24	35	0	Total Percentage

Remarks:

CI 9.4.8 - Sample has not been pretreated

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GEO SITE & TESTING SERVICES LTD

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Jon Tatam (Office/Quality Assistant)





Particle Size Distribution Test

BS 1377: Part 2: 1990

Wet Sieve, Clause 9.2

 Client ref:
 A089434-1
 Sample Number:
 8

 Contract Number:
 30539-080416
 Depth from (m):
 1.20

 Hole Number:
 BH1603
 Depth to (m):
 1.70

 Sample Type:
 B

Location: St Asaph

Description: Brown clayey silty sandy GRAVEL (fine-coarse) with cobble content

				Fine	Med	dium Coarse	F	Fine Me	edium (Coarse	Fine	Med	ium Co	oarse	_				
		CLAY			SII	LT		SA	AND			GRA	VEL		COBBI	LES			
BS Test	%	1																	
Sieve	Passing		0.002	900.0		0.030	0.060	0.200	0.600	00		j.	20	09		200			
125	100	1 _	0.0	0:0		Ö ö		0	9.0	^	į	· · · · · ·	2	7		×			100
90	100				Ш		Ш								Ш			Ш	
75	79				Ш		Ш											Ш	90
63	79						Ш												70
50	79				Ш		Ш							Ш				Ш	80
37.5	73																		00
28	63													$/\!\!\perp\!\!\!\perp$					70
20	59																		70
14	54																		60
10	50	ing																	00
6.3	44	Pass					Ш												Γ0
5.0	41	ge																	50
3.35	37	anta .					Ш												40
2.00	34	Percentage Passing.					Ш												40
1.18	30	٥			Ш		Ш												0.0
0.60	26						Ш											Ш	30
0.425	24						Ш								Ш			Ш	
0.300	22				Ш													Ш	20
0.212	20		\top		HH		-										\Box		
0.150	18		\top				++											$\parallel \parallel$	10
0.063	16	J	\top				++										$\parallel \parallel$		
		0.001			0.01		0.	.1		1		10			100			100	0
Particle	%								Particle	Size (n	nm).	-							

i di ticio	, 0
Diameter	Passing
0.02	#
0.006	#
0.002	#

Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
16	18	45	21	Total Percentage

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Jon Tatam (Office/Quality Assistant)





Particle Size Distribution Test

Medium Coarse

BS 1377: Part 2: 1990

Wet Sieve, Clause 9.2

Client ref: A089434-1 Sample Number: 12 Depth from (m): Contract Number: 30539-080416 2.00 Hole Number: BH1603 2.50 Depth to (m): Sample Type: В

Medium Coarse

Fine

Medium Coarse

Location: St Asaph

Fine

Brown clayey silty sandy GRAVEL (fine-coarse) with cobble content Description:

Fine

		CLAY	-		SILT			SA	AND	34.00		GRAV		(COBBLES	
BS Test	%	1														
Sieve	Passing		0.002	900.0		0.030	090:0	0.200	0.600	2.00	0.9		0	_	200	
125	100	l _	0.0	0.0		0.0	0.0	0.2	9.0	2	, 9		20	09	- 52	 100
90	100															
75	100													ШШ		90
63	74															
50	64													Ш		80
37.5	50															
28	33													$\Box I \Box$		70
20	27															Ш ′
14	23	L⊥														60
10	20	sing														
6.3	16	Pas														50
5.0	14	age														
3.35	12	en ta											_ /			40
2.00	10	Percentage Passing.											$\perp I$			40
1.18	9															30
0.60	8															
0.425	7															20
0.300	7															
0.212	5															10
0.150	5															10
0.063	5	J [
Particle	%	0.001			0.01		0.	.1	1 Particle	Size (m	nm).	10		1	100	1000

Diameter	Passing					
0.02	#		Silt and Clay	Sand	Gravel	Cobble
0.006	#		5	5	64	26
0.002	#					

Remarks:

#- not determined



For and behalf of GEO Site & Testing Services Ltd

Authorised By: Jon Tatam (Office/Quality Assistant)

Date: 15.4.16



Soil Fraction Total Percentage



 Contract No:
 30539-080416

 Client Ref:
 A089434-1

 Location:
 St Asaph

 Date:
 13/04/2016

SUMMARY OF CHEMICAL ANALYSIS

(B.S. 1377 : PART 3 : 1990)

		1	I Sulphate	Content SO3 (a		Chloride (1		
			Acid	Aqueous	Ground-	Soluble	Ground-	pН	Organic	Loss	
Hole	Sample	Depth	Soluble	Extract	water	Chloride as	water	Value	Matter	on	Remarks
Number	Type/	m	Sulphate	Sulphate	water	% equiv.	water	@ 25°C	Content	Ignition	Kemarks
Number	Number	'''	as % SO ₄	as g/I SO ₄	~ (1	NaCl	- 4	@ 23 0	%	%	
	Number				g/l		g/l				
DUITO	D /F	0.50	Clause 5.5.	Clause 5.5.	Clause 5.4.	Clause 7.3	Clause 7.2	Clause 9.	Clause 3.	Clause 4.	
BH1604	D/5	0.50		0.01 (0.01))			6.98			
BH1604	D/16	3.50		0.02 (0.02))			7.20			
BH1604	D/26	6.50		0.02 (0.02))			7.63			
<u> </u>					ļ					-	
					<u></u>		<u></u>				
					1				1	1	
					-						
					1						
					1				1	1	
					-						
					I						

NCP - No Chloride present

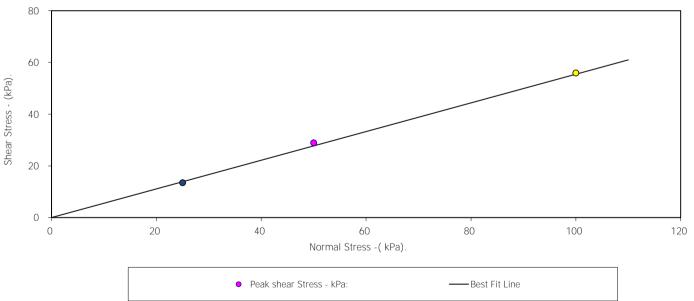
BS1377:Part 7:4.5 :1990.

Borehole Number: BH1604 Depth from (m): 0.10
Sample Number: Depth to (m): 2.50

Sample Number .		Deptil to (III).	2.30	
Sample Type:	В			
Particle Density - Mg/m3:	2.65	(Assumed)		
Specimen Tested:	Submerged, Remoulded	(Light Tamping) Material at	oove 2mm removed.	
Sample Description:				
Brown sandy (fine-coarse) gravelly (fi	ne-coarse/angular-subrounded):	silty CLAY		
STAGE		1	2	3
Initial Conditions				
Height - mm:		24.50	24.50	24.50
Length - mm:		59.90	59.90	59.90
Moisture Content - %:		25	25	25
Bulk Density - Mg/m3:		1.99	1.99	1.99
Dry Density - Mg/m3:		1.60	1.60	1.60
Voids Ratio:		0.6603	0.6608	0.6601
Normal Pressure- kPa		25	50	100
Consolidation				
Consolidated Height - mm:		24.35	23.08	21.81
Shear		•		
Rate of Strain (mm/min)		0.010	0.010	0.010
Strain at peak shear stress (mm)		10.04	9.75	9.45
Peak shear Stress - kPa:		13	29	56

PEAK	
Angle of Shearing Resistance: (0)	29.0
Effective Cohesion - kPa	

FAILURE CONDITIONS



2000 Sions

20/04/16

2 P GIONS

20/04/16

Checked Pages 1-4 by:

Date:

Approved Pages 1-4 by:

Date

Contract No.: **30539-080416**

St Asaph

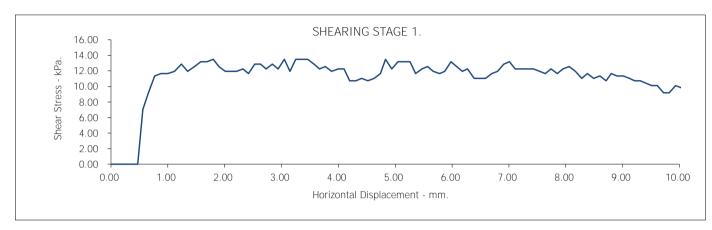
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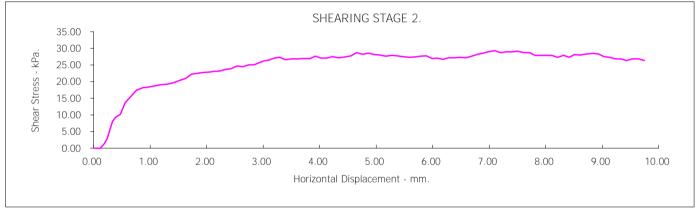


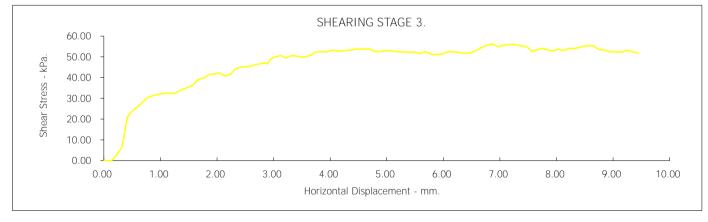


BS1377:Part 7:4.5:1990.

Borehole Number: BH1604 Depth from (m): 0.10
Sample Number: Depth to (m): 2.50







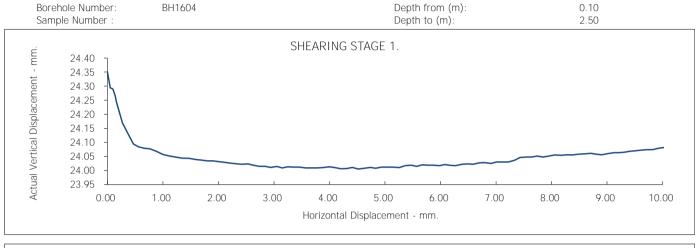
Contract No.: **30539-080416**

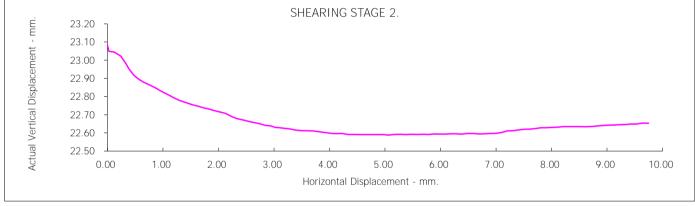
St Asaph

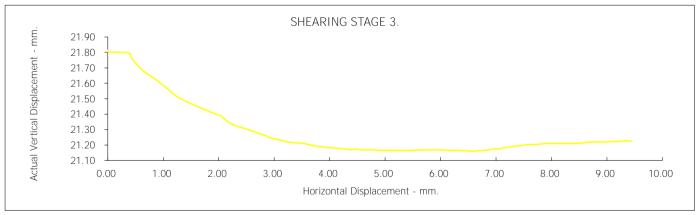
Client Ref Number: A089434-1



BS1377:Part 7:4.5:1990.







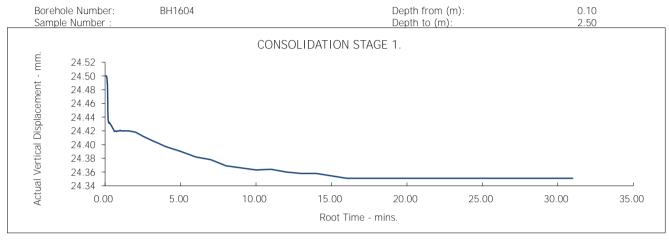
St Asaph

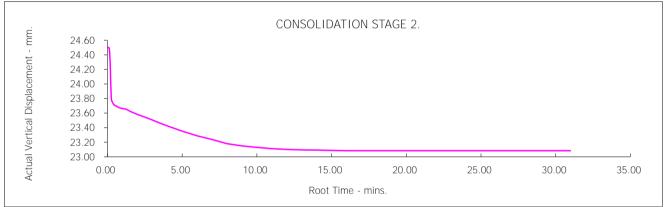
Contract No.: **30539-080416**

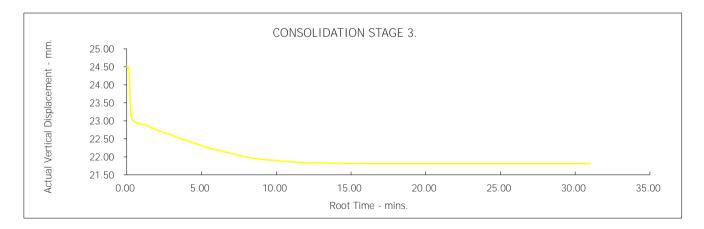
Client Ref Number: **A089434-1**



BS1377:Part 7:4.5:1990.







Contract No.: **30539-080416**

St Asaph

Client Ref Number: **A089434-1**



St Asaph FRMS Additional Ground Investigation



Appendix D – Environmental Laboratory Testing Suites

St Asaph FRMS Additional Ground Investigation



Determinand	Detection level
SUITE E1 – Soil sampl	
Arsenic Son Sample	1 mg/kg
Cadmium	0.5 mg/kg
Chromium - total	10 mg/kg
Copper	10 mg/kg
Lead	10 mg/kg
Mercury	0.5 mg/kg
Nickel	10 mg/kg
Selenium	0.5 mg/kg
Zinc	10 mg/kg
Cyanide - total	5 mg/kg
рН	0.1 units
Boron (water soluble)	0.5 mg/kg
Phenols - total	1 mg/kg
Total Organic Carbon	0.1% w/w
SUITE E2 – Soil sampl	es Asbestos
Asbestos presence and identification	0.001% w/w
Asbestos quantification HSG248	0.001%w/w
SUITE E3 – Soil sampl	es speciated TPH
TPHCWG	10 mg/kg
SUITE E4 – Soil sampl	es PAH
USEPA 16 Polyaromatic Hydrocarbons	0.2 mg/kg
SUITE E8 — Soil san chromium	nples hexavalent
Chromium - hexavalent	5 mg/kg

Determinand	Detection level
SUITE F1 – Water sam	ples general
pH value	0.1 pH units
Hardness	2 mg/l
Arsenic	5 μg/l
Cadmium	1 μg/l
Chromium	10 μg/l
Copper	10 μg/l
Lead	10 μg/l
Mercury	0.1 μg/l
Nickel	10 μg/l
Selenium	5 μg/l
Zinc	30 μg/l
Ammoniacal nitrogen	0.1 mg/l
Cyanide - total	30 μg /l
Phenols - total	20 μg/l
SUITE F2 — Water sam	ples speciated TPH
TPH CWG	50 μg/l
SUITE F3 – Water sam	ples PAH
16 USEPA Polyaromatic Hydrocarbons	0.05 μg/l



Registered Address: Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point

Zone 3

Deeside Industrial Park

Deeside CH5 2UA

WYG 5th Floor Longcross Court 47 Newport Road Cardiff CF24 0AD

Tel: +44 (0) 1244 833780

Fax: +44 (0) 1244 833781





Attention: Luzia Kathriner

Date: 12th May, 2016

Your reference : A089434-1

Our reference : Test Report 16/6451 Batch 1 16/6451 Batch 2 16/6451 Batch 3

Location: St Asaph

Date samples received: 17th & 19th March, 2016 & 8th April, 2016

Status: Final report

Issue:

Twenty one samples were received for analysis on 17th & 19th March, 2016 & 8th April, 2016. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Phil Sommerton BSc Project Manager

Client Name: WYG

Reference: A089434-1 Location: St Asaph

Contact: Luzia Kathriner

JE Job No.: 16/6451

Report : Solid

J E Sample No.	3-4	8-9	32-33	36-37	38-39	40-41	42-43				
Sample ID	WS1601 A	WS1601 A	TP1604	BH1602	TP1608	TP1608	TP1606				
Depth	0.67-0.90	1.96-2.80		0.60-1.70	0.60-0.70	1.10-1.45	0.30-0.80		Please se	e attached n	otes for all
COC No / misc										ations and a	
Containers	٧J	٧J	٧J	٧J	٧J	٧J	٧J				
Sample Date	15/03/2016	15/03/2016	17/03/2016	06/04/2016	06/04/2016	06/04/2016	06/04/2016				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil				
Batch Number	1	1	2	3	3	3	3		LOD/LOR	Units	Method No.
•	17/03/2016	17/03/2016	19/03/2016		08/04/2016	08/04/2016	08/04/2016				
Arsenic #M	11.8	18.4	19.1	7.5	3.6	12.2	9.7		<0.5	mg/kg	TM30/PM15
Cadmium #M	0.6	0.9	1.3	<0.1	0.7	0.8	0.3		<0.1	mg/kg	TM30/PM15
Chromium #M	58.7	42.5	42.9	70.4	28.8	77.7	69.5		<0.5	mg/kg	TM30/PM15
Copper #M	42	53	193	23	12	39	28		<1	mg/kg	TM30/PM15
Lead **M Mercury **M	110 <0.1	192 0.1	504 0.6	17 <0.1	26 <0.1	107 <0.1	100 <0.1		<5 <0.1	mg/kg mg/kg	TM30/PM15 TM30/PM15
Nickel *M	42.7	35.0	29.4	50.5	14.2	48.8	40.5		<0.1	mg/kg	TM30/PM15
Selenium *M	1	<1	1	<1	<1	2	1		<1	mg/kg	TM30/PM15
Water Soluble Boron #M	1.5	1.3	1.8	0.4	0.4	1.2	1.1		<0.1	mg/kg	TM74/PM32
Zinc **M	192	230	586	110	64	183	166		<5	mg/kg	TM30/PM15
PAH MS											
Naphthalene #M	<0.04	1.43 _{AB}	<0.04	<0.04	<0.04	<0.04	<0.04		<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	12.83 _{AB}	<0.03	<0.03	<0.03	<0.03	<0.03		<0.03	mg/kg	TM4/PM8
Acenaphthene #M	<0.05	1.73 _{AB}	<0.05	<0.05	<0.05	<0.05	<0.05		<0.05	mg/kg	TM4/PM8
Fluorene #M	<0.04	9.10 _{AB}	<0.04	<0.04	<0.04	<0.04	<0.04		<0.04	mg/kg	TM4/PM8
Phenanthrene #M	0.26	59.23 _{AB}	0.10	<0.03	0.04	0.04	0.10		<0.03	mg/kg	TM4/PM8
Anthracene #	0.09	21.59 _{AB}	<0.04	<0.04	<0.04	<0.04	<0.04		<0.04	mg/kg	TM4/PM8
Fluoranthene #M	1.18	57.17 _{AB}	0.19	0.07	0.11	0.13	0.26		<0.03	mg/kg	TM4/PM8
Pyrene #	1.16	47.79 _{AB}	0.18	0.06	0.10	0.12	0.24		<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.75	25.90 _{AB}	0.13	<0.06	0.08	0.12	0.17		<0.06	mg/kg	TM4/PM8
Chrysene #M	0.81	26.86 _{AB}	0.13	0.05	0.08	0.11	0.18		<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #M	1.31	34.87 _{AB}	0.22	<0.07	0.10	0.17	0.30		<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene # Indeno(123cd)pyrene #M	0.82	20.59 _{AB}	0.13	<0.04	0.06	0.11	0.17		<0.04	mg/kg	TM4/PM8 TM4/PM8
Dibenzo(ah)anthracene #	0.55	10.45 _{AB}	0.09 <0.04	<0.04	<0.04 <0.04	0.08 <0.04	0.10 <0.04		<0.04	mg/kg mg/kg	TM4/PM8
Benzo(ghi)perylene #	0.51	9.55 _{AB}	0.09	<0.04	<0.04	0.07	0.08		<0.04	mg/kg	TM4/PM8
PAH 16 Total	7.5	342.0 _{AB}	1.3	<0.6	<0.6	1.0	1.6		<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.94	25.11 _{AB}	0.16	<0.05	0.07	0.12	0.22		<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.37	9.76 _{AB}	0.06	<0.02	0.03	0.05	0.08		<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	122	123 _{AB}	106	104	104	108	105		<0	%	TM4/PM8
TPH CWG											
Aliphatics											
>C5-C6 **M	<0.1	<0.2 _{AA}	<0.2 _{AA}	<0.1	<0.1	<0.1	<0.1		<0.1	mg/kg	TM36/PM12
>C6-C8 **M	<0.1	<0.2 _{AA}	<0.2 _{AA}	<0.1	<0.1	<0.1	<0.1		<0.1	mg/kg	TM36/PM12
>C8-C10	<0.1	<0.2 _{AA}	<0.2 _{AA}	<0.1	<0.1	<0.1	<0.1		<0.1	mg/kg	TM36/PM12
>C10-C12 **M	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		<0.2	mg/kg	TM5/PM16
>C12-C16 **M	<4	<4	<4	<4	<4	<4	<4		<4	mg/kg	TM5/PM16
>C16-C21 **M	<7	<7	<7	<7	<7	<7	<7		<7	mg/kg	TM5/PM16
>C21-C35 #M	<7	13	19	<7	<7	<7	<7		<7	mg/kg	TM5/PM16
Total aliphatics C5-35	<19	<19	19	<19	<19	<19	<19		<19	mg/kg	TM5/TM36/PM12/PM16

Client Name: WYG

Reference: A089434-1 Location: St Asaph

Contact: Luzia Kathriner

Report : Solid

JE Job No.:	16/6451
-------------	---------

J E Sample No.	3-4	8-9	32-33	36-37	38-39	40-41	42-43					
Sample ID	WS1601 A	WS1601 A	TP1604	BH1602	TP1608	TP1608	TP1606					
Depth	0.67-0.90	1.96-2.80		0.60-1.70	0.60-0.70	1.10-1.45	0.30-0.80			Please se	e attached n	otes for all
COC No / misc											ations and a	
Containers	٧J	٧J	٧J	٧J	٧J	٧J	٧J					
Sample Date	15/03/2016	15/03/2016	17/03/2016	06/04/2016	06/04/2016	06/04/2016	06/04/2016					
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil					
Batch Number	1	1	2	3	3	3	3					
Date of Receipt										LOD/LOR	Units	Method No.
TPH CWG	17/03/2016	17/03/2016	19/03/2016	08/04/2016	08/04/2016	08/04/2016	08/04/2016					
Aromatics												
>C5-EC7	<0.1	<0.2 _{AA}	<0.2 _{AA}	<0.1	<0.1	<0.1	<0.1			<0.1	mg/kg	TM36/PM12
>EC7-EC8	<0.1	<0.2 _{AA}	<0.2 _{AA}	<0.1	<0.1	<0.1	<0.1			<0.1	mg/kg	TM36/PM12
>EC8-EC10 #M	<0.1	<0.2 _{AA}	<0.2 _{AA}	<0.1	<0.1	<0.1	<0.1			<0.1	mg/kg	TM36/PM12
>EC10-EC12	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2			<0.2	mg/kg	TM5/PM16
>EC12-EC16	<4	11	<4	<4	<4	<4	<4			<4	mg/kg	TM5/PM16
>EC16-EC21 >EC21-EC35	<7 29	131 329	<7 19	<7 <7	<7 20	<7 29	<7 28			<7 <7	mg/kg mg/kg	TM5/PM16 TM5/PM16
Total aromatics C5-35	29	471	19	<19	20	29	28			<19	mg/kg	TM5/TM36/PM12/PM16
Total aliphatics and aromatics(C5-35)	<38	471	38	<38	<38	<38	<38			<38	mg/kg	TM5/TM36/PM12/PM16
MTBE#	<5	<10 _{AA}	<10 _{AA}	<5	<5	<5	<5			<5	ug/kg	TM31/PM12
Benzene #	<5	<10 _{AA}	<10 _{AA}	<5	<5	<5	<5			<5	ug/kg	TM31/PM12
Toluene #	<5	<10 _{AA}	<10 _{AA}	<5	<5	<5	<5			<5	ug/kg	TM31/PM12
Ethylbenzene # m/p-Xylene #	<5 <5	36 _{AA}	<10 _{AA}	<5 <5	<5 <5	<5 <5	<5 <5			<5 <5	ug/kg ug/kg	TM31/PM12 TM31/PM12
o-Xylene #	<5 <5	18 _{AA}	<10 _{AA}	<5 <5	<5	<5	<5			<5 <5	ug/kg	TM31/PM12
o Aylone		о : дд	тодд								-55	
Total Phenols HPLC	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15			<0.15	mg/kg	TM26/PM21
Natural Moisture Content	25.1	15.0	19.1	7.9	10.4	31.3	17.9			<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3			<0.3	mg/kg	TM38/PM20
Total Cyanide #M	<0.5	<0.5	4.2	<0.5	<0.5	<0.5	<0.5			<0.5	mg/kg	TM89/PM45
T	7		40.07	0.05	0.00	4.0=	4.0=			0.00	6.	TM21/PM24
Total Organic Carbon #	7.15	11.41	13.37	0.25	0.36	1.65	1.27			<0.02	%	11VIZ1/MWZ4
pH #M	7.98	8.21	7.66	8.26	8.45	7.78	8.46			<0.01	pH units	TM73/PM11
Sample Type	Loam	Loam	Sandy Loam	Clay	Clay	Clay	Clay				None	PM13/PM0
Sample Colour	Dark Brown	Dark Brown	Dark Brown	Medium Brown	Medium Brown	Light Brown	Medium Brown				None	PM13/PM0
Other Items	NA	stones	roots, stones	stones and sand	stones	none	stones and roots				None	PM13/PM0
]		l]		

Client Name: WYG

Reference: A089434-1 Location: St Asaph

St Asaph Luzia Kathriner

JE Job No.: 16/6451

Contact:

Report: CEN 10:1 1 Batch

J E Sample No.	32-33	38-39							
Sample ID	TP1604	TP1608							
Depth		0.60-0.70					Diago co	e attached n	otes for all
COC No / misc								ations and a	
Containers	٧J	٧J							
Sample Date	17/03/2016	06/04/2016							
	Soil	Soil							
Sample Type									
Batch Number	2	3					LOD/LOR	Units	Method No.
Date of Receipt									
Dissolved Arsenic#	4.8	<2.5					<2.5	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5					<0.5	ug/l	TM30/PM14
Dissolved Chromium #	1.8	<1.5					<1.5	ug/l	TM30/PM14
Dissolved Copper#	25	<7					<7	ug/l	TM30/PM14
Dissolved Lead #	<5	<5					<5	ug/l	TM30/PM14
Dissolved Mercury#	<1	<1					<1	ug/l	TM30/PM14 TM30/PM14
Dissolved Nickel # Dissolved Selenium #	<2 <3	<2 <3					<2 <3	ug/l ug/l	TM30/PM14
Dissolved Zinc#	38	8					<3	ug/l	TM30/PM14
Total Hardness Dissolved	78	44					<1	mg/l	TM30/PM14
PAH MS									
Naphthalene	<0.1	4.8					<0.1	ug/l	TM4/PM30
Acenaphthylene	<0.013	0.230					<0.013	ug/l	TM4/PM30
Acenaphthene	<0.013	0.100					<0.013	ug/l	TM4/PM30
Fluorene	<0.014	0.190					<0.014	ug/l	TM4/PM30
Phenanthrene	<0.011	0.260					<0.011	ug/l	TM4/PM30
Anthracene	<0.013	0.050					<0.013	ug/l	TM4/PM30
Fluoranthene	<0.012	0.050					<0.012	ug/l	TM4/PM30
Pyrene	<0.013	0.030					<0.013	ug/l	TM4/PM30
Benzo(a)anthracene	<0.015	<0.015					<0.015	ug/l	TM4/PM30
Chrysene	<0.011	<0.011					<0.011	ug/l	TM4/PM30
Benzo(bk)fluoranthene	<0.018	<0.018					<0.018	ug/l	TM4/PM30
Benzo(a)pyrene	<0.016	<0.016					<0.016	ug/l	TM4/PM30
Indeno(123cd)pyrene	<0.011	<0.011					<0.011	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.01	<0.01					<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene PAH 16 Total	<0.011	<0.011					<0.011	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.195 <0.01	5.710 <0.01					<0.195 <0.01	ug/l ug/l	TM4/PM30 TM4/PM30
Benzo(k)fluoranthene	<0.01	<0.01					<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	74	79					<0	%	TM4/PM30
								,,	
TPH CWG									
Aliphatics									
>C5-C6	<5	<5					<5	ug/l	TM36/PM69
>C6-C8	<5	<5					<5	ug/l	TM36/PM69
>C8-C10	<5	<5					<5	ug/l	TM36/PM69
>C10-C12	<5	<5					<5	ug/l	TM5/PM30
>C12-C16	<10	<10					<10	ug/l	TM5/PM30
>C16-C21	<10	<10					<10	ug/l	TM5/PM30
>C21-C35	<10	<10					<10	ug/l	TM5/PM30
Total aliphatics C5-35	<10	<10					<10	ug/l	TM5/TM36/PM30/PM69

WYG Client Name:

A089434-1 Reference: Location: St Asaph

Luzia Kathriner Contact:

Report: CEN 10:1 1 Batch

JE Job No.:	16/6451					
J E Sample No.	32-33	38-39				
Sample ID	TP1604	TP1608				
Depth		0.60-0.70				
COC No / misc						
Containers	٧J	٧J				

Sample ID	TP1604	TP1608							
Depth		0.60-0.70					Diagon on	a attached a	otoo for all
COC No / misc								e attached no ations and ac	
Containers	VJ	٧J							
Sample Date									
Sample Type	Soil	Soil							
Batch Number	2	3					LOD/LOR	Units	Method
Date of Receipt	19/03/2016	08/04/2016							No.
TPH CWG									
Aromatics									
>C5-EC7	<5	<5					<5	ug/l	TM36/PM69
>EC7-EC8	<5	<5					<5	ug/l	TM36/PM69
>EC8-EC10	<5	<5					<5	ug/l	TM36/PM69
>EC10-EC12	<5	<5					<5	ug/l	TM5/PM30
>EC12-EC16	<10	<10					<10	ug/l	TM5/PM30
>EC16-EC21	<10	<10					<10	ug/l	TM5/PM30
>EC21-EC35	<10	<10					<10	ug/l	ТМ5/РМ30
Total aromatics C5-35	<10	<10					<10	ug/l	
Total aliphatics and aromatics(C5-35)	<10	<10					<10	ug/l	TM5/TM36/PM30/PM69
MTBE	<5	<5					<5	ug/l	TM36/PM69
Benzene	<5	<5					<5	ug/l	TM36/PM69
Toluene	<5	<5					<5	ug/l	TM36/PM69
Ethylbenzene	<5	<5					<5	ug/l	TM36/PM69
m/p-Xylene	<5	<5					<5	ug/l	TM36/PM69
o-Xylene	<5	<5					<5	ug/l	TM36/PM69
,									
Phenol	<10	<10					<10	ug/l	TM26/PM0
A	0.18	0.03					-0.03	ma/l	TM38/PM0
Ammoniacal Nitrogen as N #	0.18	0.03					<0.03	mg/l	TIVI38/PIVIU
Total Cyanide #	<10	<10					<10	ug/l	TM89/PM0
Total Cyanide	VIO	<10					V10	ug/i	110103/1 1010
Mass of raw test portion	0.1353	0.1126						kg	NONE/PM17
Leachant Volume	0.854	0.878						ı	NONE/PM17
рН	8.06	8.01					<0.01	pH units	TM73/PM0

Client Name: WYG
Reference: A089434-1
Location: St Asaph
Contact: Luzia Kathriner

Note:

Analysis was carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Jones Environmental Laboratory consultant, Jones Environmental Laboratory cannot be responsible for inaccurate or unrepresentative sampling.

Signed on behalf of Jones Environmental Laboratory:

Ryan Butterworth
Asbestos Team Leader

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Date Of Analysis	Analysis	Result
16/6451	1	WS1601 A	0.67-0.90	4	30/03/2016	Mass of Dry Sample	45.3 (g)
					30/03/2016	General Description (Bulk Analysis)	Soil/Stones
					30/03/2016	Asbestos Fibres	NAD
					30/03/2016	Asbestos Fibres (2)	NAD
					30/03/2016	Asbestos ACM	NAD
					30/03/2016	Asbestos ACM (2)	NAD
					30/03/2016	Asbestos Type	NAD
					30/03/2016	Asbestos Type (2)	NAD
					30/03/2016	Asbestos Level Screen	NAD
16/6451	1	WS1601 A	1.96-2.80	9	30/03/2016	Mass of Dry Sample	45.3 (g)
					30/03/2016	General Description (Bulk Analysis)	Soil/Stones/Glass
					30/03/2016	Asbestos Fibres	NAD
					30/03/2016	Asbestos Fibres (2)	NAD
					30/03/2016	Asbestos ACM	NAD
					30/03/2016	Asbestos ACM (2)	NAD
					30/03/2016	Asbestos Type	NAD
					30/03/2016	Asbestos Type (2)	NAD
					30/03/2016	Asbestos Level Screen	NAD
16/6451	2	TP1604		33	30/03/2016	Mass of Dry Sample	36.0 (g)
					30/03/2016	General Description (Bulk Analysis)	Soil/Stone Soil/Stone
					30/03/2016	Asbestos Fibres	NAD
					30/03/2016	Asbestos Fibres (2)	NAD
					30/03/2016	Asbestos ACM	NAD
					30/03/2016	Asbestos ACM (2)	NAD
					30/03/2016	Asbestos Type	NAD
					30/03/2016	Asbestos Type (2)	NAD
					30/03/2016	Asbestos Level Screen	NAD
16/6451	3	BH1602	0.60-1.70	37	14/04/2016	General Description (Bulk Analysis)	soil/stones
					14/04/2016	Asbestos Fibres	NAD
					14/04/2016	Asbestos Fibres (2)	NAD
					14/04/2016	Asbestos ACM	NAD
					14/04/2016	Asbestos ACM (2)	NAD
					14/04/2016	Asbestos Type	NAD
					14/04/2016	Asbestos Type (2)	NAD
					14/04/2016	Asbestos Level Screen	NAD

Client Name: WYG
Reference: A089434-1
Location: St Asaph
Contact: Luzia Kathriner

J E Job	Batch	Sample ID	Depth	J E Sample	Date Of Analysis	Analysis	Result
No.				No.			
16/6451	3	TP1608	0.60-0.70	39	14/04/2016	General Description (Bulk Analysis)	soil/stones
					14/04/2016	Asbestos Fibres	NAD
					14/04/2016	Asbestos Fibres (2)	NAD
					14/04/2016		NAD
					14/04/2016	Asbestos ACM (2)	NAD
					14/04/2016	• • • • • • • • • • • • • • • • • • • •	NAD
					14/04/2016	Asbestos Type (2)	NAD
					14/04/2016	Asbestos Level Screen	NAD
16/6451	3	TP1608	1.10-1.45	41	14/04/2016	General Description (Bulk Analysis)	soil/stones
					14/04/2016	Asbestos Fibres	NAD
					14/04/2016	Asbestos Fibres (2)	NAD
					14/04/2016		NAD
					14/04/2016		NAD
					14/04/2016	Asbestos Type	NAD
					14/04/2016	Asbestos Type (2)	NAD
					14/04/2016	Asbestos Level Screen	NAD
16/6451	3	TP1606	0.30-0.80	43	14/04/2016	General Description (Bulk Analysis)	soil/stones
					14/04/2016	Asbestos Fibres	NAD
					14/04/2016		NAD
					14/04/2016	Asbestos ACM	NAD
					14/04/2016		NAD
					14/04/2016	Asbestos Type	NAD
					14/04/2016	Asbestos Type (2)	NAD
					14/04/2016	Asbestos Level Screen	NAD

Notification of Deviating Samples

Client Name: WYG Matrix : Solid

Reference: A089434-1 **Location:** St Asaph

Contact: Luzia Kathriner

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
16/6451	1	WS1601 A	0.67-0.90	3-4	Cyanide, EPH, GRO, PAH	Sample holding time exceeded
16/6451	1	WS1601 A	1.96-2.80	8-9	Cyanide, EPH, GRO, PAH	Sample holding time exceeded
16/6451	2	TP1604		32-33	Cyanide, GRO	Sample holding time exceeded
16/6451	2	TP1604		32-33	GRO	Solid Samples were received at a temperature above 9°C.

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 16/6451

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCI (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 (UKAS) accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

ISO17025 (UKAS) accredited - UK.
Indicates analyte found in associated method blank.
Dilution required.
MCERTS accredited.
Not applicable
No Asbestos Detected.
None Detected (usually refers to VOC and/SVOC TICs).
No Determination Possible
Calibrated against a single substance
Surrogate recovery outside performance criteria. This may be due to a matrix effect.
Results expressed on as received basis.
AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
Result outside calibration range, results should be considered as indicative only and are not accredited.
Analysis subcontracted to a Jones Environmental approved laboratory.
Samples are dried at 35°C ±5°C
Suspected carry over
Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
Matrix Effect
No Fibres Detected
AQC Sample
Blank Sample
Client Sample
Trip Blank Sample
Outside Calibration Range
x2 Dilution
x5 Dilution

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.				
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes	Yes	AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
ТМ5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes	Yes	AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	Yes

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID.	PM12/PM16	CWG GC-FID			AR	Yes
TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID.	PM30/PM69	PM030: Eluate samples are extracted with solvent using a magnetic stirrer to create a vortex.PM069: One part soil is mixed with 10 parts water in a vial leaving no headspace. The mixture is shaken and then left to leach for 24 hours before VOC analysis.			AR	Yes
PM13	A visual examination of the solid sample is carried out to ascertain sample make up, colour and any other inclusions. This is not a geotechnical description.	PM0	No preparation is required.			AR	
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid or water samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes		AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes	Yes	AD	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes	Yes	AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM69	Modified BS EN 12457 method.One part soil is mixed with 10 parts water in a vial leaving no headspace. The mixture is shaken and then left to leach for 24 hours before VOC analysis.			AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes		AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground samples with deionised water in a 2:1 water to solid ratio for anions. Extraction of as received samples with deionised water in a 2:1 water to solid ratio for ammoniacal nitrogen. Samples are extracted using an orbital shaker.	Yes		AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.			AR	
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.			AR	Yes
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes	Yes	AR	No

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes	Yes	AD	Yes
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM0	No preparation is required.	Yes		AR	Yes
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide and Thiocyanate analysis.	Yes	Yes	AR	Yes
NONE	No Method Code	PM17	Modified method EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.				
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.			AR	

St Asaph FRMS Additional Ground Investigation



Appendix E – Environmental Laboratory Testing Results