Appendix A.5.1.4

Phase 3 Contract 1

N6 Galway City Transport Project Phase 3 Ground Investigation Contract 1,

January to April 2016

IGSL Ltd

N6 Galway City Transport Project – Phase 3 Ground Investigation Contract 1

Factual Report

Project No. 18963

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FOREWORD

The following conditions and notes on the geotechnical site investigation procedures should be read in conjunction with this report.

Standards

The ground investigation works for this project (**N6 Galway City Transport Project – Phase 3 Ground Investigation Contract 1**) have been carried out by IGSL in accordance with Eurocode 7 - Part 2: Ground Investigation & Testing (EN 1997-2:2007). This has been used together with complementary documents such as BS 5930:1999 +A2:2010 and BS 1377 (Parts 1 to 9) and the following European Norms:

- EN 1997-2 Eurocode 7: 2007 Geotechnical Design Part 2: Ground Investigation & Testing
- EN ISO 22475-1:2006 Geotechnical Investigation and Sampling Sampling Methods & Groundwater Measurements
- EN ISO 14688-1:2002 Geotechnical Investigation and Testing Identification and Classification of Soil, Part 1: Identification and Description
- EN ISO 14688-2:2004 Geotechnical Investigation and Testing Identification and Classification of Soil, Part 2: Classification Principles
- EN ISO 14689-1:2004 Geotechnical Investigation and Testing Identification & Classification of Rock, Part 1: Identification & Description

Reporting

No responsibility can be held by IGSL Ltd for ground conditions between exploratory hole locations. The engineering logs provide ground profiles and configuration of strata relevant to the investigation depths achieved and caution should be taken when extrapolating between exploratory points. No liability is accepted for ground conditions extraneous to the investigation points. Unless specifically stated, no account has been taken of possible subsidence due to mineral extraction, mining works or karstification below or close to the site.

This report has been prepared for Galway County Council / ARUP and the information should not be used without prior written permission of either party. IGSL Ltd accepts no responsibility or liability for this document being used other than for the purposes for which it was intended.

Boring Procedures

Unless otherwise stated, 'shell and auger' or cable percussive boring technique has been employed as defined by Section 6.3 of IS EN ISO 22475-1:2006. The boring operations, sampling and in-situ testing complies with the recommendations of IS EN 1997-2:2007 and BS 1377:1990 and EN ISO 22476-3:2005. The shell and auger boring technique allows for continuous sampling in clay and silt above the water table and sand and gravel below the water table (Table 2 of IS EN ISO 22475-1:2006).

It is highlighted that some disturbance and variation is unavoidable in particular ground (e.g. blowing sands, gravel / cobble dominant glacial deposits etc). Attention is drawn to this condition, whenever it is suspected. Where cobbles and boulders are recorded, no conclusion should be drawn concerning the size, presence, lithological nature, or numbers per unit volume of ground.

In-Situ Testing

Standard penetration tests were conducted strictly in accordance with Section 4.6 of IS EN 1997-2:2007. The SPT equipment (hammer energy test) has been calibrated in accordance with EN ISO 22476-3:2005 and the Energy Ratio (E_r). A calibration certificate is available upon request. The E_r is defined as the ratio of the actual energy E_{meas} (measured energy during calibration) delivered to the drive weight assembly into the drive rod below the anvil, to the theoretical energy (E_{theor}) as

calculated from the drive weight assembly. The measured number of blows (N) reported on the engineering logs are uncorrected. In sands, the energy losses due to rod length and the effect of the overburden pressure should be taken into account (see IS EN ISO 22476-3:2005).

Soil Sampling

Three categories of sampling methods are outlined in EN ISO 22475-1:2006. The categories are referenced A, B and C for any given ground conditions and are shown in Tables 1 and 2 of EN ISO 22475-1:2006. Reference should be made to EN 1997-2:2002 for guidelines on sample class and quality for strength and compressibility testing. Samples of quality classes 1 or 2 can only be obtained by using Category A sampling methods.

Soil samples for laboratory tests are divided into five classes with respect to the soil properties that are assumed to remain unchanged during sampling, handling transport and storage. The minimum sample quality required for testing purposes to Eurocode 7 compatibility (EN 1997-2:2002) is shown in Table A.

Table A – Details of Sample Quality Requirements

EN 1997 Clause	Test	Minimum Sample Quality Class
5.5.3	Water Content	3
5.5.4	Bulk Density	2
5.5.5	Particle Density	N/S
5.5.6	Particle Size Analysis	N/S
5.5.7	Consistency Limits	4
5.5.8	Density Index	N/S
5.5.9	Soil Dispersivity	N/S
5.5.10	Frost Susceptibility	N/S
5.6.2	Organic Content	4
5.6.3	Carbonate Content	3
5.6.4	Sulphate Content	3
5.6.5	рН	3
5.6.6	Chloride Content	3
5.7	Strength Index	1
5.8	Strength Tests	1
5.9	Compressibility Tests	1
5.10	Compaction Tests	N/S
5.11	Permeability	2

N/S – not stated. Presume a representative sample of appropriate size.

Samples recovered from trial pits or trenches meet the requirements of IS EN ISO 22475-1. It is highlighted that unforeseen circumstances such as variations in geological strata may lead to lower quality sample classes being obtained.

Groundwater

The depth of entry of any influx of groundwater is recorded during the course of boring operations. However, the normal rate of boring does not usually permit the recording of an equilibrium level for any one water strike. Where possible drilling is suspended for a period of twenty minutes to monitor the subsequent rise in water level. Groundwater conditions observed in the borings or pits are those appertaining to the period of investigation. It should be noted however, that groundwater levels are subject to diurnal, seasonal and climatic variations and can also be affected by drainage conditions, tidal variations etc.

Engineering Logging

Soil and rock identification has been based on the examination of the samples recovered and conforms with IS EN ISO 14688-1:2002 and IS EN ISO 14689-1:2004. Rock weathering classification conforms to IS EN ISO 14689-1:2003 while discontinuities (bedding planes, joints, cleavages, faults etc) are classified in accordance with 4.3.3 of IS EN ISO 14689-1:2003. Rock mechanical indices (TCR, SCR, RQD) are defined in accordance with IS EN ISO 22475-1:2006.

Retention of Samples

After satisfactory completion of all the scheduled laboratory tests on any sample, the remaining material will be discarded. Unless a period of retention of samples is agreed, it is our normal practice to discard all soil samples one month after submission of our final report.

1. INTRODUCTION

At the instruction of ARUP on behalf of their Client Galway County Council, IGSL has undertaken a programme of geotechnical site investigation works in the environs around Galway City from Bearna in the west to Coolagh, Briarhill in the east (Figure 1). It is understood that the Client (Galway County Council) intends to construct a new by-pass road extending east-west across the northern fringe of Galway City incorporating a new River Corrib bridge crossing. Tunnelling and the construction of a viaduct will also form part of the scheme. This will allow the road infrastructure to cross the Lough Corrib cSAC without direct impact on Annex I habitat (N6 Galway City, 2015).

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Figure 1 - Site Location Plan - Proposed N6

Reproduced from N6galwaycity.ie website (N6 Galway City, 2015)

The investigations comprised both machine-excavated and hand-dug trial pits, window samples, cable percussive boreholes and rotary coreholes. In situ testing comprised falling head permeability testing and soakaway testing to BRE Digest 365. The intrusive works were supplemented by numerous geophysical 2D resistivity and seismic survey lines throughout the scheme. Geotechnical instrumentation (50mm diameter standpipes) was installed in nominated cable percussive boreholes and rotary coreholes. The investigations were executed in accordance with BS 5930, Code of Practice for Site Investigations (1999+A2:2010) and EN 1997-2 Eurocode 7 Part 2 Ground Investigation & Testing.

Geotechnical laboratory testing was carried out on a range of disturbed bulk samples. The testing included particle size distributions, moisture contents, Atterberg Limits, CBR, compactions and 5-point MCV testing. Chemical soil analyses were also completed comprising pH, sulphate and organic testing. Specialist environmental testing (ARUP Disposal Suite and asbestos screening) were also undertaken on nominated soil samples.

Rock strength testing comprising Point Load Strength Index (PLSI) and Unconfined Compressive Strength (UCS) tests were performed on the rock core samples acquired from the rotary coring. The strength testing was carried out in accordance with ISRM. Los Angeles abrasion, slake durability and 10% fines analysis were also conducted on rock core samples. The 'as-built' exploratory locations were surveyed by IGSL and the co-ordinates and elevations are presented on the field logs. An exploratory hole location plan is presented in Appendix 17.

2. FIELDWORK

2.1 General

The fieldworks were carried out from January 2016 to April 2016 and comprised the following:

- o Cable percussion boreholes (29 No.)
- O Hand-excavated pits at cable percussive borehole locations (18 No.)
- o Rotary Coreholes (40 No.)
- Machine-excavated inspection pit at rotary corehole (1 No.)
- o Trial pits (38 No.) (i)
- Hand-excavated pits at trial pit locations (5 No.)
- Soakaway Testing (2 No.)
- o Falling head Permeability Testing (5 No.)
- Plate BearingTests (4 No.)
- Window Sampling (4 No.)
- Geophysical Survey
- o Groundwater Monitoring
- Surveying of as-built exploratory locations

2.2 Cable Percussion Boreholes

Cable percussive boring (200mm diameter) was undertaken at twenty nine locations using a Dando 3000 rig. At eighteen other proposed borehole locations, because of the obvious presence of outcropping bedrock in the vicinity and occasionally due to prohibitive access issues posed by boggy or undulating terrain, hand digging was carried out through the very shallow overburden soils. The borehole numbers are prefixed BH3/_ and extended to depths of between 0.10m and 10.50m bgl. Boring commenced after scanning (CAT & Jenny) to verify the presence or absence of service ducts. Disturbed bulk samples were recovered at 1m intervals or change of strata during boring and these are denoted 'B' on the engineering logs.

Standard Penetration Tests (SPT's) were performed in the boreholes and given the nature of the soils, a solid cone was used. It is noted that the SPT N-Values reported are the number of blows for 300mm increment penetration (e.g. BH3/17 at 1.0m where N=21). These exclude the seating blow values, which represent the initial 150mm depth of penetration. Where partial penetration was achieved during testing, the number of blows is shown for the actual penetration depth achieved (e.g. BH3/06 at 0.50m where N=50/75mm). In accordance with Eurocode 7, the SPT hammer has been calibrated and the energy ratio (Er) value is incorporated on the engineering logs. It is highlighted that the SPT N-Values reported on the engineering logs are uncorrected for energy ratio.

Descriptions of the soils encountered, in-situ tests undertaken and samples recovered are presented on the borehole records in Appendix 1. Details of groundwater strikes and hard strata boring (i.e. chiselling) are also presented on the aforementioned records. A standpipe was installed in one of the boreholes (BH3/21) to establish an equilibrium groundwater level. The standpipe (50mm diameter uPVC with proprietary 1mm slots and filter sock) incorporated a pea gravel filter pack and cement/bentonite grout seal. A protective stand-up headwork cover was concreted in place. Measured groundwater levels are detailed in Appendix 12.

⁽i) Including hand-excavated pit record from TP3/43 (formerly BH3/05)

2.3 Hand-excavated pits at Cable Percussive Borehole locations

Hand-digging was deployed at cable percussive borehole locations where shallow bedrock was anticipated and occasionally where access issues were faced in trying to achieve rig access. In all eighteen hand-dug pits were carried out at borehole locations. At three of these locations (BH3/15, BH3/31 and BH3/35), cable percussive boring (200mm diameter) was ultimately undertaken using a Dando 3000 rig. Here rig set-up was undertaken only after shallow rockhead was not thought intercepted to a depth of 1.20m / 1.30m in the pit. The hand-dug pits extended to depths of between 0.30m and 1.30m bgl. Disturbed bulk samples recovered during pit excavation are denoted 'B' on the engineering logs. Photographs were taken as the pits progressed and these are presented in Appendix 2.

2.4 Rotary Core Drillholes

Rotary core drilling (coreholes denoted BH3/_R) was carried out across the site using three different drill rigs. The terrain largely dictated which rig was used where. A track-mounted Casagrande C6 rig, a rubber-wheeled Unimog-mounted Knebel rig and a smaller rubber-tracked Comacchio GEO 205 were all used at various times throughout the contract period. Across all rigs symmetrex drilling was utilized within the superficial deposits with conventional coring techniques used in the bedrock. The rotary drilling in bedrock produced 79mm (T6-H core bit) and 71.7mm (T2-86) diameter cores using air mist flush. The smaller diameter drill bit was utilized in the very strong granite bedrock to effect penetration.

The cores were placed in 3m capacity timber boxes and logged by an IGSL engineering geologist. This included photography of the cores with a digital camera. Where rock core was recovered, a graphic fracture log is also presented alongside the mechanical indices. This illustrates the fracture state of the rock cores and allows easy identification of highly fractured / non-intact zones and discontinuity spacings. It should be noted that no correction for dip of the joints has been made and that the spacings shown are successive joint / core intersections within the core.

The core log records are presented in Appendix 3 and this includes engineering geological descriptions, details of the bedding / discontinuities and mechanical indices (TCR, SCR and RQD's) for each core run. Core photographs are also presented in Appendix 3 and these illustrate the structure and fracture state of the bedrock.

Groundwater monitoring standpipes were installed in numerous coreholes as specified by the client's representative on site. The installed well standpipes consist of 50mm diameter HDPE pipework with proprietary 1mm slots and incorporated a pea gravel filter pack and cement/bentonite grout seal. Stand-up headwork covers were concreted in place with protective post-and-rail timber fencing erected about the well heads. The groundwater reading measurements are presented in Appendix 12. Monthly dip readings are to be taken for a period of 12 months from the end of the contract period.

In the case of BH3/30R, a small trial excavation was initially excavated to ensure that symmetrex open-hole drilling did not push through possible asbestos-containing soils from ground level to 1.60m. Possible asbestos fragments were thought intercepted during the construction of cable percussive borehole BH3/30*. The rotary casing was lowered into the excavation prior to machine-backfilling of the inspection pit. Photographs of the excavation are presented in Appendix 4.

^{*}Environmental testing with asbestos screening later failed to identify asbestos material in the sampled soils at BH3/30

2.5 Trial Pits & Hand-excavated pits at Trial Pit locations

The majority of trial pits were excavated on site using an 8ton tracked excavator. Pitting was also undertaken using a 13ton tracked excavator (TP3/30). In addition to machine-excavation, hand-digging was deployed in the case of five trial pits. Where hand-digging was used, poor access to trial pits was generally a deciding factor coupled with the knowledge that shallow (<1.20m) overburden existed in the area. The trial pits were logged and sampled by an IGSL geotechnical engineer in accordance with BS 5930 (1999+A2:2010). Bulk disturbed samples (typically 30 to 40 kg) were taken as the pits progressed. The bulk samples were placed in heavy-duty polyethylene bags and sealed before being transported to Naas for laboratory testing. The trial pits were backfilled with the as-dug arisings and reinstated to the satisfaction of IGSL's site geotechnical engineer. The trial pit logs are presented in Appendix 5 and include descriptions of the soils encountered, groundwater conditions and stability of the pit sidewalls. Appendix 6 presents the hand-dug pit log for TP3/43. This trial pit was scheduled in place of BH3/05 after it was agreed that access to the location would not be possible with a cable percussive boring rig.

2.6 Soakaway Tests

Two infiltration tests were performed to assess the suitability of the sub-soils for dispersion of storm water through a soakaway system. The infiltration tests were performed in accordance with BRE Digest 365 'Soakaway Design'. To obtain a measure of the infiltration rate of the sub-soils, water is poured into each test pit, and records taken of the fall in water level against time. This procedure is repeated twice more to ensure saturation of the sub-soils. The infiltration rate is the volume of water dispersed per unit of exposed area per unit of time, and is generally expressed as metres / minute or metres / second. Designs are based on the slowest infiltration rate, which is generally calculated from the final cycle. The soakaway design logs are presented in Appendix 7.

2.7 Falling Head Permeability Testing

Four falling head permeability tests were performed in 50mm diameter groundwater wells installed over the course of the contract. The wells identified by the client's representative were BH3/35R, BH3/46R, BH3/47R and BH3/48R. In addition to performing variable head permeability tests in the aforementioned corehole installations, one further permeability test was conducted. This was an existing 4" diameter well (MW3) located in Lackagh Quarry. It was drilled several years ago by the operators of the guarry. The records for the permeability tests are presented in Appendix 8.

2.8 Plate Bearing Tests

Four number plate bearing tests were conducted along the proposed road corridor. The depth of the four tests varied from beneath shallow peats at c.0.50m bgl to 1.20m bgl (TP3/23). All tests were undertaken to evaluate the modulus of sub-grade reaction (Ks) and equivalent CBR value. A 450mm diameter plate was used with kentledge provided by a tracked excavator. Two load cycle tests were performed and the load / settlement plots, Ks and equivalent CBR values are presented in Appendix 9.

2.9 Window Sampling (Driven Sampling)

Window sampling was carried out at four locations using a Dando Terrier rig mounted upon a Kubota tracked dumper. Ground conditions varied from shallow blanket peat bog to soft organic clays. The rig was positioned atop the dumper in order to facilitate access to each of the four locations. The Terrier rig uses a 63.5kg weight to drive the window sampler and the material was retrieved in a semi-rigid plastic core liner. Depths were dictated by the level of very stiff to hard stratum or medium dense to dense stratum in the area. Termination depths were also influenced by coarse cobble and boulder material obstructing the sample drive.

The maximum depth achieved with window sampling was 4.0m bgl (WS3/04). Overall recovery of the subsurface soils was high and provides a good understanding of the composition, structure and

strength of the near surface materials. The window sample records are presented in Appendix 10 and include descriptions of the soils encountered and the total recovery per run.

2.10 Geophysical Surveying

Minerex Geoservices carried out the geophysical survey across the site. The key aim of the survey was to determine the depth to rockhead and to identify any anomalous ground conditions. A combination of techniques was utilized consisting of 2D Electrical Resistivity Tomography (ERT) and Seismic Refraction Profiling. The findings of the geophysical survey are incorporated in Appendix 11.

2.11 Groundwater Monitoring

Groundwater monitoring was undertaken during the fieldworks period and at designated intervals following completion (monthly for a period of 12 months beyond the end of the contract term). Groundwater levels were measured using an electric dipmeter with measurements taken from the wells installed in boreholes and coreholes throughout the project. The levels recorded are shown in Appendix 12.

2.12 Surveying of Exploratory Locations

Following completion of the exploratory works, surveying was carried out using GPS techniques. Co-ordinates (x, y) were measured to Irish Transverse Mercator and ground levels (z) established to Malin Head. The co-ordinates and ground levels are shown on the exploratory hole logs with locations shown on the exploratory hole plan in Appendix 17.

3. LABORATORY TESTING

Geotechnical laboratory testing was carried out on selected borehole and trial pit samples. The soils testing was undertaken in accordance with BS 1377 (1990) and included particle size gradings, Atterberg limit, 5-point MCV, optimum moisture content plots, shear box, CBR, water soluble sulphate and pH testing. The geotechnical laboratory test results are contained in Appendix 13 with the chemical results presented separately in Appendix 14. Environmental testing performed on soil samples acquired from site are presented in Appendix 15.

Geotechnical laboratory testing was also carried out on selected rock cores. Point load strength index (PLSI), unconfined compressive strength (UCS), Los Angeles abrasion, slake durability and 10% fines analysis were conducted with the results presented in Appendix 16.

REFERENCES

- **1.0** BS 5930 (1999 + A2:2010) Code of Practice for Site Investigation, British Standards Institution (BSI).
- 2.0 BS 1377 (1990) Methods of Testing of Soils for Civil Engineering Purposes, BSI.
- **3.0** Eurocode 7, Part 2: Ground Investigation & Testing (EN 1997-2:2007)
- **4.0** N6 Galway City (2015). *Emerging Preferred Route Options Brochure*. Retrieved March 30, 2016 from the N6 Galway City website http://www.n6galwaycity.ie/wp-content/uploads/2015/05/GCOB-4.03-17.3.3-004_PC-No.-3_Brochure.pdf
- **5.0** Site Investigation Practice: Assessing BS 5930 (1986), Geological Society Special Publication, No. 2.

Appendix 1

Cable Percussive Borehole Logs

(including shallow hand-excavated pits at borehole locations)

Exploratory Hole Number	Method of Construction [Cable Percussive / Hand Dug]
BH3/03	HD
BH3/04	СР
BH3/06	СР
BH3/07	HD
BH3/08	СР
BH3/09	СР
BH3/10	HD
BH3/11	СР
BH3/12	СР
BH3/14	HD
BH3/15	HD
BH3/15 CP	СР
BH3/16	СР
BH3/17	СР
BH3/18	HD
BH3/19	HD
BH3/20	HD
BH3/21	СР
BH3/22	HD
BH3/23	СР
BH3/25	СР
BH3/26	СР
BH3/27	СР
BH3/28	HD
BH3/29	СР
BH3/30	HD
BH3/31	HD
BH3/31 CP	СР

BH3/32	СР
BH3/33	СР
BH3/33A	СР
BH3/34	СР
BH3/35	HD
BH3/35 CP	СР
BH3/36	HD
BH3/38	СР
BH3/39	СР
BH3/40	HD
BH3/41	СР
BH3/42	СР
BH3/43	HD
BH3/46	HD
BH3/47	СР
BH3/48	HD
BH3/52	СР
BH3/53	СР
BH3/54	СР

Note: Boreholes BH3/15, BH3/31 and BH3/35 were each hand dug initially and then drilled using cable percussive methods



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NS	TALLAT	ION DET	AILS			Da		Hole	Casing	Dé	epth to Vater	Comme		
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СО	NTRAC	T NO	6 Galv	way City	r Transpor	t Project - Phase	3					BOREHO	LE NO.	BH3/06	
	0001					DIC T	/DE			D		SHEET		Sheet 1 of 1	
	-ORDIN		A O	524,24 724,82	5.14 N		HOLE DIAM		nm) :	Dando 30 200		DATE CO		CED 27/01/2016 ED 27/01/2016	
	ENT	LEVEL (23.68 Council		HOLE DEPT AMMER RE			0.70	-	BORED B		WC	
	GINEEF		aiway RUP	County	Couricii		SY RATIO (9					PROCESS			
EINC	JINEER	K Ar	KUP			ENERG	T KATIO (/o) 		1		ples	ום עם	JL	
Œ								ے	Ē			ipies	<u> </u>	-	e e
Depth (m)				Desc	ription		Legend	Elevation	Depth (m)	Ref. Number	Sample Type	₽	Recovery	Field Test Results	ide
)eb							ege	l s	Jeb	Zef.	San	Depth (m)	600	Results	Standpipe Details
0	Grave	elly TOP	SOIL						_	+	0,1		I IX		0,0
							71/2 1/2 1/2 1/2	23.28	0.40						
	Loos GRA'	e to med √FI	lium d	dense lig	ght brown	silty very sandy	0x0 0x	22.98	0.70	AA43886	В	0.50-0.70		N = 50/75 mm (16, 9, 37, 13)	
.	Obstr	uction					4								
1	End o	of Boreho	ole at	0.70 m											
2															
3															
۲															
4															
. 5															
6															
7															
.															
8															
9															
HΑ	ARD ST	RATA B			ELLING		Wate	Nr. O	oina I	Cools-l	D:-	_ :		ATER STRIKE DET	AILS
ror	m (m)	To (m)	Tin (h		omments		Strik		sing :	Sealed At	Rise To			omments	
0).5	0.7	1				0.70		.70	No	0.50			Seepage	
												<u> </u>	GRO	DUNDWATER PRO	GRES
NS	TALLA	TION DE	ETAIL	.s			Dat		Hole	Casing	De	oth to ater C	ommer	nts	
	Date				RZ Base	Туре			Depth	Depth	VV	aici			
			1												
) — ·	MAD://	Davit	als !	ا دادانات	Line:	moleties Desire		for	0 -	1-1-					
ΚΕİ	WAKKS	rotarv	oie ba follow	acktilled v-on cor	upon com ing. Waitir	npletion. Borehole ng on following po	scrieduled sition from	10:30	D - Small	le Legen Disturbed (tub)	d			ndisturbed 100mm Diameter	
		to 16:3			· · ·	5 57			B - Bulk I LB - Larg Env - Env	Disturbed e Bulk Disturbe ⁄ironmental San	d nple (Jar +	· Vial + Tuh)	Sample P - Und W - Wa	e disturbed Piston Sample ater Sample	
										001	, , , , , , , , ,	,	.,,		



REPORT NUMBER

1	GSL													10903		
СО	NTRAC	T N6	Galway	y City T	ransport	Project - Phase 3						BOREHO	LE NO.	BH3/07		
CO	-ORDIN	IATES	52	24,504.	62 E	RIG TYP	Έ		ŀ	Hand Dug	n	SHEET		Sheet 1 of 1		
		LEVEL (n	72	25,005.	37 N 36.22		OLE DIAM			0.60		DATE CO		ED 12/02/2016 ED 12/02/2016		
CLI	ENT	Ga	lway Co	ounty C	Council	SPT HAI	MMER RE	F. NO.				BORED B	Y	AC		
	GINEER		-			ENERGY	RATIO (9	%)				PROCES		JL		
						'					San	nples				
(E)								on	Depth (m)	Ē	Ф		gr.	Field Test	jee .	
Depth (m)				Descrip	otion		gen	Elevation	pt	Ref. Number	Sample Type	Depth (m)	8	Results	Standpipe Details	
							Legend	e	å	& 3	Sa		Recovery		Sta	
0	TOPS	SOIL					37.37.	36.12	0.10	AA49476	D	0.10-0.30				
		lack to d					1990	35.92	0.30	AA49477 AA49478	D B	0.10-0.30 0.10-0.30				
						DERS of granite	100	35.62	0.60	-						
١,		uction - F of Boreho			hered Gr	anite Rockhead										
1	Lila	n Borcho	ic at o.	00 111												
2																
_																
3																
4																
5																
6																
7																
-8																
9																
ΗA	ARD ST	RATA BO	ORING/0	CHISEL	LING								WA	 TER STRIKE DET	AILS	
ror	m (m)	To (m)	Time (h)	Con	nments		Wate Strik	er Ca	sing S	Sealed At	Ris To			omments		
			\·'/				0.30					(111)		Slow		
													000	LINIDWATER REC	ODEO	
Me	ΤΔΙΙΛ	TION DE	- ΙΙΔΤ				Dat		Hole	Casing	De	pth to c	GRO omment	UNDWATER PRO	GKESS	
	Date			Ton R	RZ Base	Туре	Dai	<u> </u>	Depth	Depth	W	ater C	OTTITIO III			
	บผเษ	T I I Del	-ui IX	10p K	עב טמאכ	турс										
REI	MARKS	Hand d	lug pit a	at locati	ion of R⊢	13/07			Samn	le Legen	d					
			-3 Pit 0	5 Juli		· =- • •			B - Bulk L	le Legen Disturbed (tub) Disturbed			Sample	disturbed 100mm Diameter		
									LB - Large	e Bulk Disturbe ironmental San	d nple (Jar	+ Vial + Tub)	P - Undi:	sturbed Piston Sample er Sample		



REPORT NUMBER

	<u> </u>												10000	
CO	NTRACT	N6 (Galway (City Transport	Project - Phase 3						BOREH	OLE NO		
CO.	-ORDINA	ΓES	524, 725,	620.87 E 068.66 N	RIG TYP BOREHO	E OLE DIAM	ETER (n		Dando 30 200	າດດ 🖯	SHEET DATE C	OMMEN		
	OUND LE		AOD)	41.74		DLE DEPT		, (0.70		DATE C			
l	ENT SINEER	Galv ARU	-	nty Council		MMER REI (RATIO (%					BORED PROCES		WC Y JL	
	JINLLIN	71110	,,		LIVERO						nples	JOLD D	J. J.	
Depth (m)			De	escription		Legend	Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
- 0	Gravelly	TOPS	OIL			1/ 1/1/ 1/1/ 1/1/ 1/1/ 1/1/ 1/1/ 1/1/	41.24	0.50					N = 50/75 mm	
2 3	coarse (GRAVE obbles tion - Po	L-sized for the size of the si	very sandy ai fragments of Rockhead	ngular fine to Granite with		41.04	0.70		В	0.50-0.70		(10, 15, 28, 22)	
9														
HA	RD STRA	TA BO	RING/CH	IISELLING								w	/ATER STRIKE DET	AILS
Fror	m (m) To	(m)	Time (h)	Comments		Wate		sing S	Sealed At	Ris To		ime	Comments	
0	0.5).7	1			Sun		,,,,		10	(1		No water strike	
								Hole	Casing	Do	nth to		OUNDWATER PRO	GRESS
	TALLATIO			n P7 Paga	Typo	Dat	te	Depth	Depth	W	pth to ater	Comme	ents	
	Date 1	ip Debi	ui KZ IO	p RZ Base	Туре									
REI	ι	l.5hr ge ipon co coring.	etting rig	and tools to E Borehole so	BH location. Boreho cheduled for rotary	ole backfill follow-on	led	D - Small B - Bulk D LB - Large	Legen Disturbed (tub) Disturbed Bulk Disturbed Fronmental Sar) ed	+ Vial + Tub)	Samp P - U	Undisturbed 100mm Diameter ole endisturbed Piston Sample Vater Sample	



REPORT NUMBER

	GBL													10903	
COI	NTRAC	T N6	Galwa	ay City	Transport	: Project - Phase	3					BOREHO	LE NO	BH3/09	
	ODDIN	ATEC		-04.05	2.40.5	RIG TY	DE			Dando 30		SHEET		Sheet 1 of 1	1
	-ORDIN		7	524,952 725,30	2.19 E 5.97 N		PE IOLE DIAMI	ETER (n		200	000	DATE CO			
GR	OUND L	.EVEL (ı	m AOD	D)	47.38		OLE DEPT			0.40		DATE COMPLETED 28/01/2			
CLI	ENT	Ga	alway C	County	Council	SPT HA	MMER REI	F. NO.				BORED E	3Y	WC	
ENC	SINEER	AR	RUP			ENERG	Y RATIO (9	%)				PROCES	SED B	Y JL	_
											Sar	nples			0
Depth (m)				Desc	ription		٦	Elevation	Depth (m)	Ref. Number	<u>e</u>	_	Recovery	Field Test	Standpipe
ept				2000			Legend	eva	eptl	ef.	Sample Type	Depth (m)	900	Results	tanc
							<u> </u>			W Z	ω⊢		ď		(V)
0	PEAT						I	46.98	0.40						
		ght grey	brown	ı very s	andy grav	elly slightly peaty	xo. x . c			AA43887	D	0.50			
	SILT						× ½ × ×	46.38	1.00						
1	Loose	to med	ium de	ense m	ottled grey	brown	\$0 00 X	46.08	1.30	AA43888		1.00-1.30		N 50/05	
	Clayey	silty ve	ry sand	ay GRA	AVEL					AA43889	D	1.30		N = 50/85 mm (2, 4, 15, 35)	
		f Boreho	ole at 0).40 m											
2															
3															
4															
4															
5															
6															
7															
'															
8															
9															
HA	RD ST	RATA B	ORING	CHISI	ELLING			<u> </u>					W	_ ATER STRIKE DE	TAILS
		Го (т)	Time	e Co	mments		Wate	er Ca		Sealed	Ris		me (Comments	
	.2	1.3	<u>(h)</u> 1	+			Strike	e De	epth	At	To) (m	iin)		
•	-													No water strike	
													GR	OUNDWATER PRO	OGRE
NS	TALLA	TION DE	TAILS	 }			Dat		Hole	Casing	Dé	pth to ater	Comme		
	Date				RZ Base	Туре			Depth	Depth	V\	valer			
						71 .									
) F !	NVDK6	Borobo		-kfillad	upon com	nletion			Comm	le Locar					
\ <u>_</u>	················	DOLETT	JIE DAC	-KIIII C U	арон сош	piction			D - Small	ole Legen Disturbed (tub)		Sampl	Indisturbed 100mm Diameter	
									LB - Larg	je Bulk Disturbe vironmental Sai	ed mple (Jar	+ Vial + Tub)	P - Un	idisturbed Piston Sample l'ater Sample	
									B - Bulk I LB - Larg	Disturbed je Bulk Disturbe	ed	+ \/iol + Tub\	Sampl P - Un	le idisturbed Piston Sample	
										O	.F.0 (UGI	· · · · · · · · · · · · · · · · ·	**		



REPORT NUMBER

	2F/														
CONT	RACT	N6 G	alway C	ity Transpor	t Project - F	Phase 3						BOREH SHEET	OLE NO	BH3/10 Sheet 1 of 1	
	RDINAT		725,6	320.57 E 603.65 N 66.51	E	RIG TYPE BOREHO BOREHO	LE DIAM		nm)	Hand Dug 0.30	g	DATE C		ICED 11/02/2016	
CLIEN		Galw		ty Council		SPT HAM ENERGY						BORED		AC Y JL	
					1	Sa						nples			
Depth (m)			De	scription			Legend	Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe
	OPSOL						71 1/2 71 1/2								- 0, 1
			ssible ar	anite rockhe	ead	:		66.21	0.30	-					
E	End of B	orehole	at 0.30	m											
1															
2															
3															
4															
5															
6															
7															
8															
9															
	- c==		nie (e	OF 1 1 11 1											
rom (Timo	SELLING Comments			Wate		sing	Sealed	Ris	e T	ime	ATER STRIKE DET	IAILS
10111 ((111) 10	(111)	(h)	Comments			Strik 0.30		epth	At	To) (r	nin) '	Seepage	
														1 0	
													GR	OUNDWATER PRO	OGRE
NSTA	LLATIC	N DETA	AILS				Da		Hole Depth	Casing Depth	De	epth to Vater	Comme		
Da	ite T	ip Depth	RZ To	p RZ Base	Туре	9				20001					
DENA A	DK6 11	and due	nit of Is	ocation of Bh	13/10				Cam-	do Logar	d				
\⊏IVI/	NKNO H	anu dug	j pit at 10	ocauon oi Bh	13/10				D - Smal B - Bulk	ole Legen I Disturbed (tub) Disturbed)		Samp	Jndisturbed 100mm Diameter	
									LB - Larg	je Bulk Disturbe vironmental Sar	ed nple (Jar	+ Vial + Tub)	P - Ur	ndisturbed Piston Sample Vater Sample	



REPORT NUMBER

18963

BOREHOLE NO. BH3/11 CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 Dando 3000 **RIG TYPE CO-ORDINATES** 525,784.11 E DATE COMMENCED 21/01/2016 **BOREHOLE DIAMETER (mm)** 200 725,831.24 N **DATE COMPLETED** 22/01/2016 **GROUND LEVEL (m AOD)** 54.37 **BOREHOLE DEPTH (m)** 2.60 SPT HAMMER REF. NO. WC CLIENT **Galway County Council BORFD BY ENERGY RATIO (%) ENGINEER PROCESSED BY** ARUP JL Samples Standpipe Details (E \mathbb{E} Elevation Ref. Number Sample Type Recovery Field Test Legend Depth (Depth (Description Depth (m) Results - 0 Gravelly TOPSOIL 711. 711 53.97 0.40 11/11 Very soft dark brown sandy gravelly CLAY 53.57 0.80 Soft dark brown black slightly gravelly pseudofibrous 191 AA43876 AA43877 1.00-1.45 B D PEAT with occasional wood fragment (0, 0, 1, 1, 0, 4) 1, 16 11 1.00 M 111 52.57 1.80 16 11 9 0 2 0 0 A 0 A Medium dense to dense dark brown slightly N = 39 (3, 4, 7, 7, 9, 16) AA43878 AA43879 2.00 2.00-2.45 2 clayey/silty sandy fine to coarse GRAVEL with a medium cobble content 51.97 2.40 51.77 2.60 Obstruction End of Borehole at 2.60 m 3 4 . 5 6 8 9 WATER STRIKE DETAILS HARD STRATA BORING/CHISELLING Water Casing Sealed Time Time Comments From (m) To (m) Comments Strike Depth То (h) Αt (min) 2.4 2.6 1.5 1.20 1.20 Seepage 16/8/16 0.95 20 Moderate 1 90 1 90 Nο .GDT IGSL. **GROUNDWATER PROGRESS** Hole Casing Depth to Water **INSTALLATION DETAILS** Comments 18963.GPJ Date Depth Depth Tip Depth RZ Top RZ Base Туре **REMARKS** Borehole backfilled upon completion. Borehole scheduled for Sample Legend ВН D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Samp rotary follow-on coring. Sample P - Undisturbed Piston Sample IGSL tal Sample (Jar + Vial + Tub) W - Water Sample



REPORT NUMBER

18963

BOREHOLE NO. **BH3/12** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 Dando 3000 **RIG TYPE CO-ORDINATES** 525,909.63 E DATE COMMENCED 22/01/2016 **BOREHOLE DIAMETER (mm)** 200 725,923.39 N DATE COMPLETED 22/01/2016 **GROUND LEVEL (m AOD)** 53.99 **BOREHOLE DEPTH (m)** 2.20 SPT HAMMER REF. NO. CLIENT **BORED BY** WC **Galway County Council ENERGY RATIO (%) ENGINEER PROCESSED BY** ARUP JL Samples Standpipe Details (H \mathbb{E} Elevation Ref. Number Sample Type Recovery Field Test Legend Depth (Depth (Description Depth (m) Results - 0 Very soft black slightly gravelly organic SILT <u>///\</u>0x 53.49 0.50 N = 2(2, 2, 1, 0, 1, 0) AA43880 AA43881 D B 0.50 0.50-0.95 Loose dark brown slightly silty sandy GRAVEL with many cobbles 52.69 1.30 Loose light brown grey silty sandy GRAVEL AA43882 AA43883 1.50 1.50-1.95 N = 5(0, 0, 0, 0, 1, 4) 51.89 51.79 F2 Obstruction End of Borehole at 2.20 m -3 4 -5 6 8 9 HARD STRATA BORING/CHISELLING **WATER STRIKE DETAILS** Water Casing Sealed Rise Time Time From (m) To (m) Comments Comments Strike Depth То (h) (min) 2.1 2.2 1.30 1.30 Seepage 1 16/8/16 1.10 20 Moderate 1 90 1 90 Nο IGSL.GDT **GROUNDWATER PROGRESS** Hole Casing Depth to Water **INSTALLATION DETAILS** Date Comments 18963.GPJ Depth Depth Tip Depth RZ Top RZ Base Туре BH LOG **REMARKS** Borehole backfilled upon completion Sample Legend D - Small Disturbed (tub) B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Samp IGSL Sample P - Undisturbed Piston Sample tal Sample (Jar + Vial + Tub) W - Water Sample



REPORT NUMBER

10	ഭൂ	/												10903	
CO	NTRAC	T N6	Galw	ay City	Transport	Project - Phase	3					BOREHO SHEET	LE NO.		
	-ORDIN		7	526,467 726,392	2.59 N	RIG TY BOREL	PE IOLE DIAM	ETER (m		Hand Dug		DATE CO		Sheet 1 of 1 CED 18/02/2016	
		LEVEL (n			55.52		IOLE DEPT	. ,	().70		DATE CO			
	ENT SINEER		-	County	Council		MMER REI Y RATIO (%					BORED E		JD ′ JL	
						'					San	nples			4)
Depth (m)				Descr	ription		Legend	Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TOPS						%	55.42	0.10	AA39959	В	0.10-0.70			
3 3 5 5 6 7 7	mediu Grave Obstr	ım cobble	e cont ılar to	tent. Sa subang	y sainty G	RAVEL with a to medium. se.	0-00	54.82	0.70						
НА	RD ST	RATA BO			ELLING						I			ATER STRIKE DET	AILS
ror	m (m)	To (m)	Tim (h)		mments		Wate Strik		sing S pth	Sealed At	Ris To			Comments	
														No water strike	
													GRO	OUNDWATER PRO	GRES
INS	TALLA	TION DE					Dat		Hole Depth	Casing Depth	De W	pth to ater	ommer	nts	
	Date	Tip Dep	oth R	Z Top	RZ Base	Туре									
REI	MARKS	Hand d	lug pit	t at loca	ation of BH	3/14			LB - Bulk L	le Legen Disturbed (tub) Disturbed Bulk Disturbe Ironmental San	d	+ Vial + Tub)	Sample P - Und	ndisturbed 100mm Diarneter e disturbed Piston Sample ater Sample	



REPORT NUMBER

/1	এইদ															
со	NTRAC	T N6	Galway	City T	ransport	Project -	Phase 3						BOREH	IOLE NO	D. BH3/1	
	-ORDIN OUND L	ATES .EVEL (n	726	,580. ,493.				PE OLE DIAM OLE DEPT	•	nm)	Hand Duç 1.30	9	DATE (COMPLE	NCED 19/02/2	2016
l	ENT GINEER		lway Cou UP	ınty C	Council			MMER RE					BORED PROCE	BY SSED E	JD BY JL	
Depth (m)			D	escriț	otion			Legend	Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Recovery	Field Tes Results	Standpipe
1 2 3 4 4 5 6 6 7 7 8 8 9	(Loose high compared weath (Loose GRAV Cobble (Loose GRAV suban Obstru	obble co ered of g e) Light b EL with I is angu es are w e) Brown EL. San gular coa uction - F	orown cla ntent. Sa granite. orown slig a high co lar to sub eathered slightly s d is fine. arse.	ghtly sobble bangul of grave	silty sandy coarse. silty/claye content. ular fine or ranite. layey ver el is angu	Cobbles ey slightly Sand is of granite y sandy ular to	are / sandy coarse.		58.80 58.60 58.20 57.70	0.20 0.40 0.80 1.30	AA39960 AA39961 AA39962	B B B	0.20-0. 0.40-0.3 0.80-1.2	30		
- H/-	ARD ST	RATA BO	RING/CI	HISEL	LING									V	 VATER STRIKE	DETAILS
From	m (m)	Го (m)	Time (h)	Con	nments			Wate Strik		sing (Sealed At	Ris To		Time min)	Comments	
								1.20							Slow	
		FION: TE	TAU C							Hole	Casing	De	pth to		ROUNDWATER	PROGRES
	Date	Tip Dep	TAILS oth RZ T	ор Б	RZ Base	Ту	ре	Dat	te	Depth	Depth	N N	ater	Comm	ents	
RE	MARKS	Hand d	ug pit at	locati	ion of BH	3/15				D - Small B - Bulk I LB - Larg	Disturbed (tub) Disturbed (tub) Disturbed e Bulk Disturbe) :d	+ Vial + Tuh	Sam P - l	· Undisturbed 100mm Dia pple Indisturbed Piston Samp Water Sample	



REPORT NUMBER

10	GSL												10903	
CO	NTRAC	T N6	Galway	City Transpo	t Project - Phase	3					BOREHO	LE NO.		•
	-ORDIN	ATES LEVEL (n	726	,595.30 E ,495.59 N 58.49		HOLE DIAM		im) 2	Dando 30	00	SHEET DATE CO DATE CO			
CLI	ENT GINEER	Ga	lway Cou	inty Council	SPT HA	HOLE DEPT AMMER RE GY RATIO (°	F. NO.).60		BORED B	Υ	WC	
LIVE	SINLLIN		OF .		LINEIX	JOHANO	/0)				nples	ים סבכ	JL	
Depth (m)			D	escription		Legend	Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
2	Obstr	uction - [ly CLAY ONE fragments		58.09	0.40	_ AA48883	В	0.50-0.60			
7														
9 	ARD STI	RATA BO	ORING/CI	HISELLING								WA	ATER STRIKE DETA	AILS
Fror	m (m)	To (m)	Time	Comments		Wate	er Ca		Sealed	Ris			omments	
).5	0.6	(h) 0.5			Strik	e De	epth	At	<u>To</u>	(mi	in)	No water strike	
											·	GRO	DUNDWATER PRO	GRESS
	TALLA Date	TION DE		op RZ Base	Туре	Da		Hole Depth	Casing Depth	De W	pth to c	ommen	nts	
REI	MARKS	2hrs ge getting	etting plai off positi	nt and equipr on.	nent to borehole lo	ocation. 1.5	hrs	LB - Bulk D	le Legeni Disturbed (tub) isturbed e Bulk Disturbei ironmental Sam	d	+ Vial + Tub)	Sample P - Und	ndisturbed 100mm Diameter e sisturbed Piston Sample ster Sample	



REPORT NUMBER

0	હકા													18963	
СО	NTRAC	T N6	Galw	vay City	Transpor	t Project - Phase 3						BOREHO	LE NO.		
CO	-ORDIN	IATES		526,754	1 60 F	RIG TYF	PE			Dando 30	າດດ 🖯	SHEET		Sheet 1 of 1	
		LEVEL (1		726,635	5.82 N 58.47	BOREH	OLE DIAM		nm)	200 0.50		DATE CO			
	ENT				Council		MMER RE					BORED E	RY	WC	
	GINEER		RUP	County	Courion		Y RATIO (PROCES			
						l .	<u> </u>	ĺ				nples			
E				_			- 5	u u	Depth (m)	ē	Ф		<u>></u>	Field Test	Standpipe Details
Depth (m)				Desci	ription		Legend	Elevation	pt	Ref. Number	Sample Type	Depth (m)	Recovery	Results	ndp tails
ا ۵							Le	#	ے ا	% Z	S ₂	<u>ه</u> ه	Re		Sta
0	PEAT	-					11/1/1/	58.17	0.30						
			VEL- a	and CO	BBLE-size	ed fragments of	200		0.50						
	Grani	te uction				/									
1	End c	of Boreho	ole at	0.50 m											
. 2															
-															
3															
4															
. 5															
5															
6															
7															
-8															
9															
HΑ	ARD ST	RATA B	ORING	G/CHISE	ELLING		1						W	ATER STRIKE DET	AILS
ror	n (m)	To (m)	Tim		mments		Wate			Sealed	Rise			Comments	
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													GRO	OUNDWATER PRO	GRESS
NS	ΤΔΙΙΛ	TION DE	-ΤΔII ⁽	s ·			Da		Hole	Casing	De	pth to c	commer		2.1.200
	Date				RZ Base	Туре	Ба		Depth	Depth	W	ater C	, JIIIIII EI	11.0	
	Dale	тір Бе	pui K	∟ IUP	NE Dase	туре									
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REI	MARKS	1.5hr g	getting	g rig and	l tools off	BH location. Borel cheduled for rotary	nole backf	illed	Samp D - Smal	ole Legen	d)			ndisturbed 100mm Diameter	
		coring.		D		a a lor rotary			LB - Bulk	Disturbed ` ge Bulk Disturbe vironmental Sar	ed	+ Vial + Tub\	Sample P - Und W - Wa	e disturbed Piston Sample ater Sample	
									L CITY - CIT	onomai odi	pio (Jai 1	, · 140)	+40		



REPORT NUMBER

SARRACT No Galway City Transport Project - Phase 3 SAREFULE NOST SHEET	$\sqrt{0}$	GSL														10903	
DORDINATES 527,023.54 E SOUND LEVEL (m AOD) 65.54 BOREHOLE DIAMETER (mm) 200 200 200 200 200 200 200 200 200 20	СО	NTRAC	T N6	Galway	/ City Tra	nsport	Project -	Phase 3							LE NO.		
JENT Galway County Council SPT HAMMER REF. NO. ENERGY RATIO (%) Description Set to firm dark brown sandy gravelly CLAY with a medium cobbile content. Medium dense dark brown sandy gravelly CLAY with a medium cobbile content. Medium dense dark brown sandy GRAVEL with a medium cobbile and boulder content. Medium dense dark brown sandy GRAVEL with a medium cobbile and boulder content. Medium dense dark brown sandy GRAVEL with a medium cobbile and boulder content. Medium dense dark brown sandy GRAVEL with a medium cobbile and boulder content. Medium dense dark brown sandy GRAVEL with a medium cobbile and boulder content. Medium dense dark brown sandy GRAVEL with a medium cobbile and boulder content. Medium dense dark brown sandy GRAVEL with a medium cobbile and boulder content. Medium dense dark brown sandy GRAVEL with a medium cobbile and boulder content. Medium dense dark brown sandy GRAVEL with a medium cobbile and boulder content. Medium dense dark brown sandy GRAVEL with a medium cobbile and boulder content. Medium dense dark brown sandy GRAVEL with a medium cobbile and boulder content. Medium dense dark brown sandy GRAVEL with a medium cobbile and boulder content. Medium dense dark brown sandy GRAVEL with a medium cobbile and boulder content. Medium dense dark brown sandy GRAVEL with a medium cobbile and boulder content. Medium dense dark brown sandy GRAVEL with a medium cobbile and boulder content. Medium dense dark brown sandy GRAVEL with a medium cobbile and boulder content. Medium dense dark brown sandy GRAVEL with a medium cobbile and boulder content. Medium dense dark brown sandy GRAVEL with a medium cobbile and boulder content. Medium dense dark brown sandy GRAVEL with a medium cobbile and boulder content. Medium dense dark brown sandy GRAVEL with a medium cobbile and boulder content. Medium dense dark brown sandy GRAVEL with a medium cobbile and boul				72	6,804.98	N		BOREH	OLE DIAM	•	nm)	200	000	DATE CO		ED 14/03/2016	
Description Descr	CLI	ENT	Ga	lway Co				SPT HA	MMER REI	F. NO.		2.00		BORED B	Υ	WC	
Soft to firm dark brown sandy gravelly CLAV with a medium cobble content Medium dense dark brown silty sandy GRAVEL with some cobbles Medium dense light brown silty sandy GRAVEL with a medium cobble and boulder content AA48881 B 1.00-1.45 N-21 (3.4.4.5.7.5) N-21 (3.4.4.5.7.5) N-21 (3.4.4.5.7.5) N-21 (3.4.4.5.7.5) N-21 (3.4.4.5.7.5) N-21 (3.4.4.5.7.5) N-22 (3.4.4.5.7.5) N-23 (2.8.4.3.3.5) N-24 (2.80) AA48882 B 2.00-2.45 N-15 (2.8.4.3.3.5) N-25 (2.8.4.3.3.5) N-27 (2.8.4.3.3.5) N-26 (2.8.4.3.3.5) N-27 (2.8.4.3.3.5) N-27 (2.8.4.3.3.5) N-28 (2.8.4.3.3.5) N-28 (2.8.4.3.3.5) N-29 (2.8.4.3.3.5) N-29 (2.8.4.3.3.5) N-21 (3.4.4.5.7.5) N-20 (2.8.4.3.3.5) N-20 (2.8.4										,						<u> </u>	
Medium does dark brown silty sandy GRAVEL with some cobbles Medium does dark brown silty sandy GRAVEL with a medium cobble and boulder content Medium does light brown silty sandy GRAVEL with a medium cobble and boulder content Medium does light brown silty sandy GRAVEL with a medium cobble and boulder content MA448881 B 1.00-1.45 N = 21 (2.4, 4.5, 7.6) N = 15 (2.8, 4.3, 3.8) N = 1	Depth (m)			[Descriptio	on			Legend	Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Recovery		Standpipe
ARD STRATA BORING/CHISELLING End of Borehole at 2.80 m AA48888 B 1.00-149	0	mediu	ım cobbl	e conte	nt					65.04	0.50			0.50			
Medium corbbie and boulder content AAA68882 B 2,00-2,45 (3,4,4,5,7,5) End of Borehole at 2,80 m AAA68882 B 2,00-2,45 (3,4,4,5,7,5) End of Borehole at 2,80 m Water Casing Sealed Rise Time Comments To (m) To (m) Time Comments Strike Depth At To (min) Comments 2,70 2,70 No 2,40 20 Seepage STALLATION DETAILS Date Tip Depth RZ Top RZ Base Type EMARKS 1,75hrs getting plant and equipment to borehole location. 1hr getting off position.		some	cobbles						\$0 -0 × 0 × 0 × 0 × 0 × 0 × 0 × 0 × 0 × 0	64.54	1.00					N = 21	
End of Borehole at 2.80 m ARD STRATA BORING/CHISELLING Water STRIKE DETAILS Depth At To (min) (2.8,4.3.3,5) WATER STRIKE DETAILS Depth At To (min) Comments 2.70 2.70 No 2.40 20 Seepage STALLATION DETAILS Date Tip Depth RZ Top RZ Base Type EMARKS 1.75 hrs getting plant and equipment to borehole location. 1hr getting off position.	1	Mediı mediı	ım dense ım cobbl	e light bi e and b	rown silty oulder co	sandy ntent	y GRAVEL	. with a				AA40001	В	1.00-1.45		(3, 4, 4, 5, 7, 5)	
ARD STRATA BORING/CHISELLING Mater Casing Sealed Rise Time Comments Comme	2												В	2.00-2.45			
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STALLATION DETAILS Date Tip Depth RZ Top RZ Base Type EMARKS 1.75hrs getting plant and equipment to borehole location. 1hr getting off position. Strike Depth At To (min) Collinents	ΗA	ARD ST	RATA BO		CHISELLI	NG					<u> </u>					TER STRIKE DET	AILS
2.70 2.70 No 2.40 20 Seepage GROUNDWATER PROGRE STALLATION DETAILS Date Tip Depth RZ Top RZ Base Type EMARKS 1.75hrs getting plant and equipment to borehole location. 1hr getting off position. Sample Legend D- Small Disturbed (tub) B- Bulk Disturbed (tub) B- Bulk Disturbed (1B- Large Bulk Disturbed (1B- Large Bulk Disturbed Platon Sample P- Undisturbed Platon Sample	ror	m (m)	To (m)		Comm	ents										omments	
STALLATION DETAILS Date Hole Depth Depth Under Comments Date Tip Depth RZ Top RZ Base Type EMARKS 1.75hrs getting plant and equipment to borehole location. 1hr getting off position. Sample Legend Depth Sample Legend Depth Sample Sample Legend Sample	2	2.7	2.8													Seepage	
Date Tip Depth RZ Top RZ Base Type EMARKS 1.75hrs getting plant and equipment to borehole location. 1hr getting off position. Sample Legend Depth Depth Water Confidence Confi	Ne	TALL A	TION DE	TAII S					Det				De	pth to			GRE
getting off position. D - Small Disturbed (tub) UT - Undisturbed 100mm Diameter Sample LB - Large Bulk Disturbed P - Undisturbed Piston Sample					Top RZ	Base	Тур	е	Dat	e			W	Water Comments			
1= ==:	REI	MARKS	3 1.75hrs getting	s getting off posi	plant an ition.	d equi	pment to I	borehole	D - Small Disturbed (tub) B - Bulk Disturbed					Sample			



REPORT NUMBER

CONTRACT N6 Galway City Transport Project - Phase 3 CO-ORDINATES 527,254.91 E 726,892.24 N GROUND LEVEL (m AOD) 70.75 BOREHOLE DIAMETER (mm) BOREHOLE DEPTH (m) 0.70 BOREHOLE NO. SHEET DATE COMMENCED DATE COMPLETED	BH3/18 Sheet 1 of 1
CO-ORDINATES 527,254.91 E 726,892.24 N RIG TYPE Hand Dug BOREHOLE DIAMETER (mm) DATE COMMENCED	
GROUND LEVEL (m AOD) 70.75 BOREHOLE DEPTH (m) 0.70 DATE COMPLETED	22/02/2016
CLIENT Galway County Council SPT HAMMER REF. NO. BORED BY ENGINEER ARUP ENERGY RATIO (%) PROCESSED BY	JD JL
Samples	
Deptron Property P	Field Test Results edid pure to the control of the
0 TOPSOIL 344 47 70.55 0.20	
TOPSOIL Dark brown clayey/silty sandy fine to coarse angular GRAVEL with a high cobble content. Cobbles are angular of granite. Obstruction TOPSOIL AA39965 B 0.50	
Dostruction End of Borehole at 0.70 m 2 3 4 5 6 7 8 8 8 8 8 8 8 8 8	
- 9 - 9	
HARD STRATA BORING/CHISELLING WATER	R STRIKE DETAILS
From (m) To (m) Time Comments Water Casing Sealed Rise Time Comm	nents
Stirke Deptil At 10 (IIIII)	vater strike
	DWATER PROGRE
INSTALLATION DETAILS Date Hole Casing Depth to Water Depth Depth PZ Top PZ Page Type	
Date Tip Depth RZ Top RZ Base Type	
B - Bulk Disturbed ` ´ Sample	ed 100mm Diameter



REPORT NUMBER

	<u>এই</u> দ															
CO	NTRACT	N6 (Galway (City T	ranspor	t Project	- Phase 3						BOREH	HOLE NO	D. BH3/19 Sheet 1	
	-ORDINA OUND L	ATES EVEL (m	727,	,396.4 ,015.8 6	47 E 87 N 1.67		I	E OLE DIAM OLE DEPT	•	nm)	Hand Dug 1.20	g	DATE (NCED 23/03/20)16
	ENT SINEER	Galv ARU	way Cou IP	nty C	ouncil			MMER RE						BY ESSED E	JD BY JL	
Depth (m)			De	escrip	otion			Legend	Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
- 0	TOPS	OIL						74 1 ^N · 7/1 1 ^N · 7	61.37	0.30				 "		
3	high co boulde Firm lig with a boulde Obstru	dark brov obble and rs are ar ight brown nigh cobl rs are ar ction - Po Borehold	d boulde agular to and da ble and b agular to ossible v	r con suba rk bro bould suba veath	tent. Columbian community contents to the cont	bbles an of granite sandy G ent. Cobb of granite	od e. GRAVEL oles and e.	3 - 0 - 2 - 0	61.17	1.20	AA39978 AA39979		0.30-0.:			
HA	RD STR	ATA BO	RING/CH	IISEL	LING									v	VATER STRIKE	DETAILS
		o (m)	Time		ments			Wate			Sealed	Ris		Time	Comments	
			(h)					Strik 0.80		epth	At	To	((min)	Slow	
									<u> </u>	Hole	Casing	Do	onth to		ROUNDWATER	PROGRESS
	TALLAT Date	ION DET Tip Dept		op R	Z Base	Ту	уре	Dat	te	Depth	Depth	W	epth to Vater	Comm	ents	
REI	WARKS	Hand du				13/19				D - Smal B - Bulk	DIE Legen Disturbed (tub))		San	- Undisturbed 100mm Diam	
										LB - Larg	e Bulk Disturbe vironmental Sar	ed mple (Jar	+ Vial + Tub	P - I	Undisturbed Piston Sample Water Sample	



REPORT NUMBER

	GSL													10000	
СО	NTRAC	Г N6 (Galway C	ity Transp	ort Project	- Phase 3						BOREHO	LE NO.		
СО	-ORDIN	ATES	527,	212.43 E		RIG TYF	PE			——— Hand Du	n h	SHEET	BABAT NI	Sheet 1 of 1	
GR	OUND L	EVEL (m		670.35 N 51.46			OLE DIAM			1.00		DATE CO		CED 23/03/2016 ED 23/03/2016	
	ENT			nty Council			MMER RE	• ,		1.00		BORED B		AC	
	SINEER	ARU	-				Y RATIO (PROCESS			
<u></u>								_	<u></u>			nples			Φ
Depth (m)			De	scription			pue	Elevation	Depth (m)	her	e e	£	very	Field Test Results	didbi
Dep							Legend		Dep	Ref. Number	Sample Type	Depth (m)	Recovery	Nesuits	Standpipe Details
0	TOPS	OIL					0 0 0	51.36	0.10	AA49485	В	0.10-0.45	-		
	Dark g	rey black EL with re	clayey/s	ilty very sa	ndy organi	ic	A A A A	51.01	0.45	AA49486	В	0.50-0.80			
	Orang	e brown s	slightly cl	ayey/silty f	ne to coar	se sandy	19 0 0 3 1 0 0 0 3 1 0 0 0 3	50.66	0.80	AA49487	В	0.80-1.00			
1	∖angula	ır to suba	ngular of			/	7877								
	Brown	slightly o	layey/silt	y very san	dy fine to c	oarse s are	/								
	angula	ır of gran	ite.												
2	pit			ess due to	many cob	pies in									
	End of	Borehole	e at 1.00	m											
. ,															
3															
- ₄															
5															
- - 6															
:															
7															
8															
9															
			Time	Comments Comments			Wate	er Ca	sing	Sealed	Ris	e Tin	ne	ATER STRIKE DETA	AILS
-101	m (m) 1	o (m)	(h)	Comments			Strik	e D	epth	At	То			Onlinents	
														No water strike	
												-	GRO	DUNDWATER PRO	GRESS
		TON DET					Da	te	Hole Depth	Casing Depth	De W	pth to ater C	ommer	nts	
	Date	Tip Dept	th RZ To	p RZ Bas	e Ty	/pe									
									1-						
REI	MARKS	Hand du	ıg pit at l	ocation of I	3H3/20				D - Sma	ole Legen I Disturbed (tub) Disturbed	d)		UT - Ur Sample	ndisturbed 100mm Diameter	
									LB - Larg	Disturbed je Bulk Disturbe vironmental San	d nple (Jar -	+ Vial + Tub)	P - Uno	listurbed Piston Sample Iter Sample	



REPORT NUMBER

18963

BOREHOLE NO. **BH3/21** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 Dando 3000 **RIG TYPE CO-ORDINATES** 527,143.84 E DATE COMMENCED 16/02/2016 **BOREHOLE DIAMETER (mm)** 726,344.76 N 200 **DATE COMPLETED** 16/02/2016 **GROUND LEVEL (m AOD)** 37.76 **BOREHOLE DEPTH (m)** 1.80 CLIENT SPT HAMMER REF. NO. **BORED BY** WC **Galway County Council ENGINEER PROCESSED BY ARUP ENERGY RATIO (%)** JL Samples Standpipe Details (E \mathbb{E} Elevation Ref. Number Sample Type Recovery Field Test Legend Depth (Depth (Description Depth (m) Results - 0 <u>/A/</u> ./// Soft to firm dark brown sandy very gravelly PEAT 1.6 1.1 37.26 0.50 В 0.50 Light brown sandy GRAVEL 0.00 36.96 0.80 Light brown silty sandy GRAVEL with many cobbles N = 13В 1.00-1.45 (0, 1, 2, 3, 4, 4) 36.46 1.30 Firm cream very sandy gravelly CLAY 36.06 1.70 В 1.70-1.80 Reddish brown slightly silty very sandy fine to medium 35.96 1.80 GRAVEL End of Borehole at 1.80 m 3 4 . 5 6 8 9 HARD STRATA BORING/CHISELLING WATER STRIKE DETAILS Casing Water Sealed Rise Time Time From (m) To (m) Comments Comments Strike Depth At То (min) (h) 1.8 1.30 Slow 1.7 0.75 1.70 1.70 No 20 16/8/16 GDT IGSL. **GROUNDWATER PROGRESS** Hole Casing Depth to Water **INSTALLATION DETAILS** Date Comments .GPJ Depth Depth Date Tip Depth RZ Top RZ Base 18963. Type 1.80 50mm SP 16-02-16 1.80 1.10 BH LOG **REMARKS** 2.5hr getting rig on to position from BH3/38. Driller reports wet Sample Legend D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Samp ground from 1.50m. 4.5hr getting rig and tracked dumper out of Sample P - Undisturbed Piston Sample IGSL field, reinstating field and cleaning down road. Tracked al Sample (Jar + Vial + Tub) W - Water Sample excavator used to assist rig access / egress from field. Move to next borehole, BH3/27.



REPORT NUMBER

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СО	NTRACT	N6 G	Salway C	City Tran	sport	Project - Phase 3	}					BOREH SHEET	OLE NO	BH3/22 Sheet 1 of	1
	ORDINA	ATES EVEL (m	727,	548.26 126.52 49.4	N		PE OLE DIAM OLE DEPT		(mm)	Hand Du	ıg	DATE C		ICED 12/02/2016	
	IENT GINEER	Galw ARU	<i>ı</i> ay Couı P	nty Coui	ncil	I	MMER RE Y RATIO (⁹					BORED PROCES		AC Y JL	
_											Sar	nples			
Depth (m)			De	escriptio	n		Legend	100	Depth (m)	Ref.	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe
0	TOPS	OIL					711/	49.10	0.3	0					
3 3 4 5 5 6 6 7 7	GRAV angula Obstru	EL with a r of grani	high col te. ssible V	bble cor	ntent.	to coarse Cobbles are ranite Rockhead	997 - 077	48.90	0.5	<u>0</u> AA4947.	2 B	0.30-0.5			
11/	ADD CT	ATA DO	NINO/OU	UCEL LIA	10									VATER OTRIVE RE	TAII 0
		ATA BOF	Time				Wate	er C	asing	Sealed	Ris	se T	ime	ATER STRIKE DE	IAILS
-ro	m (m) T	o (m)	(h)	Comme	ents		Strik	е [Depth	At	To		min)	Comments	
							0.45						GR	Slow OUNDWATER PR	OGRE!
INS	STALLAT	ION DET	AILS				Dat	te	Hole	Casing	g De	epth to Vater	Comme	nts	
	Date	Tip Dept		p RZ E	Base	Туре			Depth	Depth	1 V	valei			
RE	MARKS	Hand du	g pit at l	ocation	of BH	13/22			D-S B-B LB-	mple Lege mall Disturbed (tu ulk Disturbed Large Bulk Disturl Environmental S	ib) bed	+ Vial + Tuh\	Samp P - Ur	Undisturbed 100mm Diameter ole disturbed Piston Sample Vater Sample	



REPORT NUMBER

18963

BOREHOLE NO. **BH3/23** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 Dando 3000 **RIG TYPE CO-ORDINATES** 527,770.91 E DATE COMMENCED 05/02/2016 BOREHOLE DIAMETER (mm) 727,345.14 N 200 DATE COMPLETED 05/02/2016 **GROUND LEVEL (m AOD)** 26.78 **BOREHOLE DEPTH (m)** 3.70 **Galway County Council** SPT HAMMER REF. NO. WC CLIENT **BORFD BY ENGINEER PROCESSED BY ARUP ENERGY RATIO (%)** JL Samples Standpipe Details (E \mathbb{E} Elevation Ref. Number Recovery Sample Field Test Legend Depth (Depth (Description Depth (m) Results - 0 Firm dark brown sandy gravelly CLAY with a low to medium cobble and boulder content 25.78 1.00 N = 15AA32640 В 1.00-1.45 Medium dense brown silty very sandy GRAVEL with (2, 3, 3, 3, 4, 5)some cobbles N = 15 (3, 3, 2, 3, 4, 6) -2 AA32641 В 2.00-2.45 24.48 2.30 Medium dense light brown clayey/silty very sandy GRAVEL with a low to medium cobble and boulder content N = 16AA32643 -3 В 3.00-3.45 (3, 4, 3, 4, 4, 5) 23.08 3.70 End of Borehole at 3.70 m 4 -5 6 8 9 HARD STRATA BORING/CHISELLING WATER STRIKE DETAILS Casing Water Sealed Time Time From (m) To (m) Comments Comments Strike Depth At То (min) (h) 3.6 3.7 3.20 Slow 0.75 3.70 3.70 No 20 16/8/16 GDT IGSL. **GROUNDWATER PROGRESS** Hole Casing Depth to Water **INSTALLATION DETAILS** Comments 18963.GPJ Date Depth Depth Tip Depth RZ Top RZ Base Туре **REMARKS** 0.5hr moving boulders obstructing access to plot. 0.5hr moving Sample Legend ВН D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Samp rig and tracked dumper from borehole including replacement of Sample P - Undisturbed Piston Sample GSL boulders to block entrance. tal Sample (Jar + Vial + Tub) W - Water Sample



REPORT NUMBER

18963

BOREHOLE NO. BH3/25 CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 Dando 3000 **RIG TYPE CO-ORDINATES** 528,732.55 E DATE COMMENCED 01/02/2016 BOREHOLE DIAMETER (mm) 727,834.69 N 200 **DATE COMPLETED** 01/02/2016 **GROUND LEVEL (m AOD)** 12.60 **BOREHOLE DEPTH (m)** 3.80 SPT HAMMER REF. NO. WC CLIENT **Galway County Council BORFD BY ENERGY RATIO (%) ENGINEER PROCESSED BY ARUP** Л Samples Standpipe Details (E \mathbb{E} Elevation Ref. Number Recovery Sample Field Test Legend Depth (Depth (Description Depth (m) Type Results - 0 Gravelly TOPSOIL 711. 711 12.30 0.30 Firm light grey mottled brown silty very sandy AA43893 В 0.50-1.00 GRAVEL with some cobbles 80 N = 16AA43894 В 1.00-1.45 (3, 3, 4, 3, 4, 5)11.00 1.60 Firm becoming firm to stiff light brown slightly sandy × °^X gravelly SILT. Gravel is angular. N = 18 (4, 4, 3, 4, 5, 6) AA43895 В 2.00-2.45 2 × `o× × , × , × , × × o× 9.60 3.00 N = 20AA43896 3 Firm becoming firm to stiff light brown slightly sandy gravelly SILT with many cobbles. Gravel is angular. В 3.00-3.45 ₹9._× ××°°× (3, 3, 4, 4, 4, 8) Ó ×γ. 8.80 3.80 Obstruction 4 End of Borehole at 3.80 m -5 6 8 9 HARD STRATA BORING/CHISELLING WATER STRIKE DETAILS Time Water Casing Sealed Time Comments From (m) To (m) Comments Strike Depth То (h) Αt (min) 3.8 3.7 0.75 16/8/16 No water strike GDT IGSL. **GROUNDWATER PROGRESS** Hole Casing Depth to Water **INSTALLATION DETAILS** Comments 18963.GPJ Date Depth Depth Date Tip Depth RZ Top RZ Base Туре **REMARKS** Borehole backfilled upon completion. Borehole scheduled for Sample Legend ВН D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Samp rotary follow-on coring. Sample P - Undisturbed Piston Sample IGSL tal Sample (Jar + Vial + Tub) W - Water Sample



REPORT NUMBER

0	GSL				<u></u>	012011	111071			\LUC					18963	
	NTRAC		6 Galwa	ay City Tra	nsport	t Project - F							BOREHO SHEET	LE NO	BH3/26 Sheet 1 of 1	
	-ORDIN	NATES LEVEL (7	528,815.44 727,922.07 0) 14.	N	E		E PLE DIAM PLE DEPT		nm)	Dando 30 200 0.40	000	DATE CO		ICED 01/02/2016	
1	IENT GINEEF		alway C RUP	County Cou	ıncil			IMER RE					BORED E		WC Y JL	
						'						San	nples			
Depth (m)				Description	on			Legend	Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
- 0	medi	dark brow um bould ruction	wn sand der con	dy gravelly itent	CLAY	with a low	to .		14.27	0.40						
1 1 2 3 3 4 4 5 5 7 7 8 8 9 9	End	of Boreh	ole at 0	0.40 m												
-																
			ORING Time	CHISELLI				Wate	er Ca	sing	Sealed	Ris	e Tir	ma	ATER STRIKE DET	AILS
	m (m)	To (m)	(h) 0.5	Comm	ents			Strik		epth	At	То		iin)	Comments	
															No water strike	
										Hole	Casing	Do	nth to		OUNDWATER PRO	GRESS
INS	Date	Tip De		Z Top RZ	Base	Турє	Э	Dat	te	Depth	Depth	W N	pth to ater	Comme	ents	
INS	MARK	Boreh	ole bac	g access to ckfilled upo on coring.	o field on com	and movin	g to BH rehole s	location. cheduled	for	Samp D - Smal B - Bulk LB - Larg Env - En	DIE Legen Il Disturbed (tub Disturbed ge Bulk Disturbe vironmental Sa	nd o) ed mple (Jar	+ Vial + Tub)	Samp P - Ur	Undisturbed 100mm Diameter le didisturbed Piston Sample Vater Sample	



REPORT NUMBER

1	GSL	/											10903	
СО	NTRAC	T N6	Galway	City Transpo	rt Project - Phase	: 3					BOREHO	LE NO.		
СО	-ORDIN	ATES	528 728	8,960.51 E 8,130.68 N	RIG T BORE	YPE HOLE DIAM	ETER (m		Dando 30 200	000	SHEET DATE CO			
		EVEL (ı		8.94		HOLE DEPT			1.40		DATE CO			
	IENT GINEER		alway Co RUP	unty Council		IAMMER REI GY RATIO (%					BORED B		WC 'JL	
						(,	-,				nples			
Depth (m)			[Description		Legend	Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	Soft d	ark brov	vn sandy	gravelly CLA	Υ	<u> </u>	8.54	0.40						
1	a med	lium cob	ightly sar	ndy slightly gra boulder conte	avelly CLAY with nt		7.54	1.40	AA48872 AA48873	ВВ	0.50 1.00-1.45		N = 50/180 mm (2, 2, 4, 8, 38)	
	Obstruction of the control of the co		ole at 1.4	0 m										
HA	ARD STI	RATA B	ORING/C	HISELLING								WA	TER STRIKE DETA	All S
		To (m)	Time	Comments		Wate			Sealed	Ris		ne c	comments	0
	1.4	1.4	(h) 0.5			Strik	<u> </u>	epth	At	<u>Tc</u>	o (mi		No water strike	
								l lol-	C:			GRO	DUNDWATER PRO	GRES
	Date	TION DE		Γορ RZ Base	Туре	Dat		Hole Depth	Casing Depth	De W	pth to C	ommen	nts	
REI	MARKS	used to	o assist r	g on to positio ig access / eg ine from field	n from BH3/21. T press from field. 3	racked exca hr removing	vator	LB - Bulk L	le Legen Disturbed (tub) Disturbed Bulk Disturbe ironmental San	d	+ Vial + Tub)	Sample P - Und	ndisturbed 100mm Diameter e disturbed Piston Sample ater Sample	



REPORT NUMBER

10	ഭൂ													10903	
CO	NTRAC	T N6	Galwa	ay City	Transport	Project - Phase 3						BOREHO	LE NO.		
	-ORDIN		7	529,132 728,217	'.63 N	RIG TYF BOREH	PE OLE DIAM	ETER (m		Hand Dug	,	SHEET DATE CO			
		LEVEL (r		-	18.82		OLE DEPT		C).70	-	DATE CO			
	ENT SINEER		ilway C :UP	County	Council		MMER REI Y RATIO (%					BORED B		JD ′ JL	
								, 				nples			
Depth (m)				Descri	iption		Legend	Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
- 0	TOPS				ravelly SII		XO X C	18.62 18.52	0.20	AA39957	В	0.20-0.30			
3 3 4 4 7 7 8 8	Firm I with a Obstr Rockl	orownish medium uction - l	grey s cobbl arge E	slightly le and b	silty sandy boulder co	gravelly CLAY		18.12	0.70						
HA	RD ST	RATA BO	ORING	CHISE	LLING								WA	ATER STRIKE DETA	AILS
Fror	m (m)	To (m)	Time (h)		mments		Wate Strik		sing S	Sealed At	Ris To			comments	
			(11)				Sun		- ***		10	(1111		No water strike	
													GRO	DUNDWATER PRO	GRES
		TION DE			P7 Bass	Tupo	Dat		Hole Depth	Casing Depth	De W	pth to ater C	ommer	nts	
	Date	пр Бе	piri KZ	∠ 10p	RZ Base	Туре									
REI	MARKS	Hand o	dug pit	at loca	tion of BH	3/28			D - Small B - Bulk D LB - Large	le Legeno Disturbed (tub) isturbed e Bulk Disturbed ironmental Sam	d	+ Vial + Tub)	Sample P - Und	ndisturbed 100mm Diameter e isturbed Piston Sample ater Sample	



REPORT NUMBER

18963

BOREHOLE NO. BH3/29 CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 Dando 3000 **RIG TYPE CO-ORDINATES** 529,489.29 E DATE COMMENCED 01/02/2016 BOREHOLE DIAMETER (mm) 728,334.05 N 200 DATE COMPLETED 01/02/2016 **GROUND LEVEL (m AOD)** 13.73 **BOREHOLE DEPTH (m)** 2.70 CLIENT SPT HAMMER REF. NO. **BORED BY** WC **Galway County Council ENERGY RATIO (%) ENGINEER PROCESSED BY ARUP** JL Samples Standpipe Details (E \mathbb{E} Elevation Ref. Number Recovery Sample Field Test Legend Depth (Depth (Description Depth (m) Results - 0 Soft to firm light brown sandy gravelly CLAY with a low to medium cobble and boulder content 12.93 0.80 Firm to stiff light brown silty sandy GRAVEL with a AA43890 1.00 medium cobble and low to medium boulder content AA43891 1.50-1.95 N = 32 (4, 7, 7, 8, 8, 9) 2 X000 11.33 2.40 N = 50/105 mm (8, 11, 16, 34) Stiff light brown slightly sandy slightly gravelly CLAY AA43892 В 2.50-2.70 11.03 2.70 with many cobbles Obstruction 3 End of Borehole at 2.70 m 4 . 5 6 8 9 HARD STRATA BORING/CHISELLING WATER STRIKE DETAILS Time Water Casing Sealed Time Comments From (m) To (m) Comments Strike Depth То (h) (min) 2.6 2.7 0.5 16/8/16 No water strike IGSL.GDT **GROUNDWATER PROGRESS** Hole Casing Depth to Water **INSTALLATION DETAILS** Date Comments 18963.GPJ Depth Depth Tip Depth RZ Top RZ Base Туре **REMARKS** Hand dug inspection pit excavated to commence hole (1.5hr). Sample Legend ВН D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Samp Reinstating field upon completion (0.5hr). Move gear to BH3/26 Sample P - Undisturbed Piston Sample IGSL (0.75hr). Borehole backfilled upon completion. Borehole tal Sample (Jar + Vial + Tub) W - Water Sample scheduled for rotary follow-on coring.



REPORT NUMBER

ાઉટા	<u> </u>											10903	
CONTRA	CT N	6 Galway	City Transpor	t Project - Phase 3	3					BOREHO	LE NO.		
CO-ORD	INATES	531	1,041.18 E	RIG TY	PE			Hand Dug	n F	SHEET		Sheet 1 of 1	
	D LEVEL (728	3,509.06 N 23.76	BOREH	OLE DIAM		nm)	0.50		DATE CO			
CLIENT ENGINEE		alway Coo	unty Council		MMER RE				- 1	BORED E		JD Y JL	
INOINEE	-10 //	(OI		LIVERO	T TOATIO (T		nples	OLD D	JE JE	
Deptin (m)		D	escription		Legend	Elevation	Depth (m)	Ref. Number	Sample Type	.	Recovery	Field Test Results	Standpipe
								Ref	Sar	Depth (m)	Rec		Stal
	PSOIL (M/ wn clavev		DUND) sandy GRAV	EL with		23.61 23.26	0.15 0.50	AA39968 AA39969 AA39970	B ENV	0.15-0.50 0.15-0.50			
occa pipe tarm	asional fra e, timber, ı	agments of roof slate en (MADE	of concrete, re , plastic and p E GROUND)	d brick, ceramic		20.20	0.00	— AA39970	ENV	0.15-0.50			
!													
5													
IARD S	TRATA B	ORING/C	HISELLING								W	ATER STRIKE DET	AIL:
om (m)	To (m)	Time (h)	Comments		Wate Strik	er Ca	sing s	Sealed At	Ris To		ma	Comments	
												No water strike	
							Holo	Cooine		nth t-		OUNDWATER PRO	GRI
Date	ATION DE		op RZ Base	Туре	Dat		Hole Depth	Casing Depth	De W	epth to Vater	Commei	nts	
EMAR	(S Hand to pres	dug pit at	location of Bl	H3/30. Pit terminate stos roofing fragme	ed at 0.50r	n due	Samp D - Small B - Bulk I	ole Legen	d)		UT - U Sampl	Indisturbed 100mm Diameter	
							LB - Larg	e Bulk Disturbe vironmental Sar	ed nple (Jar	+ Vial + Tub)	P - Un	disturbed Piston Sample atter Sample	



REPORT NUMBER

	<u>এহাদ</u> /														
CO	NTRACT	N6 G	Salway C	ity Transpo	rt Project - P	hase 3						BOREHO	DLE NO	BH3/31 Sheet 1 of 1	ı
	-ORDINA		728,4	272.27 E 425.74 N 11.44	В		PE OLE DIAM OLE DEPT	•	nm)	Hand Duo	g			CED 23/02/2016	
	ENT			nty Council			MMER REI	. ,		1.20		BORED I		JD	
ENC	SINEER	ARU	P		E	NERG	Y RATIO (%	%)				PROCES	SED B	Y JL	
<u>ا</u>								_	(F)			nples			l e
Depth (m)			De	scription			pue	Elevation	Depth (m)	Ref. Number	Sample Type	ŧ	over	Field Test Results	l dpip
Dep							Legend	⊟e	Dep	Ref	San	Depth (m)	Recovery	results	Standpipe
0	TOPSO	IL					74 1 ^N 7/1 1 ^N 7	11.14	0.30				 		
	Firm lig	ht brown	and dar	k brown slig	ghtly sandy s cobble conte	lightly	%× × ×°	10.84	0.60	AA39971	В	0.30-0.60			
	Sand is	fine to n	nedium.	Gravel is ar	ngular to	/ / /	**************************************			AA39972	В	0.60-1.20			
1		ular coar ev mottle		slightly san	ndy gravelly S	SILT	×°.×	10.24	1.20						
	with a n	nedium t	o high co	obble conte	nt. Šand is ular coarse.	1	/								
	Cobbles	s are of I	imestone	Э.	didi oodi oo:										
2	End of I	Borehole	at 1.20	m											
3															
4															
5															
5															
6															
7															
8															
9															
HΑ	RD STR			ISELLING			100					<u> </u>		ATER STRIKE DET	TAILS
ror	n (m) To	(m)	Time (h)	Comments			Wate Strike	e De	sing S epth	Sealed At	Ris To		me nin)	Comments	
							1.20)						Seepage	
									Hole	Casing	De	enth to		OUNDWATER PRO	OGRE
	TALLATI Date			p RZ Base	Type		Dat	e	Depth	Depth	\ \V	epth to Vater	Comme	nts	
	Julio	ւ ւ Ի Ի բիլ	1	ר ויע טמטכ	Туре										
REI	MARKS	Hand du	g pit at lo	ocation of B	H3/31				Samp	le Legen Disturbed (tub)	d		117 1	Indisturbed 100mm Diameter	
									B - Bulk I LB - Larg	Disturbed e Bulk Disturbe	ed	(Vial (Tb)	Samp P - Ur		
									⊏nv - Env	ironmental San	npie (Jar	+ viai + IUD)	vv - VV	ator parripit	



REPORT NUMBER

18963

BOREHOLE NO. N6 Galway City Transport Project - Phase 3 **BH3/31 CP** CONTRACT SHEET Sheet 1 of 1 Dando 3000 **RIG TYPE CO-ORDINATES** 531,272.27 E DATE COMMENCED 02/03/2016 **BOREHOLE DIAMETER (mm)** 728,425.74 N 200 DATE COMPLETED 02/03/2016 **GROUND LEVEL (m AOD)** 11.44 **BOREHOLE DEPTH (m)** 4.20 **Galway County Council** SPT HAMMER REF. NO. WC CLIENT **BORFD BY ENGINEER PROCESSED BY ARUP ENERGY RATIO (%)** JL Samples Standpipe Details (E \mathbb{E} Elevation Ref. Number Recovery Sample Field Test Legend Depth (Depth (Description Depth (m) Results - 0 Firm dark brown sandy slightly gravelly SILT with a × × × ੴ× low to medium cobble and boulder content ரி: ⊗்: ⊗்: 9× × × × × × × × × AA48875 В 0.50 10.74 0.70 Firm and firm to stiff light brown and grey slighlty sandy slightly gravelly SILT with a medium cobble N = 16AA48876 В 1.00-1.45 × × × (2, 4, 5, 6, 2, 3)content N = 13 (3, 4, 4, 3, 3, 3) AA48877 В 2.00-2.45 2 N = 28AA48878 В 3.00-3.45 Driller notes wet ground from 3.0m (3, 4, 7, 8, 7, 6) <u>∞</u>× × × × × N = 50/75 mm (16, 9, 37, 13) AA48879 4.00-4.45 4 В 7.24 4.20 End of Borehole at 4.20 m -5 6 8 9 HARD STRATA BORING/CHISELLING WATER STRIKE DETAILS Time Water Casing Sealed Time From (m) To (m) Comments Comments Strike Depth То (h) Αt (min) 4.2 4.1 0.5 3.00 16/8/16 Seepage GDT IGSL. **GROUNDWATER PROGRESS** Hole Casing Depth to Water **INSTALLATION DETAILS** Comments GPJ Date Depth Depth Date Tip Depth RZ Top RZ Base Туре 18963. **REMARKS** 3.0hrs getting rig and tracked dumper on and off field. Tracked Sample Legend ВН D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Samp excavator deployed to assist in moving equipment. Sample P - Undisturbed Piston Sample IGSL tal Sample (Jar + Vial + Tub) W - Water Sample



REPORT NUMBER

18963

BOREHOLE NO. BH3/32 CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 2 **RIG TYPE** Dando 3000 **CO-ORDINATES** 531,971.12 E DATE COMMENCED 02/02/2016 **BOREHOLE DIAMETER (mm)** 728,317.72 N 200 DATE COMPLETED 03/02/2016 **GROUND LEVEL (m AOD)** 24.43 **BOREHOLE DEPTH (m)** 10.50 Galway County Council SPT HAMMER REF. NO. WC CLIENT **BORFD BY ENGINEER PROCESSED BY ARUP ENERGY RATIO (%)** Л Samples Standpipe Details Ξ \mathbb{E} Elevation Ref. Number Recovery Sample Field Test Legend Depth (Depth Description Depth (m) Type Results - 0 TOPSOIL 711. 711 0.20 24.23 × **₹**9.× Firm light brown slightly sandy gravelly SILT with a ××°°× low to medium cobble and boulder content AA48851 В 0.50 × × N = 16AA48852 В 1.00-1.45 (3, 4, 3, 4, 4, 5)× × × × × × × N = 17 (4, 7, 5, 4, 4, 4) AA48853 2.00-2.45 В 2 Ø× × × AA48854 3 В 3.00-3.45 (2, 2, 3, 4, 3, 4) \$\(\cdot \c N = 23 (3, 3, 3, 4, 8, 8) AA48855 В 4.00-4.45 4 20.23 4.20 Firm orange brown sandy gravelly silty CLAY $\overline{\times}$ 19.93 4.50 AA48856 D 4.50 . X Stiff light grey and grey brown slightly sandy slightly Q gravelly laminated SILT/CLAY N = 28 (3, 4, 6, 7, 7, 8) AA48857 В 5.00-5.45 -5 × X × × ŏ × × Χ. × 18.43 6.00 ×°× Ov N = 29AA48858 В 6.00-6.45 Stiff dark brown slightly sandy slightly gravelly SILT (4, 6, 6, 7, 8, 8) ×°× × . × `o_× × ,× × o × × × N = 28 (5, 6, 6, 7, 7, 8) AA48859 7.00-7.45 o×. ×c × × ₀× × ×°. × × N = 28AA48860 В 8 00-8 45 8 ·ox (4, 5, 6, 6, 7, 9) ×× ×°× × 15.43 9.00 N = 32 (6, 6, 7, 8, 8, 9) AA48861 9.00-9.45 В 9 -Stiff mottled light brown grey slightly sandy slightly gravelly CLAY ō _0_ 14.43 10.00 HARD STRATA BORING/CHISELLING WATER STRIKE DETAILS Water Sealed Time Time Casing Comments From (m) To (m) Comments Strike (h) Depth Αt To (min) 3.85 3.7 0.75 No water strike 16/8/1 10.3 10.5 0.5 GDT IGSL. **GROUNDWATER PROGRESS** Hole Casing Depth to Water **INSTALLATION DETAILS** GPJ Date Comments Depth Depth Tip Depth RZ Top RZ Base Start of Shift Type 03-02-16 18963. 9.00 9.00 4.10 LOG **REMARKS** 2hrs removing rig from BH3/26 field and accessing BH3/32. Sample Legend ВН D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Samp Borehole BH3/32 scheduled for rotary follow-on coring taking it Sample P - Undisturbed Piston Sample IGSL beyond scheduled depth of 10m. 3hr delivering / installing al Sample (Jar + Vial + Tub) W - Water Sample protective pipework in CP hole for RC follow-on.



REPORT NUMBER

10	ලවු												10903	
CO	NTRAC	T N6	6 Galway 0	City Transpo	rt Project - Phase	e 3					BOREHO	LE NO.	BH3/32	
CO	-ORDIN	NATES	531, 728	971.12 E 317.72 N	RIG T	YPE EHOLE DIAM	IETED (n		Dando 30	າດດ 🗀	SHEET DATE CO	MMENO	Sheet 2 of 2 DED 02/02/2016	
GR	OUND	LEVEL (ı		24.43		HOLE DEPT			0.50		DATE CO	MPLET	ED 03/02/2016	
	ENT GINEER		alway Cou RUP	nty Council		HAMMER RE					BORED B		WC JL	
<u>۔</u>								E			nples			e e
Depth (m)			D€	escription		Legend	Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
10	Stiff b	ecoming ly gravel	g very stiff ly SILT	dark brown	slightly sandy	× × × × × × × × × × × × × × × × × × ×	13.93	10.50	AA48862	В	10.00-10.45		N = 50/170 mm (10, 13, 16, 18, 16)	
	Drille	r reports	hard strat	a		.x ° . x	13.93	10.50						
11	End o	of Boreho	ole at 10.5	0 m										
''														
12														
12														
13														
.5														
14														
15														
13														
16														
17														
18														
19														
HA	RD ST	RATA B	ORING/CH	IISELLING								WA	 ATER STRIKE DET	AILS
ror	m (m)	To (m)	Time (h)	Comments		Wate Strik		sing S	Sealed At	Rise To			omments	
	3.7 0.3	3.85 10.5	0.75 0.5				.5 5.		7.0				No water strike	
- 10	0.5	10.5	0.5											
												GRO	OUNDWATER PRO	GRESS
INS	TALLA	TION DE	ETAILS			Da	te	Hole Depth	Casing Depth	Der	oth to c	ommen		
	Date	Tip De	pth RZ To	p RZ Base	Туре			рерш	- Pehiii	V V	atol			
REI	MARKS	2hrs re	emoving ri	g from BH3/2	26 field and acce	essing BH3/3	2.	Samp	e Legen	d		IIT - I le	disturbed 100mm Diameter	
		beyon	d schedule	ed depth of 1	for rotary follow- 0m. 3hr deliverir	ng / installing		LB - Bulk D	isturbed Bulk Disturbe	ed	LV(iol -: Trr⊏\	Sample P - Und	listurbed Piston Sample	
					le for RC follow-			Env - Envi	ronmental Sar	пріе (Jar +	r viai + Tub)	vv - Wa	ter Sample	



REPORT NUMBER

Gravelly TOPSOIL Firm light brown /grey slightly sandy gravelly SILT with a medium cobble and boulder content Medium dense light brown silty very sandy GRAVEL Medium dense light brown silty very sandy GRAVEL Description of Borehole at 2.70 m Secription of Borehole at 2.70 m	1	GSL													10903	
COORDINATES	СО	NTRAC	T N6	Galw	ay City	Transpor	t Project - Phase 3	}						LE NO.		
ALLENT AGINER ARUP STRATA BORINGCHISELLING HARD STRATA BORINGCHIS				7	728,307	7.46 N	BOREH	OLE DIAM	•	nm) 2	200	000	DATE CO		CED 04/02/2016	
Description Descr	CLI	ENT	Ga	alway (-		SPT HA	MMER REI	F. NO.	2	2.70		BORED B	Υ	WC	
Description Fig. F	EN	GINEER	. AR	KUP .			ENERG	T RATIO (5	′o) 					סבט פז	r JL	
Gravilly TOPSOIL Firm light brown grey slightly sandy gravely SILT with a medium cobble and boulder content SILT with a medium cobble and boulder content SILT with a medium dense light brown sity very sandy GRAVEL SILT with a medium dense	Depth (m)				Desci	ription		puebe-	Elevation	Depth (m)	Ref. Number		·	Recovery		Standpipe Details
Firm light brown /groy slightly sandy gravely SILT with a medium cobble and boulder content Medium dense light brown sity very sandy GRAVEL	- 0	Grave	lly TOPS	SOIL				74 18. 74 18. 7	35.45					<u> </u>		0,0
EMARKS Pit terminated at 2.70 m on obstruction. Borehole BH3/33A re-setup adjacent to hole.	- 1	Firm I	ight brov dium cob	vn /gre ble ar	nd boul	der conter	nt	× × × × × × × × × × × × × × × × × × ×	34 60							
EEMARKS Pit terminated at 2.70m on obstruction, Borehole BH3/33A EEMARKS Pit terminated at 2.70m on obstruction, Borehole BH3/33A Sample Legend or sectup adjacent to hole. Sample Legend or sectup adjacent to hole. Sample Legend or sectup adjacent to hole. Water Strike DETAILS Water Casing Sealed Rise Time (min) At To Comments No water strike GROUNDWATER PROGRES: GROUNDWATER PROGRES: GROUNDWATER PROGRES: Comments Sample Legend or sectup adjacent to hole.	- 2							%			AA48865	В	2.00-2.45			
HARD STRATA BORING/CHISELLING Tom (m) To (m) Time Comments Water Strike Depth At To To (min) Comments 2.5 2.7 1 Date Tip Depth RZ Top RZ Base Type WATER STRIKE DETAILS Date Tip Depth RZ Top RZ Base Type WATER STRIKE DETAILS Date To Time Comments GROUNDWATER PROGRES: Depth Water Casing Depth to Depth Water Comments Comments Comments SROUNDWATER PROGRES: Depth Depth Casing Depth to Depth Water Comments SROUNDWATER PROGRES: Depth Depth Water Casing Depth to Depth Water Comments SROUNDWATER PROGRES: Depth Depth Water Casing Depth to Depth Water Comments SROUNDWATER PROGRES: Depth Depth Water Casing Depth to Depth to Depth Water Casing Depth to Depth Water Casing Depth to Depth to Depth Water Casing Depth to Depth Water Casing Depth to Depth Water Casing Depth to Depth to Depth Water Casing Depth to Depth Water Casing Depth to Depth to Depth Water Casing Depth to Depth to Depth Water Casing Depth to Depth Water Casing Depth to Depth to Depth to Depth Water Casing Depth to Depth to Depth to Depth to Depth to Depth to Depth Water Casing Depth to	- 3	End c	f Boreho	ole at 2	2.70 m			8 ~ 8 ~ ×	32.90	2.70						
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HARD STRATA BORING/CHISELLING Tom (m) To (m) Time (h) Comments 2.5 2.7 1 Water Strike DETAILS Date Tip Depth RZ Top RZ Base Type Tom (m) RZ Top RZ Base Type SEMARKS Pit terminated at 2.70m on obstruction. Borehole BH3/33A re-setup adjacent to hole. WATER STRIKE DETAILS Bale Rise Time (min) Comments No water strike GROUNDWATER PROGRESS Date Depth Depth Casing Depth to Water Comments Sample Legend D. Small Disturbed (lub) D. Small D	7															
HARD STRATA BORING/CHISELLING rom (m) To (m) Time (h) Comments Z.5 2.7 1 Water Strike Depth Sealed Rise To Time (min) Comments ROUNDWATER PROGRESS NSTALLATION DETAILS Date Tip Depth RZ Top RZ Base Type REMARKS Pit terminated at 2.70m on obstruction. Borehole BH3/33A re-setup adjacent to hole. Sample Legend D. Small Disturbed (lub) B. Bulk Disturbed (lub) B	8															
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2.5 2.7 1 No water strike Casing Depth to Depth Depth RZ Top RZ Base Type Depth RZ Top RZ Base Type				Tim	ie Co									ne C		
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re-setup adjacent to hole. D - Small Disturbed (tub) B - Bulk Disturbed UT - Undisturbed 100mm Diameter Sample LB - Large Bulk Disturbed P - Undisturbed Piston Sample						RZ Base	Туре	Dat				De W	pth to later C	ommer	nts	
	RE	MARKS					struction. Borehol	 e BH3/33A	<u> </u>	LB - Bulk D	isturbed Bulk Disturbe	d	+ Viol + Trit	Sample P - Und	e disturbed Piston Sample	



REPORT NUMBER

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CON	ITRAC	T N6	Galway (City Transpo	rt Project - Phase	e 3					BOREHO SHEET	LE NO.	BH3/33A Sheet 1 of 1	
	ORDIN		728	,100.62 E ,308.29 N 35.57		EHOLE DIAN	•	mm)	Dando 30 200	000			CED 04/02/2016	
CLIE	ENT		lway Cou	nty Council	SPT I	HAMMER RE	F. NO.		2.50		BORED E	BY	WC	
ENG	INEER	AR	UP		ENER	RGY RATIO ((%)				PROCES:	SED BI	/ JL	
Depth (m)			De	escription		Legend	T lovotion	Depth (m)	Ref. Number	Sample Type	'	Recovery	Field Test Results	Standpipe
0	Firm li a med	lium cob	vn /grey s ble and b	oulder conte		× × × × × × × × × × × × × × × × × × ×	34.57							
2	Mediu	ım dense	e light bro	wn silty very	rsandy GRAVEL			2.50						
t	End o	f Boreho	le at 2.50) m			33.07	2.00	,					
3 4 4 5 6 8 9														
HA	RD STI	RATA BO	ORING/CI	HISELLING								W	 ATER STRIKE DET	L AILS
rom	n (m)	To (m)	Time (h)	Comments		Wat Stril	ter C	asing Depth	Sealed At	Ris To		ne c	Comments	
2.		2.5	0.5			Juli	NO L	,cpui	Λι	10	, (111		No water strike	
								1				GRO	OUNDWATER PRO	GRE
	TALLA Date	TION DE		op RZ Base	Туре	Da	ate	Hole Depth	Casing Depth	De W	opth to /ater C	Commer	nts	
REN	IARKS	Boreho	le BH3/3 ction. 2.0h	3A setup ad ar moving rig	jacent to BH3/33 out of field with	following sh tracked dum	allow oper.	LB - Bul	nple Leger lall Disturbed (tuk k Disturbed arge Bulk Disturb Environmental Sa	ed	+ Vial + Tub)_	Sample P - Und	indisturbed 100mm Diameter e disturbed Piston Sample ater Sample	



16/8/16

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GEOTECHNICAL BORING RECORD

REPORT NUMBER

18963

BOREHOLE NO. **BH3/34** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 Dando 3000 **RIG TYPE CO-ORDINATES** 532,404.52 E DATE COMMENCED 08/02/2016 **BOREHOLE DIAMETER (mm)** 728,276.63 N 200 DATE COMPLETED 09/02/2016 **GROUND LEVEL (m AOD)** 32.53 **BOREHOLE DEPTH (m)** 2.60 CLIENT Galway County Council SPT HAMMER REF. NO. **BORED BY** WC **ENGINEER PROCESSED BY ARUP ENERGY RATIO (%)** JL Samples Standpipe Details (H \mathbb{E} Elevation Ref. Number Sample Type Recovery Field Test Legend Depth (Depth (Description Depth (m) Results - 0 Soft dark brown sandy gravelly CLAY 32.13 0.40 Firm light brown slightly sandy gravelly SILT AA48866 В 0.50 ×°× × . × N = 12AA48867 В 1.00-1.45 |× × × | |× × × | |× × × | °o× × (2, 2, 3, 2, 4, 3) × ×c 30.63 1.90 × Firm very light brown slightly sandy gravelly SILT with a low to medium cobble and boulder content. × ô × N = 28 (1, 2, 4, 5, 7, 12) AA48868 В 2.00-2.45 Ó 29.93 2.60 End of Borehole at 2.60 m 3 4 -5 6 8 9 HARD STRATA BORING/CHISELLING WATER STRIKE DETAILS Water Casing Sealed Time Time Comments From (m) To (m) Comments Strike Depth At То (h) (min) 2.6 2.6 0.5 No water strike **GROUNDWATER PROGRESS** Hole Casing Depth to Water **INSTALLATION DETAILS** Comments Date Depth Depth Tip Depth RZ Top RZ Base Туре **REMARKS** 3hr getting rig on to borehole. 0.50hr reinstating top field. Sample Legend D - Small Disturbed (tub) B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Samp Sample P - Undisturbed Piston Sample tal Sample (Jar + Vial + Tub) W - Water Sample



REPORT NUMBER

/110	2 2다/														
CON	TRACT	N6 G	Salway C	ity Transpor	t Project - Pha	se 3						BOREH SHEET	OLE NO	D. BH3/35 Sheet 1 of 1	
	ORDINA	TES VEL (m	728,	350.77 E 225.98 N 17.52	BOF		LE DIAM LE DEPT	•	nm)	Hand Duoุ 1.20	g	DATE C		NCED 19/02/2016	
CLIE ENG	NT INEER	Galw ARUI	-	nty Council	I		MER REI					BORED PROCES		JD Y JL	
											Sar	nples			
Depth (m)			De	scription			Legend	Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe
0	TOPSC	IL					711/2 1/1/2	17.32	0.20						
	gravelly and low angular	SILT wing boulder to subar	th a low content ngular co	to medium o . Sand is coa parse.	tly sandy slight obble content arse. Gravel is	uy [*9 × × × × × × × × × × × × × × × × × × ×		1.00 1.20	AA39963 AA39964	В	0.50			
	Obstruc	tion - Po	ssible V	/eathered Li	mestone		_0,,0	10.32	1.20		_				
2	End on	201011010	ut 1.20												
3															
4															
3															
IAF	RD STR	ATA BOF	RING/CH	ISELLING				I	1	1		1	V	ATER STRIKE DET	AILS
om	(m) To	o (m)	Time (h)	Comments			Wate Strike		sing S epth	Sealed At	Ris To		ime nin)	Comments	
														No water strike	
									lle!-	0			GR	OUNDWATER PRO	GRE
		ON DETA		p RZ Base	Туре		Dat		Hole Depth	Casing Depth	V	epth to Vater	Comme	ents	
					7,5-										
EM	IARKS	Hand du	g pit at lo	ocation of Bl	H3/35				D - Small B - Bulk D	le Legen Disturbed (tub) Disturbed)		Sam	Undisturbed 100mm Diameter ple indisturbed Piston Sample	
									Env - Env	e Bulk Disturbe ironmental San	nple (Jar	+ Vial + Tub)	W - V	Vater Sample	



16/8/16

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GEOTECHNICAL BORING RECORD

REPORT NUMBER

18963

BOREHOLE NO. **BH3/35 CP** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **RIG TYPE** Dando 3000 **CO-ORDINATES** 532,852.21 E DATE COMMENCED 29/03/2016 **BOREHOLE DIAMETER (mm)** 728,223.09 N 200 DATE COMPLETED 30/03/2016 **GROUND LEVEL (m AOD)** 17.70 **BOREHOLE DEPTH (m)** 8.90 Galway County Council SPT HAMMER REF. NO. WC CLIENT **BORFD BY ENGINEER PROCESSED BY ARUP ENERGY RATIO (%)** Л Samples Standpipe Details Ξ \mathbb{E} Elevation Ref. Number Recovery Sample Field Test Legend Depth (Description Depth Depth (m) Type Results - 0 Soft dark brown sandy gravelly CLAY 17.40 0.30 Firm becoming stiff light brown slightly sandy gravelly AA1 В 0.50 CLAY with a medium cobble and boulder content 16.70 1.00 N = 10AA2 В 1.00-1.45 ®× Stiff light brown/grey slightly sandy gravelly SILT with (1, 2, 2, 2, 3, 3)a low to medium cobble content Ø, × S× N = 19 (2, 2, 3, 4, 6, 6) AA3 В 2.00-2.45 2 × × × N = 373 AA4 В 3.00-3.45 (5, 7, 4, 8, 11, 14) N = 26 (3, 3, 5, 7, 6, 8) AA5 В 4.00-4.45 4 N = 39 (6, 7, 7, 9, 11, 12) ⊗ ^c AA6 В 5 00-5 45 . 5 × % × 11.80 5.90 ₹<u>®</u>× × × × × Stiff to very stiff dark brown mottled grey brown 6 slightly sandy slightly gravelly SILT with a medium \$ × × × × × × × cobble and boulder content N = 45AA7 6.50-6.95 (8, 5, 9, 11, 12, 13) ×8× \$\delta^{\delta} \delta^{\delta} \delta^{\delt ~%<u>×</u> N = 31 (4, 6, 7, 11, 7, 6) AA8 В 8 00-8 45 × 9.40 8.30 9.20 8.50 Stiff orange brown sandy gravelly CLAY Stiff dark grey brown sandy gravelly silty CLAY with a medium cobble and boulder content ₩Œ 8.80 8.90 End of Borehole at 8.90 m HARD STRATA BORING/CHISELLING WATER STRIKE DETAILS Casing Water Sealed Time Time Comments From (m) To (m) Comments Strike Depth (h) Αt То (min) 6.5 6.3 0.5 No water strike 89 0.75 88 **GROUNDWATER PROGRESS** Depth to Hole Casing **INSTALLATION DETAILS** Comments Date Depth Depth Date Tip Depth RZ Top RZ Base Type **REMARKS** 1.5hrs getting plant and equipment to borehole location. 0.5hr Sample Legend D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Samp cleaning down road after exiting field. Sample P - Undisturbed Piston Sample tal Sample (Jar + Vial + Tub) W - Water Sample



REPORT NUMBER

1	ഭൂ	./													10903	
СО	NTRAC	CT NO	6 Ga	lway City	/ Transport	Project - Phas	se 3						BOREHO SHEET	DLE NO		
	-ORDIN			533,12 728,20	4.71 N		EHC	DLE DIAM		nm)	Hand Du	ıg	DATE CO		Sheet 1 of 1 NCED 12/02/2016	
	OUND IENT	LEVEL (51.78 Council			OLE DEPT			0.50		BORED		12/02/2016 AC	
	GINEEF		RUP	y county	Courion			RATIO (%					PROCES			
Depth (m)				Desc	cription			pue	Elevation	Depth (m)	Ref. Number		mples =	very	Field Test Results	Standpipe Details
								Legend		'			Depth (m)	Recovery	Results	Stan
- 0	TOPS Firm	brown sa	andy	slightly	gravelly SI	LT with a low to	/ o	**	51.68 51.28		1	9 B	0.10-0.50	'		
- - - - - 1	Obsti	ruction -	Larg		DERS of li											
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- - - 9																
<u> </u>																
- H/	ARD ST	RATA B		NG/CHIS	ELLING										/ATER STRIKE DET	AILS
Froi	m (m)	To (m)		ime (h)	omments			Wate Strik	er Ca e D	asing epth	Sealed At	Ris To		me nin)	Comments	
															No water strike	
										Hali	0		4.	GR	ROUNDWATER PRO	GRES
	TALLA Date	Tip De			RZ Base	Туре		Dat	te	Hole Depth	Casing Depth		epth to Vater	Comme	ents	
DE	MADV	Nand :	dua	nit at loo	ation of BH	13/36				Cor	mplo Logar	nd				
KE	INIMININ	ı ianu	aug	pit at 100	auon oi Bh	10/00				LB - L	nple Legel mall Disturbed (tu ılk Disturbed arge Bulk Disturb Environmental Sa	oed	+ Vial + Tuk\	Sam P - U	Undisturbed 100mm Diameter ple Indisturbed Piston Sample Water Sample	
										LIIV -	omicinal O	pic (udl	* iui · (UD)	7 V - V		



REPORT NUMBER

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со	NTRAC	T N6	Galway (City Transpo	ort Proje	ect - Phase	3					BOREHO SHEET	DLE NO	D. BH3/38 Sheet 1 of 1	
	ORDIN	ATES .EVEL (n	727	,249.34 E ,540.83 N 45.27			YPE HOLE DIAM HOLE DEPT		nm)	Dando 30 200 0.40	000	DATE CO		ICED 09/02/2016	
	IENT GINEER			nty Council		I	IAMMER RE GY RATIO (°					BORED PROCES		WC Y JL	
						'					San	nples			
Depth (m)			De	escription			Legend	Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	Soft lig	ght brow	n sandy (gravelly CLA	ΑΥ		0	44.07	0.40						
: :			Possible Following	Rockhead) m				44.87	0.40						
- - - 1															
. 2															
3															
4															
5															
6															
-															
. 7															
- - 8															
-															
. 9															
H/	ARD STE	RATA BO		HISELLING										 ATER STRIKE DET	AILS
Fror	m (m) -	Го (m)	Time (h)	Comments	3		Wate Strik		sing epth	Sealed At	Ris To		me nin)	Comments	
C	0.4	0.4	0.5											No water strike	
													GR	OUNDWATER PRO	GRES
INS	STALLA	LION DE					Da		Hole Depth	Casing Depth	De W	pth to ater	Comme	ents	
	Date	Tip Dep	oth RZ To	op RZ Bas	е	Туре			•	·					
REI	MARKS				 tracked	dumper. 0	.5hr reinstat	ing	Samp	le Legen	d				
			er works						D - Small B - Bulk I LB - Larg	Disturbed (tub) Disturbed e Bulk Disturbe) ed	+ Vial + Total	Samp P - U	Undisturbed 100mm Diameter ole ndisturbed Piston Sample Vater Sample	
									⊏nv - En	vironmental Sar	iipie (Jar	r viai + IUD)	vv - V	valor dampit	



REPORT NUMBER

(1)	હરા														18963	
СО	NTRAC	T N6	Galw	vay City	Transpor	t Project - P	hase 3						BOREHO	LE NO		
	OPDIA	IATES		E24 26	0.45.5	Р	IG TYPE				Dando 30		SHEET		Sheet 1 of 1	
	-ordin Ound	LEVEL (1		534,360 727,402 D)	0.45 E 2.19 N 41.88	В	OREHO	: LE DIAM LE DEPT		nm) 2	200 2.40		DATE CO			
	ENT				Council			IMER REI			0.10		BORED E		WC	
	GINEER		aiway RUP	County	Couricii			RATIO (%					PROCES			
	O II VEEL	. , , ,						104110 ()			Т		ples		JL JL	
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Depth (m)				Desc	ription			end	atic	Depth (m)	nbe	nple e	£	ove	Field Test Results	idbr
Dek								Legend	Elevation	Dep	Ref. Number	Sample Type	Depth (m)	Recovery	, toodile	Standpipe Details
0	Drille	r reports	GRA'	VFI ha	rdstanding	ı (MADF		~~~								- 0, -
	GRO	UND)				, (>>>>>	41.48	0.40						
	Obstr	uction - I	Possil	ble Roc	khead											
	Ellu C	n borenc	ne at	0.40 111												
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HA	RD ST	RATA B			ELLING							'			ATER STRIKE DET	AILS
ror	m (m)	To (m)	Tim (h		mments			Wate Strik		sing (epth	Sealed At	Rise To		ne in)	Comments	
C).4	0.4	0.5	5											No water strike	
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														GR	OUNDWATER PRO	GRESS
NS	TALLA	TION DE	TAIL	s				Dat		Hole	Casing	De	oth to ater	Comme	ents	
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					-	71										
ם סודי	MADVO	0 F0b-	merid	na ria -	nd trooks	dumner t-	рца/аа			C	la La marr					
\EI	WAKKS	v.sunr	HVOIN	ny ng a	па гаскес	d dumper to	¤⊓3/39			D - Small	le Legen Disturbed (tub))		UT - I Samp	Undisturbed 100mm Diameter	
										B - Bulk I LB - Larg Env - Env	Disturbed e Bulk Disturbe vironmental Sar	ed mple (Jar +	· Vial + Tub)	P - Úi	ndisturbed Piston Sample Vater Sample	
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REPORT NUMBER

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СО	NTRAC	N6 C	Salway C	ity Transpor	t Project - Phase 3	3					BOREHO SHEET	LE NO	BH3/40 Sheet 1 of 1	
	-ORDINA	ATES EVEL (m	727,2	139.24 E 295.41 N 42.35		PE OLE DIAM OLE DEPT	•	nm)	Hand Duo).80	9	DATE CO		CED 11/02/2016	
	ENT GINEER	Galv ARU		ty Council		MMER RE Y RATIO (9					BORED E		AC Y JL	
Depth (m)			De	scription		Legend	Elevation	Depth (m)	Ref. Number	Sample S Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0 -1 -2 -3 -5 -6 -7 -7 -8	Brown GROL Firm d to med Firm b high co boulde Obstru rockhe	ND) ark grey s ium cobb rown sligh bbble and rs are an ction - La	dy fine to slightly sa le conter htly sand boulder gular of I rge BOU	andy gravelly nt. Cobbles y slightly gra- content. Co imestone.	RAVEL (MADE / CLAY with a low are of limestone. velly SILT with a bbles and possible weathered		42.20	0.05 0.15 0.50 0.80	AA49469 AA49470	ВВВ	0.15-0.50 0.50-0.80			
H/	ARD STE	ATA BOF	RING/CH	SELLING								W	ATER STRIKE DET	AILS
			Timo	Comments		Wate Strik		sing S	Sealed At	Ris To		me	Comments	
			\.,			Suik	5 De	1 11 29 2	7.15	10	(11)		No water strike	
		ION DET				Dai		Hole Depth	Casing Depth	De W	pth to /ater	GR Comme	OUNDWATER PRO	GRES
	Date	Tip Dept	h RZ To	p RZ Base	Туре				•					
REI	MARKS	Hand du	 g pit at lo	cation of Bl	H3/40			D - Small B - Bulk D LB - Large	le Legen Disturbed (tub) Disturbed e Bulk Disturbe ironmental San	d	+ Vial_+ Tub)	Sampl P - Un	Indisturbed 100mm Diameter le didisturbed Piston Sample fater Sample	



REPORT NUMBER

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COI	NTRAC	r N6	Galway	City Transpor	t Project - Phase 3	3					BOREHO	LE NO.		
	ORDINA	ATES .EVEL (r	727	,580.56 E ,065.87 N 41.38		PE OLE DIAM OLE DEPT		nm) 2	Dando 30 200 0.50	000	SHEET DATE CO DATE CO			
	ENT SINEER	Ga AR	-	ınty Council	SPT HA	MMER RE	F. NO.				BORED BY WC PROCESSED BY JL			
											ples		. 02	
Depth (m)			D	escription		Legend	Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	Soft da	ark brow	n sandy	gravelly CLA	Y	0	41.08	0.30						
- 1 - 2 - 3 - 4 - 5 - 6			ele at 0.50	Rockhead) m										
				HISELLING		Wate	or C-	sing 6	Sealed	Rise		me C	ATER STRIKE DET	AILS
		Го (m)	Time (h)	Comments		Strik		sing S epth	At	To		ne iin)	Comments	
0	.3	0.3	0.5										No water strike	
IP 10:	TA::		TA!! C				4-	Hole	Casing	Der	oth to		OUNDWATER PRO	GRES
	TALLAT Date	Tip De		op RZ Base	Туре	Da		Depth	Depth	JW	oth to ater	Commer	nts	
REM	MARKS	field po	st works	. Awating nex	Imper to location. (t borehole 10:30 - aints posed by land	16:30 - de	stating lay to	D - Small B - Bulk D LB - Large	le Legen Disturbed (tub) Disturbed e Bulk Disturbe ironmental San) :d	· Vial + Tub)	Sample P - Und	ndisturbed 100mm Diameter e disturbed Piston Sample ater Sample	



REPORT NUMBER

1	GSL													10903	
СО	NTRAC	T N6	Galw	vay City	Transport	Project - Phase 3						BOREHO	LE NO.		
СО	-ORDIN	IATES		534,727 726,825	7.54 E	RIG TYF	PE OLE DIAM	FTFR (m		Dando 30 200	nn F	SHEET DATE CO	MMEN	Sheet 1 of 1 CED 22/03/2016	
GR	OUND	LEVEL (r	m AOI	D)	31.36		OLE DEPT			0.30		DATE CO			
	ENT		-	County	Council		MMER RE					BORED B		WC	
EN	GINEER	R AR	UP			ENERG	Y RATIO (9	%) 				PROCESS nples	SED BY	' JL	
Depth (m)				Dosco	ription		٥	tion	Depth (m)	er		·	ery	Field Test	pipe
)epth				Desci	приоп		Legend	Elevation	Septr	Ref. Number	Sample Type	Depth (m)	Recovery	Results	Standpipe Details
0	TOPS	SOIL: So	ft dark	k brown	sandy gra	ivelly CLAY	<u> </u>				0) [<u>~</u>		00 🗆
	Obstr		Driller	reports		Rockhead		31.00	0.30						
	Enac	n borenc	ne at t	0.30 111											
1															
2															
_															
3															
4															
5															
3															
6															
-															
7															
-															
- - 8															
9															
		RATA BO	ORING Tim		ELLING		Wate	ar Ca	sing	Sealed	Ris	e Tin	20	ATER STRIKE DET	AILS
	m (m)	To (m)	(h)) 00	mments		Strik		pth	At	To			Comments	
C).3	0.3	0.7	5										No water strike	
									Llala	Casina			GRO	DUNDWATER PRO	GRESS
		TION DE			D7 D 1	T	Dat		Hole Depth	Casing Depth	De W	pth to ater C	ommer	nts	
	Date	Tip De	pth R	∠ lop	RZ Base	Туре									
RF	MARKS	1 5hre	gettin	ıa plant	and equip	ment to borehole	location		Samr	le Legen	d				
			90 mii	.g Pidiit	ana oquip		.55641011		B - Bulk L	Disturbed (tub) Disturbed e Bulk Disturbe			Sample	ndisturbed 100mm Diameter e disturbed Piston Sample	
									Env - Env	e Bulk Disturbe rironmental San	u nple (Jar -	+ Vial + Tub)	W - Wa	ater Sample	



REPORT NUMBER

1	ger	/													10903	
СО	NTRAC	T N6	Galway	/ City T	Γransport	Project - Pha	ise 3						BOREHO	LE NO.		
	-ORDIN		72	4,627. 6,780.	31 E 71 N		TYP REH	E OLE DIAM	ETER (n	nm)	Hand Dug	9			Sheet 1 of 1 22/02/2016	
GR	OUND	LEVEL (n			32.77			OLE DEPT			0.60		DATE CO	MPLET	ED 22/02/2016	
	ENT GINEER		lway Co UP	ounty C	Council			MMER REI (RATIO (%					BORED E		JD ′ JL	
													nples			
Depth (m)			[Descri	ption			Legend	Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0					GROUND				32.57	0.20		В	0.20-0.30	 		
1	grave (Poss Firm I grave	lly SILT v ible MAD prown an lly SILT v	vith a lo E GRO d dark b	w to m DUND) prown	nedium co	otly sandy bibble content andy slightly content		**************************************	32.47 32.17	0.30 0.60	— / ΔΔ39967	В	0.30-0.60			
_		uction f Boreho	le at 0.6	60 m												
2																
3																
4																
5																
6																
7																
8																
9																
HA	ARD ST	RATA BO	ORING/0	CHISEL	LLING									WA	TER STRIKE DET	AILS
ror	m (m)	To (m)	Time (h)	Con	nments			Wate Strik		sing epth	Sealed At	Ris To			omments	
								0.50							Seepage	
										Hole	Casing	Do	onth to		DUNDWATER PRO	GRESS
	TALLA Date	TION DE		Top F	RZ Base	Туре		Dat	e	Depth	Depth	W V	opth to Vater	Commen	nts	
REI	MARKS	Hand d	ug pit a	t locat	ion of BH	13/43				D - Sma	ple Legen	d)		Sample	ndisturbed 100mm Diameter	
										LB - La	ge Bulk Disturbe nvironmental Sar	d nple (Jar	+ Vial + Tub)	P - Und	listurbed Piston Sample iter Sample	



REPORT NUMBER



REPORT NUMBER

/ 10	2F/																
CONT	RACT	N6 C	Salway C	ity Trans	port P	roject - Pha	ase 3							REHOI	LE NO.	BH3/47 Sheet 1 of 1	
	RDINA JND LE	TES VEL (m	728,	058.02 E 289.22 N 37.02		ВО		E DLE DIAM DLE DEPT		mm)	Dando 200 4.00	3000	DA			CED 22/03/2016	
CLIEN ENGIN		Galv ARU	-	nty Counc	il				IER REF. NO. ATIO (%)					BORED BY WC PROCESSED BY JL			
						'						S	Sample	es			
Depth (m)			De	scription				Legend	Flevation	Depth (m)	Ref.	Sample	Type	Depth (m)	Recovery	Field Test Results	Standpipe
0 8	Soft dar	k brown	sandy o	ravelly C	LAY			<u></u>							-		-
F	irm ligi	nt brown	slightly	•	ghtly g	ravelly SIL ent	.T	<u>*</u> * × × × × × × × × × × × × × × × × × ×	36.72	0.3	AA488	90	В	0.50			
1											AA488	91	B 1	.00-1.45		N = 8 (2, 2, 2, 2, 2, 2)	
2 F	irm to	stiff mot	tled brov	n slightly	sand	y slightly		%	35.02	2.0	0 AA488	92	В 2	.00-2.45		N = 12 (2, 3, 3, 2, 3, 4)	
g	ıravelly	CLAY							5							N = 20	
3											AA488	93	В 3	.00-3.45		N = 20 (3, 3, 4, 5, 5, 6)	
	Obstruc End of I	tion Borehole	e at 4.00	m				0	33.02	4.0	0					N = 50/20 mm (25, 50)	
IARI	D STR/	ATA BOR	RING/CH	ISELLING	}										W	ATER STRIKE DET	AILS
om (m) To	(m)	Time (h)	Commen	ts			Wate Strik		asing epth	Sealed At		Rise To	Tim (mi		Comments	
3.9		4	0.75													No water strike	
ICTA	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	ON DET	All C					Det		Hole	Casi	ng	Depth	to a		OUNDWATER PRO	GRE
Da		ON DET		p RZ Ba	se	Туре		Dat	le	Depth			Depth Wate	er C	ommer	115	
EMA	RKS	1.5hrs ge	etting pla	ant and e	quipme	ent to bore	hole lo	ocation		D-S	mple Leg	end			UT - Ui Sample	ndisturbed 100mm Diameter	
										LB -	ulk Disturbed Large Bulk Dist Environmenta	urbed Sample	(Jar + Via	l + Tub)	P - Uno	e disturbed Piston Sample ater Sample	



REPORT NUMBER

	<u>এই।</u>													
СО	NTRACT	N6 (Galway C	ity Transpor	t Project - Phase 3	1					BOREHO SHEET	OLE NO	D. BH3/48 Sheet 1 of 1	
	-ORDINA OUND L	ATES EVEL (m	727,	396.60 E 197.18 N 40.72		PE OLE DIAM OLE DEPT	•	nm)	Hand Dug	9	DATE C		NCED 11/02/2016	
	ENT GINEER	Galv ARU		nty Council		MMER RE Y RATIO (5)				BY SSED B	AC Y JL	
Depth (m)			De	scription		Legend	Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe
0 1 	slightly conter Brown Obstru limesto	ark grey of gravelly t. Cobble grey clay	SILT with se are of legan are o	n a low to mo imestone. ar COBBLE S / Possible	wn slightly sandy edium cobble S of limestone weathered	**************************************	40.62	0.10	AA49471	В	0.10-0.50			
HA	RD STF	ATA BO		ISELLING		10/-4			0 1 1	D:-			ATER STRIKE DET	AILS
-ror	m (m) 1	o (m)	Time (h)	Comments		Wate Strik	e De	sing epth	Sealed At	Ris To		ime nin)	Comments	
												- CF	No water strike	CDE
INS	TALLA	ION DET	AILS			Dat		Hole	Casing	De	pth to ater	Comme		GRE
	Date			p RZ Base	Туре			Depth	Depth	V\	aici			
REI	MARKS	Hand du	g pit at lo	ocation of Bh	H3/48			D - Small B - Bulk I LB - Larg	Die Legen Disturbed (tub) Disturbed e Bulk Disturbe) :d	+ Vial + Tuh\	Samı P - U	Undisturbed 100mm Diameter ple ndisturbed Piston Sample Vater Sample	



REPORT NUMBER

18963

BOREHOLE NO. BH3/52 CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 Dando 3000 **RIG TYPE CO-ORDINATES** 528,276.23 E DATE COMMENCED 16/03/2016 BOREHOLE DIAMETER (mm) 727,648.14 N 200 DATE COMPLETED 16/03/2016 **GROUND LEVEL (m AOD)** 15.45 **BOREHOLE DEPTH (m)** 3.80 CLIENT SPT HAMMER REF. NO. **BORED BY** WC **Galway County Council ENERGY RATIO (%) ENGINEER PROCESSED BY** ARUP Л Samples Standpipe Details (E \mathbb{E} Elevation Ref. Number Recovery Sample Field Test Legend Depth (Depth (Description Depth (m) Type Results - 0 711. 711 TOPSOIL: Soft dark brown sandy gravelly CLAY 15.15 0.30 Soft to firm becoming firm light brown slightly sandy AA48884 В 0.50 gravelly CLAY with a medium cobble and boulder content N = 10AA48885 В 1.00-1.45 (1, 2, 2, 2, 3, 3)13.45 2.00 N = 15 (2, 2, 3, 3, 4, 5) AA48886 В 2.00-2.45 2 Firm light grey brown slightly sandy slightly gravelly 12.45 3.00 N = 23AA48887 3 В 3.00-3.45 Stiff light grey and brown silty sandy GRAVEL (2, 2, 3, 5, 6, 9) 11.65 3.80 Obstruction 4 End of Borehole at 3.80 m -5 6 8 9 HARD STRATA BORING/CHISELLING WATER STRIKE DETAILS Water Casing Sealed Time Time Comments From (m) To (m) Comments Strike Depth At То (h) (min) 3.8 3.7 0.75 16/8/16 No water strike .GDT IGSL. **GROUNDWATER PROGRESS** Hole Casing Depth to Water **INSTALLATION DETAILS** Comments 18963.GPJ Date Depth Depth Tip Depth RZ Top RZ Base Туре REMARKS 2hrs getting plant and equipment to borehole location. 1.0hr Sample Legend ВН D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Samp getting off position. Sample P - Undisturbed Piston Sample IGSL tal Sample (Jar + Vial + Tub) W - Water Sample



REPORT NUMBER

18963

BOREHOLE NO. BH3/53 CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 Dando 3000 **RIG TYPE CO-ORDINATES** 528,433.41 E DATE COMMENCED 21/03/2016 **BOREHOLE DIAMETER (mm)** 727,696.60 N 200 **DATE COMPLETED** 21/03/2016 **GROUND LEVEL (m AOD)** 10.31 **BOREHOLE DEPTH (m)** 2.20 CLIENT Galway County Council SPT HAMMER REF. NO. **BORED BY** WC **ENERGY RATIO (%) ENGINEER PROCESSED BY ARUP** JL Samples Standpipe Details (E \mathbb{E} Elevation Ref. Number Sample Type Recovery Field Test Legend Depth (Depth (Description Depth (m) Results - 0 Soft dark brown sandy gravelly CLAY with a low boulder content 9.81 0.50 AA48888 В 0.50 Medium dense light grey brown silty sandy GRAVEL 0x 0x 9.51 0.80 Medium dense to dense light grey brown silty sandy N = 44AA48889 В 1.00-1.45 GRAVEL with some cobbles (4, 6, 8, 11, 11, 14) N = 50/75 mm (19, 6, 43, 7) F₂ 000 8.11 2.20 End of Borehole at 2.20 m 3 4 -5 6 8 9 HARD STRATA BORING/CHISELLING WATER STRIKE DETAILS Water Casing Sealed Time Time From (m) To (m) Comments Comments Strike Depth At То (h) (min) 2.2 0.75 16/8/16 No water strike IGSL.GDT **GROUNDWATER PROGRESS** Hole Casing Depth to Water **INSTALLATION DETAILS** Date Comments 18963.GPJ Depth Depth Tip Depth RZ Top RZ Base Туре BH LOG **REMARKS** 1.5hrs getting plant and equipment to borehole location Sample Legend D - Small Disturbed (tub) B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Samp IGSL Sample P - Undisturbed Piston Sample tal Sample (Jar + Vial + Tub) W - Water Sample



REPORT NUMBER

18963

BOREHOLE NO. BH3/54 CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 Dando 3000 **RIG TYPE CO-ORDINATES** 528,601.86 E DATE COMMENCED 30/03/2016 **BOREHOLE DIAMETER (mm)** 727,756.28 N 200 **DATE COMPLETED** 31/03/2016 **GROUND LEVEL (m AOD)** 8.05 **BOREHOLE DEPTH (m)** 3.70 Galway County Council SPT HAMMER REF. NO. WC CLIENT **BORFD BY ENGINEER PROCESSED BY ARUP ENERGY RATIO (%)** JL Samples Standpipe Details (E \mathbb{E} Elevation Ref. Number Sample Type Recovery Field Test Legend Depth (Depth (Description Depth (m) Results - 0 TOPSOIL with COBBLES and BOULDERS and some 711. 711 dark grey brown slightly silty slightly sandy GRAVEL (Possible MADE GROUND) 1/ 1/1/ 1/1 AA9 В 0.50 7.35 0.70 Dense grey brown silty sandy GRAVEL with a medium cobble content N = 40AA10 В 1.00-1.45 (6, 9, 12, 14, 8, 6) N = 49 (5, 7, 8, 11, 14, 16) AA11 В 2.00-2.45 2 N = 50/200 mm (3, 4, 6, 17, 27) 3 AA12 В 3.00-3.45 4.35 3.70 End of Borehole at 3.70 m 4 -5 6 8 9 HARD STRATA BORING/CHISELLING WATER STRIKE DETAILS Water Casing Sealed Time Time Comments From (m) To (m) Comments Strike Depth At То (h) (min) 3.7 3.7 0.75 16/8/16 No water strike .GDT IGSL. **GROUNDWATER PROGRESS** Hole Casing Depth to Water **INSTALLATION DETAILS** Comments 18963.GPJ Date Depth Depth Date Tip Depth RZ Top RZ Base Туре BH LOG **REMARKS** 1.0hr getting plant and equipment to borehole location Sample Legend D - Small Disturbed (tub) B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Samp Sample P - Undisturbed Piston Sample IGSL tal Sample (Jar + Vial + Tub) W - Water Sample

Appendix 2

Hand-excavated Pit Records at Cable Percussive Borehole Locations

BH3/03

BH3/07

BH3/10

BH3/14

BH3/15

BH3/18

BH3/19

BH3/20

BH3/22

BH3/28

BH3/30

BH3/31

BH3/35

BH3/36

BH3/40

BH3/43

BH3/46

BH3/48



See BH Log also

LOCATION PROJECT PROJECT REF. DATE

BH3/03	
GCTP Phase 3 Contract 1	
18963	
12/02/2016	

PHOTOS

Hand Dug Pit at BH3/03



Spoil Heap at BH3/03



LOG

0.00	0.10	TOPSOIL
0.10	0.70	Soft black fibrous PEAT
0.70		OBSTRUCTION - Possible Weathered Rockhead (Granite)

SAMPLES	D	0.50	AA49473
	D	0.50	AA49474
	В	0.50	AA49475

GROUNDWATER Seepages from ground level



See BH Log also

LOCATION PROJECT PROJECT REF. DATE

BH3/07
GCTP Phase 3 Contract 1
18963
12/02/2016

PHOTOS

Hand Dug Pit at BH3/07



Spoil Heap at BH3/07



LOG

0.00	0.10	TOPSOIL
0.10	0.30	Soft black to dark brown fibrous PEAT
0.30	0.60	Brown angular COBBLES and BOULDERS of granite
0.60		OBSTRUCTION - Possible Weathered Rockhead (Granite)

SAMPLES	D	0.10	to	0.30	AA49476
	D	0.10	to	0.30	AA49477
	В	0.10	to	0.30	AA49478

GROUNDWATER Slow water strike at 0.30m



See BH Log also

LOCATION PROJECT PROJECT REF. DATE

BH3/10
GCTP Phase 3 Contract 1
18963
11/02/2016

PHOTOS

Hand Dug Pit at BH3/10



Spoil Heap at BH3/10



LOG

0.00	0.30	TOPSOIL
0.30		OBSTRUCTION - Large boulders, Possible Weathered Rockhead (Granite)

SAMPLES None Taken

GROUNDWATER Seepage at 0.30m



See BH Log also

LOCATION PROJECT PROJECT REF. DATE

BH3/14	
GCTP Phase 3 Contract 1	
18963	
18/02/2016	

PHOTOS

Hand Dug Pit at BH3/14



Spoil Heap at BH3/14



LOG

0.00	0.10	TOPSOIL
0.10	0.70	Light brown clayey/silty very sandy GRAVEL with a medium cobble content. Sand
		is fine to medium. Gravel is angular to subangular coarse.
0.70		OBSTRUCTION - Possible Weathered Rockhead / Boulder

<u>SAMPLES</u> B 0.10 to 0.70 AA39959

GROUNDWATER Dry



See BH Log also

LOCATION PROJECT PROJECT REF. DATE

BH3/15
GCTP Phase 3 Contract 1
18963
19/02/2016

PHOTOS

Hand Dug Pit at BH3/15



Spoil Heap at BH3/15



LOG

0.00	0.20	TOPSOIL with rootlets
0.20	0.40	(Loose) Dark brown clayey/silty sandy GRAVEL with a medium to high cobble
		content. Sand is coarse. Cobbles are weathered of granite.
0.40		(Loose) Light brown silty/clayey slightly sandy GRAVEL with a high cobble content. Sand is coarse. Gravel is angular to subangular fine. Cobbles are weathered of granite.
0.80		(Loose) Brown slightly silty/clayey very sandy GRAVEL. Sand is fine. Gravel is
		angular to subangular coarse.
1.30		OBSTRUCTION - Possible Weathered Rockhead / Boulder

SAMPLES .	В	0.20	to	0.40	AA39960
	В	0.40	to	0.80	AA39961
	R	0.80	to	1 20	AA39962

GROUNDWATER Water strike at 1.20m



See BH Log also

LOCATION PROJECT PROJECT REF. DATE

BH3/18	
GCTP Phase 3 Contract 1	
18963	
22/02/2016	

PHOTOS

Hand Dug Pit at BH3/18



Spoil Heap at BH3/18



LOG

0.00	0.20	TOPSOIL
0.20	0.70	Dark brown clayey/silty sandy fine to coarse angular GRAVEL with a high cobble
		content. Cobbles are of granite.
0.70		OBSTRUCTION - Possible Weathered Rockhead / Boulder

SAMPLES B 0.50 AA39965

<u>GROUNDWATER</u> Dry



See BH Log also

LOCATION PROJECT PROJECT REF. DATE

BH3/19	
GCTP Phase 3 Contract 1	
18963	
23/03/2016	

PHOTOS

Hand Dug Pit at BH3/19



Spoil Heap at BH3/19



LOG

0.00	0.30	TOPSOIL
0.30	0.50	Loose dark brown clayey/silty sandy GRAVEL with cobbles and boulders of
	granite	
0.50	1.20 Firm light brown very gravelly very sandy CLAY with cobbles and bould	
		granite
1.20		Obstruction - Possible weathered rock / boulder

 SAMPLES
 B
 0.30
 to
 0.50
 AA39978

 B
 0.50
 to
 1.20
 AA39979

GROUNDWATER Ground water entering pit at 0.80m



See BH Log also

LOCATION PROJECT PROJECT REF. DATE

3H3/20	
GCTP Phase 3 Contract 1	
18963	

PHOTOS

Hand Dug Pit at BH3/20



Spoil Heap at BH3/20



LOG

0.00	0.10	TOPSOIL	
0.10	0.10 0.45 Dark grey black clayey gravelly organic fine to coarse SAND with rootlets		
0.45	0.80	Orange brown clayey very gravelly fine to coarse SAND with many cobbles of granite	
0.80	1.00	Brown very sandy fine to coarse GRAVEL with many cobbles of granite	

SAMPLES	В	0.10	to	0.45	AA49485
	В	0.50	to	0.80	AA49486
	В	0.80	to	1.00	AA49487



See BH Log also

LOCATION PROJECT PROJECT REF. DATE

H3/22	
CTP Phase 3 Contract 1	
8963	
2/02/2016	

PHOTOS

Hand Dug Pit at BH3/22



Spoil Heap at BH3/22



LOG

0.00	0.30	TOPSOIL
0.30 0.50 Brown slightly clayey/silty sandy fine to coarse GRAVEL with many		Brown slightly clayey/silty sandy fine to coarse GRAVEL with many angular
		cobbles of granite
0.50	·	OBSTRUCTION - Large boulders, Possible Weathered Rockhead

SAMPLES B 0.30 to 0.50 AA49472

GROUNDWATER Slow water ingress at 0.45m



See BH Log also

LOCATION PROJECT PROJECT REF. DATE

BH3/28	
GCTP Phase 3 Contract 1	
18963	
18/02/2016	Τ

PHOTOS

Hand Dug Pit at BH3/28



Spoil Heap at BH3/28



LOG

0.00	0.20	TOPSOIL
0.20 0.30 Firm brown slightly sandy SILT		
0.30	0.70	Firm brownish grey slightly silty sandy gravelly CLAY with a medium cobble and
		boulder content
0.70 OBSTRUCTION - Possible Weathered Rockhead / Boulder (Limestone)		OBSTRUCTION - Possible Weathered Rockhead / Boulder (Limestone)

SAMPLES B 0.20 to 0.30 AA39957



See BH Log also

LOCATION PROJECT PROJECT REF. DATE

BH3/30	
GCTP Phase 3 Contract 1	
18963	
23/02/2016	

PHOTOS

Hand Dug Pit at BH3/30



Spoil Heap at BH3/30



Possible tarmac / bitumen fragment?



LOG

0.00	0.15	TOPSOIL	
0.15	0.50	Brown clayey/silty very sandy GRAVEL with fragments of concrete, red brick,	
6.1.0		ceramic pipe, timber, roof slate, plastic and possible asbestos / felt / tarmac / bitumen (MADE GROUND)	
Pit terminated on encountering possible asbestos (possible tarmac / bitumen)			

SAMPLES	В	0.15	to	0.50	AA39968
	ENV	0.15	to	0.50	AA39969
	FNV	0.15	to	0.50	AA39970



See BH Log also

LOCATION PROJECT PROJECT REF. DATE

BH3/31	
GCTP Phase 3 Contract 1	
18963	
23/02/2016	

PHOTOS

Hand Dug Pit at BH3/31



Spoil Heap at BH3/31



LOG

١	0.00	0.30	TOPSOIL
ı	0.30	0.60	Firm light brown slightly sandy slightly gravelly SILT with a low cobble content.
ı			Sand is fine to medium. Gravel is angular to subangular coarse.
ı	0.60	1.20	Firm grey mottled brown slightly sandy gravelly SILT with a medium to high
ı			cobble content. Sand is coarse. Gravel is angular to subangular coarse.

 SAMPLES
 B
 0.30
 to
 0.60
 AA39971

 0.60
 to
 1.20
 AA39972

GROUNDWATER Water strike at 0.90m



See BH Log also

LOCATION PROJECT PROJECT REF. DATE

H3/35	
CTP Phase 3 Contract 1	
3963	
9/02/2016	

PHOTOS

Hand Dug Pit at BH3/35



Spoil Heap at BH3/35



LOG

0.00	0.20	TOPSOIL
0.20	1.00	Firm light brown mottled brown slightly sandy slightly gravelly SILT with a low to
		medium cobble and boulder content. Sand is coarse. Gravel is angular to
		subangular coarse. Cobbles and boulders are of limestone.
1.00	1.20	Firm mottled brown slightly sandy gravelly CLAY
1.20		OBSTRUCTION - Possible Weathered Rockhead

SAMPLES	В	0.50	AA39963
	В	1.00	AA39964



See BH Log also

LOCATION PROJECT PROJECT REF. DATE

BH3/36	
GCTP Phase 3 Contract 1	
18963	
12/02/2016	

PHOTOS

Hand Dug Pit at BH3/36



Spoil Heap at BH3/36



LOG

0.00	0.10	TOPSOIL
0.10	0.50	Firm brown sandy slightly gravelly SILT with occasional cobbles of limestone
0.50		OBSTRUCTION - Large boulders of limestone

SAMPLES B 0.10 to 0.50 AA49479



See BH Log also

LOCATION PROJECT PROJECT REF. DATE

13/40	
CTP Phase 3 Contract 1	
963	
/02/2016	

PHOTOS

Hand Dug Pit at BH3/40



Spoil Heap at BH3/40



LOG

0.00	0.05	TOPSOIL
0.05	0.15	Brown grey sandy fine to medium GRAVEL
0.15	0.50	Firm dark grey slightly sandy gravelly CLAY with occasional cobbles of limestone
0.50		Firm brown slightly sandy slightly gravelly SILT with many angular cobbles and boulders of limestone
0.80		OBSTRUCTION - Large boulders, Possible Weathered Rockhead

SAMPLES	В	0.15	to	0.50	AA49469
	В	0.50	to	0.80	AA49470



See BH Log also

LOCATION PROJECT PROJECT REF. DATE

BH3/43
GCTP Phase 3 Contract 1
18963
22/02/2016

PHOTOS

Hand Dug Pit at BH3/43



Spoil Heap at BH3/43



LOG

0.00	0.20	TOPSOIL (Possible MADE GROUND)
0.20	0.30	Soft to firm dark grey and brown slightly sandy gravelly SILT with a low to medium
		cobble content (Possible MADE GROUND)
0.30	0.60	Firm brown and dark brown slightly sandy slightly gravelly SILT with a medium
		cobble content
0.60		OBSTRUCTION - Possible Weathered Rockhead / Boulder

 SAMPLES
 B
 0.20
 to
 0.30
 AA39966

 B
 0.30
 to
 0.60
 AA39967

GROUNDWATER Water strike at 0.50m



See BH Log also

LOCATION PROJECT PROJECT REF. DATE

BH3/46	
GCTP Phase 3 Contract 1	
18963	
00/00/00/0	

PHOTOS

Hand Dug Pit at BH3/46



Spoil Heap at BH3/46



LOG

0.00	0.60	TOPSOIL with rootlets and many limestone cobbles and boulders from 0.20m
0.60		Obstruction - Possible weathered rock

<u>SAMPLES</u> B 0.00 to 0.60 AA39980



See BH Log also

LOCATION PROJECT PROJECT REF. DATE

BH3/48
GCTP Phase 3 Contract 1
18963
11/02/2016

PHOTOS

Hand Dug Pit at BH3/48



Spoil Heap at BH3/48



LOG

0.00	0.10	TOPSOIL
0.10		Firm dark grey occasionally light brown slightly sandy slightly gravelly SILT with occasional cobbles of limestone
0.50		
		Brown grey clayey angular COBBLES of limestone
0.60		OBSTRUCTION - Large boulders, Possible Weathered Rockhead

<u>SAMPLES</u> B 0.10 to 0.50 AA49471

Appendix 3

Rotary Core Drillhole Records and Photographs

BH3/29R
BH3/30R
BH3/31R
BH3/32R
BH3/33R
BH3/34R
BH3/35R
BH3/36R
BH3/38R
BH3/39R
BH3/40R
BH3/41R
BH3/42R
BH3/43R
BH3/46R
BH3/47R
BH3/48R
BH3/52R
BH3/53R
BH3/54R



REPORT NUMBER

/		7																			
СО	NTR	ACT	N	16 Ga	alway City	/ Transpo	rt Pro	oject -	Phase 3					DRILL		NO	BH3/03R Sheet 1 of 1				
	-ORE		TES	(mO	523,11 724,21 D)				RIG TYPE FLUSH			Casagra Air/Mist		DATE DATE	DRILL						
	IENT GINE			alwa RUP	ay County	Council			INCLINATION CORE DIA		n)	-90 80		DRILL LOGG				SL O'She	ea		
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Spa Lo (m	ng m)	Non-intact Zone	Legend			Depth (m)	Elevation	Standpipe Details	SPT (N Value)							
- 0								<u>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</u>	SYMMETI as peat	RIX DRILLI	NG: No red	covery, ob	serve	ed by dri	ller	0.50	40.09				
Ė	0.90							+++	SYMMETI as weathe	RIX DRILLI ered rock	NG: No red	covery, ob	serve	ed by dri	ller		39.69				
1		100	87	61				+	mottled, p fresh to lo	ig, thickly to orphyritic, r cally slightl	medium to o y weathere	coarse-gr d.	ained	, ĞRAN	ITE,						
2	2.40				L		√ ≥ λ/	1 + · · · · · · · · · · · · · · · · · ·	closely sp	0° to locall aced, roug partly ope	n to locally	smooth, p	olanar	. Apertu	to res						
3		100	98	85				+ + · + + · + + ·													
4	3.70					8	380] + + · · · · · · · · · · · · · · · · ·													
-		100	83	83				+++++++++++++++++++++++++++++++++++++++													
5	5.20					_		+ +	End o	of Borehole	at 5.20 m					5.20	35.39				
- 6 - 7 - 8 - 9	MAR	KS														WAT	FER ST	*RIKE	DETAILS		
Hol			0.00-0	0.90r	m.					Water Strike	Casing	Sealed Δt		se	Time		mmen		DETAILS		
RE HO										зике	Depth	At		U	(min)	N	No water strike recorder				
NIS	ΤΔΙ	LΔTI	ON D	EΤΔ	ILS					Date	Hole	Casin		epth to Water	Com	GRO		VATER	DETAILS		
- 1143	Date				RZ Top	RZ Base	9	Тур	oe	Date	Depth	Depth	<u>'</u>	Water	0011						
- ∟						1					1										



REPORT NUMBER

]ලිදි	3L/									'	090	13	
ONTR	RACT	N	6 Ga	lway City Transpo	ort Pr	oject -	Phase 3	DRILLHOLE SHEET	NO	BH3/04R Sheet 1 of 1			
	DINAT		(mOI	523,645.55 E 724,286.79 N O) 36.82						15/02/2016 16/02/2016			
LIENT	-	G		y County Council			INCLINATION (deg) -90 CORE DIAMETER (mm) 80	DRILLED BY		S. Petersen D. O'Shea			
Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description		Depth (m)	Elevation	Standpipe Details	SPT (N Value)	
						+ 711/7	SYMMETRIX DRILLING: No recovery, obs as peaty TOPSOIL.	-	0.30	36.52			
0.80					X : X	+++++++++++++++++++++++++++++++++++++++	SYMMETRIX DRILLING: Driller reports green Very strong, thickly to thinly banded, light	eenish pink rock	0.80	36.02			
	100	96	84			+ + + + + +	pink/red/brown/grey/white/orange mottled, medium to coarse-grained, GRANITE, fres slightly weathered.	porphyritic, h to locally					
2.90	100	100	100		750	+ + + + + + + + + + + + + + + + + + +	Dips are 35° to locally 80°. Discontinuities a medium spaced, rough to locally smooth, p Apertures are tight to partly open, very thin smearing, slightly iron-oxide stained.	olanar.			0 0		
3.70	100	100	100	F									
4.30	100	100	93			1 + + + + +							
4.70	100	100	100		750	}							
	100	100	100			++							
5.60)					+ +	End of Borehole at 5.60 m		5.60	31.22	0 0		
EMAR ole ca	RKS ased 0	.00-0).80n	n.			Water Casing Sealed	Rise Time				DETAIL	
5 56	.554 0						Strike Depth At 0.30 0.30 N/S	To (min) 0.30 5	Co	ommen Seepag			
									GR	OUNDV	VATER	R DETA	
	LATIO	211 5	CT 4 ·	1.0			Date Hole Casing	Depth to Water Con	nment	-			



REPORT NUMBER

(I)	වුව	<u></u> 나													'	090		
CON	ITR/	ACT	N	6 Ga	lway City Transpo	rt Pro	oject -	Phase 3				DRILL		NO		3/06R		
:0-0	ORD	INAT	ΓES		524,242.31 E							DATE		ED		et 1 of 2/2016		
3RC)(INI)	DIF	VFI	(mOI	724,826.60 N 23.09			RIG TYPE Casagrand					LOGGI			2/2016		
	ENT				y County Council			FLUSH INCLINATION	ON (deg)		Air/Mist -90	DRILL	ED BY	,	IGSL			
NG	INE	ER		RUP	-			CORE DIAI		m)	80	LOGG	ED BY	,	D	. O'She	ea	
(m)	(m) r	,,	,0	٠,٥		4.										<u>si</u>		
Dept	Depti	T.C.R.%	S.C.R.%	.Q.D.%	Fracture Spacing	Zone				Document	tion					Deta	(en)	
Downhole Depth (m)	Run	J.T	S.(R.O	Log (mm)	ntact	<u>ب</u>			Descrip	AUOI I			(m)	tion	pipe	N Va	
Jown	Core Run Depth (m)				0 ²⁵⁰ 500	Non-intact Zone	Legend							Depth (m)	Elevation	Standpipe Details	SPT (N Value)	
0					0 ²⁵⁰ 500		000	SYMMETE	RIX DRILL	ING: No re	covery, obse	rved by dri	ller			M K	0,	
							0-0	as clayey	gravel					0.00	00.55			
<u>,</u>							+	SYMMET	RIX DRILL	ING: No re	covery, obse	rved by dri	ller		22.29			
1 1	1.20					λ ·	+	as weathe Very stron	g, thickly t	o thinly bar	nded, dark br	ownish pur	ple	1.20	21.89	0 0		
		100	77	61		/	++	mottled, po	orphyritic, cally slight	medium to ly weathere	coarse-grair ed.	ed, GRAN	ITE,					
2 2	2.20						+ + + + +	Dips are 2	0° to local	ly 80°. Disc	continuities a	re widely to)					
		100	32	25			+ · - + - +				y smooth, pl en, very thin l					0 0		
3 3	3.20	100	52	20			+ + + +	sinealing.										
	J.ZU					(io) /	+++											
		100	77	42		/	++											
1 2	1.20						 - - -											
		100	95	55			+++											
5	5.20						-											
							 + -											
		100	81	61		(2 2 /	+++											
3 6	5.20						+ + + + +											
		100	96	96			-+ + + +											
7 7	7.20						 +											
7	7.50	333	100	100			<u>- </u>	End o	of Borehole	e at 7.50 m				7.50	15.59			
3																		
9																		
REM	IARI	KS												WA ⁻	 TER S1	 	DETAILS	
			.00-	1.20n	n.				Water Strike	Casing Depth	Sealed At		Time (min)		mmen			
										,			/	N	lo wate	er strike	e recorde	
	ΓΔΙΙ	ΔΤΙ	ם אכ	ETAI	ıs				Date	Hole	Casing	Depth to Water	Com	GRO		VATER	RDETAIL	
	ate				RZ Top RZ Base		Ту		Dale	Depth	Depth	Water	COIII	miciil	J			
			2.6	0	0.80 2.80		50mn	n SP										



REPORT NUMBER

CONT				6 Ga	lway City	Transpo	ort Pro	oject -	Phase 3					ORILLI SHEET		NO	1		
CO-O GROL				(mOl	524,50 725,01 D)				RIG TYPE FLUSH			Casagra Air/Mist	-d-	ATE L				4/2016 4/2016	
CLIEN ENGIN		₹		alwa RUP	y County	Council			INCLINATION CORE DIA		m)	-90 80		RILLE OGGI				SL O'Shea	
Downhole Depth (m)	Cole Rull Deptil (III)	1.C.R.%	S.C.R.%	R.Q.D.%	Frac Spa Lc (m	cing og m)	Non-intact Zone	Legend			Descript	iption				Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0 2 2.0 2.1 3 3.0 4 4.0 5.5 5.0 6.0 6.1 7	1 1 660 1 1 660 1 1 660 1 1 1 660 1 1 1 1	000	46 96 76	32 90 76			3330		Very stron mottled, p fresh to lo Dips are 2 closely sp are tight to 2.60-3.15i 3.71-5.02i	RIX DRILLI ered rock orphyritic, r cally slightl aced, roug o partly ope m - Modera m - Modera	o thinly band medium to divide weathered by 70°. Discorter, very thin attely weather the w	ded, brow coarse-grad. ontinuities smooth, p brown cla ered, sligh	n pink cained, Care mealanar. Aay smeat weaket weaket	by dril green GRANI dium pertur aring. ening.	ler TE,		35.11		
8	60						530	+ + +	End (28.81									
REMA					1				1							WA	TER ST	RIKE	DETAILS
Hole (case	d 0.	.00-2	2.60r	m.										Time (min)	N		er strike	e recorded
											Hela	Casia		41- 4		GRO	DUNDV	VATER	DETAILS
INST <i>A</i>						RZ Base	e	Tvr	oe .	Date	Hole Depth	Casing Depth	Dep Wa	th to ater	Comments				
	Pate Tip Depth RZ Top RZ Base Type																		



REPORT NUMBER

	3L/														0000	
ONTR	RACT	N	6 Ga	lway City Transp	ort Pro	oject -	Phase 3					LHOLE	NO		3/08R	
O-ORI			(mOI	524,622.58 E 725,067.54 N D) 42.05		DIC TYPE Kashal						DATE DRILLI				
LIENT			alwa RUP	y County Council			INCLINATION CORE DIAM		m)	-90 DRILLE n) 80 LOGGE				S. Petersen D. O'Shea		
Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend			Descrip	tion			Depth (m)	Elevation	Standpipe Details SPT (N Value)	
0.90	100	96	91		620	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	as peaty T SYMMETF as brownis SYMMETF as brownis Very stron- pink/red/bi	OPSOIL. RIX DRILL Sh pink we RIX DRILL Sh pink roc g, thickly to rown/grey/	o thinly ban white/oranc	covery, obs k covery, obs ded, light se mottled.	served by c	driller	0.30 0.70 0.90	41.75 41.35 41.15		
2.60	100	97	87	F		-	slightly we Dips are 3	athered. 5° to locall	rained, GRA ly 80°. Disc igh to locall	ontinuities	are widely					
3	100	92	81			+	Apertures	are tight to	partly ope on-oxide sta	n. verv thin		у				
3.90	100	100	80	E		+ + - + + - + + - + + -										
4.75 5.75	100	100	100		610										0 0	
3	100	100	92		560	-										
7.30	100	100	88	F		+ + + - + + - + - + - + - + - + - + - +										
8.50	100	100	100		580 660											
9.80						-	End o	of Borehole	e at 9.80 m					32.25	°	
IEMAR lole ca		0.00-0).90n	n.				Water Strike	Casing Depth	Sealed At	Rise To	Time (min)		mmen	TRIKE DETAI ts	
													N	lo wate	r strike reco	
									Hole	Casing	Depth to Water		GR	OUNDV	VATER DETA	



REPORT NUMBER

CONTRACT CO-ORDINATE GROUND LEVE CLIENT ENGINEER F	EL (mOl	525,320.57 E 725,603.65 N D) 66.51	Project -	Phase 3			DRILLH	OLE NO	ВН	3/10R
GROUND LEVE CLIENT ENGINEER	EL (mOl	725,603.65 N				CLIEFT		CI.	ot 1 of 0	
NGINEER				RIG TYPE FLUSH		Casagrand	DATE DO		04/0	et 1 of 2 04/2016 04/2016
Ê		ay County Council		INCLINATION (deg) CORE DIAMETER (m	nm)	-90 80	DRILLE LOGGE			GSL . O'Shea
Core Run Depth (m) T.C.R.%	S.C.R.% R.Q.D.%	Fracture Spacing N Log (mm) spurious 100 N Spurious	- 1		Descript	ion		Depth (m)	Elevation	Standpipe Details SPT (N Value)
1 1.20			- + - + - + - + - + - +	SYMMETRIX DRILL as peat SYMMETRIX DRILL as weathered rock		-	-	er	0 65.31	
	99 95	510	+++++++++++++++++++++++++++++++++++++++	Very strong, thickly mottled, porphyritic, fresh to locally sligh Dips are 20° to loca closely spaced, rough	medium to on the total the medium to one the the the the the the the the the th	coarse-grain d. ontinuities a smooth, plai	ed, ĞRANIT re medium to nar. Aperture	E,	30.01	
3 2.70 100 9	99 94	710	+ + + + + + + + + + + + + + + + + + +	are tignt to partly op	en, very thin	brown clay	smearing.			
4 4.20	94 94									
5.70			= + + · + + · - + + · - + + ·							0 0
7 7.20	00 100	720	+ + · · · + · · · · · · · · · · · · · ·							
8.70	99 96	750								0 0 0
	97 97	520	+++++++++++++++++++++++++++++++++++++++							0 0 0
REMARKS Hole cased 0.0	00-1.20r	m.		Water Strike	Casing Depth	Sealed At		ime	ommer	TRIKE DETAIL: nts
				Guine	Борит	, , ,	10 (1		No wate	er strike record
								GI	ROUND	WATER DETAI
		RZ Top RZ Base 5.50 11.00	Tyr 50mm		Hole Depth	Casing Depth	Depth to Water	Commer	nts	



REPORT NUMBER

/ IGSL													•	000			
CONTRACT	T N6	6 Ga	lway City	Transpoi	t Projec	t - Phase 3					DRILLHOLE NO			O BH3/10R Sheet 2 of 2			
CO-ORDINA GROUND L		(mOl	525,320 725,603)			RIG TYPE FLUSH			Casagrar Air/Mist	DATE	DRILLE LOGGE		<u> </u>				
CLIENT ENGINEER		alwa RUP	y County	Council		INCLINATI	ON (deg) METER (mi	m)	-90 80	l l	ED BY		IGSL D. O'Shea				
Downhole Depth (m) Core Run Depth (m) T.C.R.%	S.C.R.%	R.Q.D.%	Frac Spac Lo (mi	cing g m)	Non-intact Zone			Descript	ion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)		
10 10.20	99	98			+++++++++++++++++++++++++++++++++++++++	mottled, p fresh to lo Dips are 2	oorphyritic, rocally slightle 20° to localle aced, rougo partly ope	o thinly band medium to d y weathered y 70°. Disco h to locally s en, very thin	oarse-graid. ontinuities smooth, pl	ned, GRAN are medium anar. Aperti	IITE, n to ures						
12 100	100	100		54	+ + + 10.000000000 + +	+											
14.70	0 100	100		18	+ + + + + + +	+											
100	100	100			+++++++++++++++++++++++++++++++++++++++	⊤_ +_ +_ +_ +_ +_											
16.70	98	86			+	L	of Borehole	e at 16.70 m			1	<u>16.70</u>	49.81				
- 18 																	
REMARKS												WAT	TER ST	RIKE I	DETAILS		
Hole cased	0.00-1	.20n	n				Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	+	mmen o wate		e recorded		
												GRO	DUNDV	VATER	DETAILS		
INSTALLAT							Date Hole Casing Depth to Depth Depth Water Comments										
Date 06-04-16	Tip De 10.00		5.50	RZ Base 11.00		ype nm SP											



REPORT NUMBER

O-OF	RACT RDINA	TES		525,784.67 E 725,830.02 N	ort Pro	oject -	RIG TYPE			Comacchi	SHEET DATE D	ORILLED	She 02/0	3/11R et 1 of 02/2016 02/2016	1
CLIEN ENGIN	Т	G		y County Council			FLUSH INCLINATION CORE DIAI		m)	Air/Mist -90 80	DRILLE	D BY	IC	GSL . O'She	
Downhole Depth (m) Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend			Descripti	on		Deoth (m)	Elevation	Standpipe Details	SPT (N Value)
0						0-A	as grey br	own clayey	sandy grav	el	erved by drill	0.7	0 53.54		
1						/	SYMMETF as weathe	RIX DRILLI red rock	NG: No rec	overy, obse	erved by drill	er			
1.80 2.00 2.30	100 100 100	0	0				Possible w basalt.	veathered i	rock - recov	ered as an	gular gravel	of	52.44	0 0	
2.60	100	93	46		(A ! A)(A		grained, ve	ery dark gr ts). Possib	le BASALTI	le (with ang	coarse gular cream TE, fresh to	2.6	<u>0</u> 51.64		
3.30	400		0 45		(. · ·) (. · · ·) (. · · · · · · · · · · · · · · · · · ·	/	locally slig Dips are 1	htly weathe 0°. Discon	ered. tinuities are	widely to n	nedium spac				
4.00	100	0	0			/	smooth, pl smearing,	lanar. Aper slightly iro	tures are tig n-oxide staii	iht, very thi ned.	n brown clay	/			
5.00	100		0		/ /	/									
5.80	100	100	70												
6.5	0	100			k · · · h										
7.10	100		100		<u> </u>										
7.80	100	100	100				End o	of Borehole	e at 7.80 m			7.8	<u>0</u> 46.44		
EMA	RKS											W	ATER S	TRIKE I	DETAILS
	ased	0.00-4	4.60m	n.				Water Strike 1.00	Casing Depth	Sealed At		Time	Commer		
JCT^	LLAT	ON D	ETAI	18				Date	Hole	Casing	Depth to Water	G		WATER	DETAIL
Dat 10-02	te		epth	RZ Top RZ Bas 1.80 2.70		Tyr 50mn		10-02-16	Depth 7.80	Depth 4.60	Water 0.40	Water level drilling		10 mins a	ıfter end of



REPORT NUMBER

100	35 	노/													090	•
ON	ITR/	ACT	N	6 Gal	lway City Transport	Projec	t - Ph	e 3			DRILLI		Ю		3/13R	
0-0	ORD	INAT	ΓES		526,078.57 E						DATE I	DRILLEI	<u> </u>		et 1 of 2 3/2016	
iRC	UNI	D LE	VEL	(mOE	726,036.12 N 58.65			TYPE SH		Casagrande Air/Mist					3/2016	
	ENT				y County Council			INATION (deg)		-90	DRILLE	ED BY			SL	
_	INE	ER	Α	RUP			C	E DIAMETER (m	nm)	80	LOGGI	ED BY		D.	O'She	а
Downnole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 250 500	Non-Intact Zone			Descrip	tion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
)						°-0	4 a	METRIX DRILL	_ING: No red	covery, obser	ved by dril	ler				
						9	و آھ	METRIX DRILL	ING: No red	covery obser	ved by dril	ler 0	.70	57.95		
1	1.10					$-\Box$	a	/eathered rock / strong, thickly		•	•	1	.10	57.55		
		100	96	96	600	-	+ m	led, porphyritic, to locally sligh	medium to	coarse-graine	ed, GRANI	TE,				
. 2	2.10					₫+	+ + D	are 20° to loca	lly 80°. Disc	ontinuities ar	e widely to					
		100	97	97		- -{+	+ m	lium spaced, roเ rtures are tight t	ugh to locall	y smooth, pla	nar.				0 0	
3	3.10	100	91	ฮเ		- [+	+]	aring.							0 0	
					1070	, [+	+] +]								0 0	
		100	98	98		_ + _ +	+] +								0 0	
4	4.10					+++++++++++++++++++++++++++++++++++++++	+]								0 0	
		100	100	100	830	+++++++++++++++++++++++++++++++++++++++	+ +]								0 0	
5	5.10					+	+] +								0 0	
		100	100	100		= + = +	+ + +								0 0	
6	3.10				899.	99999999	+ 9999								00 00	
		100	100	100		—}+	+ +]								• 🗐 •	
7	7.10	100	100	100	<u>() </u>	+	+] +]								• •	
						+++++++++++++++++++++++++++++++++++++++	+								•	
		100	100	100	570	+	+] +]								0 0	
8	3.10				530	00000000	+									
		100	100	100		+	+ +									
Ş	9.10				569.	999999999999999999999999999	9999									
		100	100	100		+++++++++++++++++++++++++++++++++++++++	+ +								0 0	
EM	IAR	KS				+[+]						WA1	rer st	O O	DETAILS
			.00-1	1.10m	1.			Water Strike	Casing Depth	Sealed At	I	Time (min)	Т	mmen		
													N	o wate	r strike	recorde
									11-1-	0	D "	1	GRO	DUNDV	VATER	DETAIL
				ETAI	LS RZ Top RZ Base		Type	Date	Hole Depth	Casing Depth	Depth to Water	Comm	nent	S		
	0ate 03-1		9.00		6.00 10.10		Гуре nm SI									



REPORT NUMBER

	35	/			GEC	<i>,</i> , ,	СП	INIC	AL CURI	E LOC	RECU	עאי				1	896	3
OI	NTR	ACT	Ne	6 Ga	lway City Tran	spor	t Pro	ject -	Phase 3				DRIL SHE	LHOLE ET	NO		3/13R et 2 of :	
		DINAT	TES VEL ((mOE	526,078.57 726,036.12 0) 58	E N .65			RIG TYPE FLUSH			Casagran Air/Mist	DATE	E DRILLE E LOGGE		21/0 22/0	3/2016 3/2016	6
	ENT SINE	ER		alwa _: RUP	y County Cour	ncil			INCLINATION CORE DIAME		m)	-90 80		LED BY GED BY			SL O'She	ea
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	500	Non-intact Zone	Legend			Descrip	tion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
	10.10				0 250 		_	+	End of	Borehole	e at 10.10 n	n				48.55	''	
11																		
13																		
14																		
15																		
16																		
17																		
18																		
19																		
REN	//AR	KS													WA	TER ST	RIKE I	DETAILS
Hole	e cas	sed C).00-1	.10m	1.					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Со	mmen	ts	e recorde
NG.	TA!!	ΔT14	ON DI	FT^!	18					Date	Hole	Casing	Depth to Water	Com	GR0 ments		VATER	DETAIL
[Date -03-1	1		epth	RZ Top RZ E 6.00 10.			Ty _l 50mn		Date	Depth	Depth	Water	Con	ment			



REPORT NUMBER

୍ରାପ୍ତ]Si	١٠/												'	090	,,,
ONT	ΓRA	СТ	N	6 Ga	lway City Transport I	Project	- Phase 3					HOLE	NO		3/16F	
0-0	RDI	NAT	ES		526,764.74 E						SHEE				et 1 of	
ROI	חאו) E	/FI	(mOI	726,611.40 N		RIG TYPE			Casagrand	_	DRILLE			3/2016 3/2016	
LIEN		, LE			y County Council		FLUSH INCLINATION	ON (dea)		Air/Mist -90		ED BY			SSL	
NGIN		R		RUP			CORE DIAI		m)	80		ED BY			. O'Sh	ea
E 2	E)														,,	
Downhole Depth (m)	ebtu	T.C.R.%	S.C.R.%	.Q.D.%	Fracture	2									etail	<u>e</u>
ם ק	ת ה	T.C.	S.C.	R.Q.	Spacing No.				Descrip	tion			Œ	L C	be D	Valu
Core Run Denth (m)	<u>ه</u>				Fracture Spacing Log (mm) 50 250 500 500	Legend							Depth (m)	Elevation	Standpipe Details	SPT (N Value)
	3				0 250 500 S	- 1	1						De	Ĕ	Šţ	R. S.
						0-0	as clayey		ING: No red	covery, obse	rved by dr	ıller				
						00	,†									
						Ľ0 s	يا ا									1
-	\dashv					0 0	CVMMET	SIX DBII I	ING: No re	covery, obse	rved by dr		1.50	60.16		
						+ + +	an wantha	red rock	10. 140 160	covery, obser	ved by di					
2.5	50					+ - +	-]						2 50	59.16		
2.0	~~ -						Very stron	g, thickly t	o thinly ban	nded, dark bro coarse-grain	ownish pu	rple		100.10		
		100	86	64		##	fresh to lo	cally slight	ly weathere	ed.	cu, Orvari	∟,				
3.5	50				人 人 人 之	+	Dips are 2	0° to local	ly 80°. Disc	ontinuities ar y smooth, pla	e widely to	0				
		100	35	35			Apertures	are tight to	partly ope	en, very thin b	rown clay					
4.5		.55	55	33	(A. 9	<u></u>	2.50-5.80r	m - Slightly	to locally n	noderately w oxide staining	eathered,					
7.3	~~ -				(. · ·	+	weakening		.auve 11011-(ovine erailiili	y, əliyill					
		62	16	0	(. a	++	-]									1
					(A. 4) (A. 4)	<u> </u>	4									
5.8	80						4									
		100	93	73		+	.]									
						= + ; - + ;	+									
7.0	00					++	1									
							4									
	-	100	97	97		=[+] =[+]	4									
8.5	50						1									
3.0] - -	-]									
		100	99	99		+	+									
		100	23	99	1150		-									
10.						+		(D)						51.66		
eMA ole d			.00-1	1.10n	າ.		End o	Water	e at 10.00 n Casing	Sealed	Rise	Time		mmen		DETAILS
								Strike	Depth	At	То	(min)	+			e recorde
													GRO	OUNDV	NATER	R DETAIL
IST <i>A</i>	ALL			ETAI				Date	Hole Depth	Casing Depth	Depth to Water	Com	ment	s		
Da 24-03	ate 3-16		ip De		RZ Top RZ Base 6.00 10.00		/pe m SP									
					10.00		=.									



REPORT NUMBER

ાિ	350	ᅡ/														- 1	890	13
CONT	ΓRA	CT	N	6 Ga	alway City	/ Transp	ort Pro	oject -	Phase 3				DRILI SHEE	LHOLE I	NO		3/17R et 1 of	
:0-0 :ROI				(mOl	527,02 726,804 D)		3		RIG TYPE			Casagran	DATE	DRILLE		10/0	3/2016	3
LIE	NT		G		y County				FLUSH INCLINATION CORE DIAM		m)	Air/Mist -90 80		LED BY GED BY			SSL . O'She	ea
Downhole Depth (m)	Core Kun Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Spac Lo	og m)	Non-intact Zone	Legend			Descript	tion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0 11 1 22									as clayey (gravel		covery, obse			2.70	62.63		
5.	.70 _						<i>(</i> -,) <i>(</i> -)	+++++++++++++++++++++++++++++++++++++++	as weathe	ered rock	o thinly ban	covery, obse	reen mottle	riller ed,		60.33 59.63	0 0 0	
6.	.70	100	26	0	t E		(1 ? AX		porphyritic locally slig Dips are 2 closely spa	c, medium to the physical physical to to locall aced, roug	to coarse-greed. ly 70°. Discount to locally	rained, GRA ontinuities a smooth, pla n brown clay	ANITE, fres are mediun anar. Apert	sh to n to tures			0 0 0	
	.20	100	88	68	E		\\ \!\\	/ + + · · · · · · · · · · · · · · · · ·			-		S				0 0 0	
9.	.70	100	100	91	F													
EM/	ARK	S						++							WA ⁻	 TER ST	₀ ₀ TRIKE	DETAILS
			.00-5	5.20r	n.					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)		mmen		
															N	o wate	r strike	e recorde
											Hole	Casing	Donth to				VATER	R DETAIL
	ALL ate			ETA lepth	ILS RZ Top	RZ Bas	se	Тур	oe l	Date	Depth	Depth	Depth to Water	Comi	ment	S		
11-0			10.2		3.00	10.20			n SP	1	1	1	1	1				



REPORT NUMBER

/1	ලිදි	<u>;</u> L/															000	
СО	NTR	ACT	N	16 Ga	alway City	/ Transpo	ort Pro	oject -	Phase 3				I	LHOLE	NO		3/17R	
СО	-ORI	DINA	TES		527,02	1.46 E							SHE		ED		et 2 of	
			EVEL	(mΩl	726,80	4.57 N 65.33			RIG TYPE			Casagran	اماء	E DRILL E LOGG			3/2016 3/2016	
	ENT		G	alwa	y County				FLUSH INCLINATI			Air/Mist -90		LED BY		IG	SL	
EN	GINE	ER	T	RUP					CORE DIA	METER (mi	m)	80	LOG	GED BY	<u>′</u>	D.	O'She	ea
Downhole Depth (m)	Core Run Depth (m)	%	%	%		4	ā										ails	
e Dep	Dep	T.C.R.%	S.C.R.%	R.Q.D.%	Frac Spa	cing	Non-intact Zone				Descript	ion					Standpipe Details	SPT (N Value)
nhole	Run	-	S	2	Lc (m	m)	-intac	pue							Depth (m)	Elevation	dpibe	> <u>Z</u>
Dow	Core				0 250	500	Non	Legend							Dep	Elev	Star	SPT
10	10.20	100	92	92				+	Fnd	of Borehole	e at 10.20 m	1			10.20	55.13	°	
										5. 511616								
11																		
12																		
14																		
13																		
14																		
15																		
. 15																		
:																		
- 16																		
17																		
18																		
18																		
- - 19																		
- -																		
RE	MAR	KS													WAT	ER ST	RIKE	DETAILS
			0.00-	5.20r	m.					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)		mmen		
															N	o wate	r strike	e recorded
															GRO	DUNDV	VATER	DETAILS
			ON D			D7 D - :		T-		Date	Hole Depth	Casing Depth	Depth to Water	O Con	nment	S		
	Date -03-		10.2		RZ Top 3.00	10.20		Ty _l 50mn		-								



REPORT NUMBER

1																			
CO	NTR	ACT	N	6 Ga	lway City	Transpo	ort Pro	oject -	Phase 3					DRII SHE	LHOLE ET	NO		3/18R et 1 of	
co	-ORE	OINA.	TES		527,25 726,89										E DRILL	.ED		2/2016	
GR	OUN	D LE	VEL ((mOI		70.64			RIG TYPE FLUSH				ebel /Mist	DAT	E LOGG	ED	26/0	2/2016	3
	IENT				y County	Council			INCLINATION			-90)		LED B			Peter	
	GINE	ER	Al	RUP					CORE DIA	METER (m	m)	80		LOG	GED B	Υ 	D.	O'She	ea
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Frac Spa Lc (m	cing og m)	Non-intact Zone	Legend			Descrip	tion				Depth (m)	Elevation	Standpipe Details	SPT (N Value)
- 0								711/2		RIX DRILL	NG: No re	cove	ry, obse	erved by o	Iriller	0.40	70.24		
1 2									as peaty T SYMMETI as brown			cover	ry, obse	erved by o	Iriller	3.60	67.04		N = 35 (2, 4, 6, 6, 9, 14)
ŧ								+++		RIX DRILL		cove	ry, obse	erved by o	Iriller		66.74	0 0	N = 50/85 mm (8, 14, 41, 9)
4	5.00	100	94	84	E			+++++++++++++++++++++++++++++++++++++++	SYMMETI as pink ro- Very stron pink/red/b	g, thickly to	NG: No re thinly bar	ided,	, light ottled. r	oorphyritic	/ ;.		10004		
5	5.60	100	100	100			770	+ + - - + + - - + + -	slightly we	coarse-greathered.									
6	6.80	100	99	68	E		<i>A</i> ,	+	Apertures	paced, rou are tight to slightly iro	gh to locall partly ope	y sm n, ve	ooth, pl ery thin	lanar.					
7	7.20	100	100	80			/ (\(\(\) \) /	++											
-	7.70	100	96	48			\. \. \. \. \. \. \. \. \. \. \. \. \. \	-											
8	9.00	100	98	73	٥													0 0 0	
-		100	91	84			570	+ + - + + - + + - + + - + + -											
RE Ho	MAR le cas		0.00-4	l ()()n	n					Water	Casing	Sea	aled	Rise	Time				DETAILS
IGSL RC FI 10M 18963.GPJ IGSL.GDT 17/8/16 H Color	io odi	Jou (Strike	Depth		At	To	(min)	N		er strike	e recorded
M 18	.		ON 5							D-4-	Hole	С	Casing	Denth t	0 0			VATER	RDETAILS
S INS	Date 5-02-1	1	ON D Γίρ De 4.00	epth	RZ Top 0.50	RZ Base 4.00	Э	Ту _р 50mm		Date	Depth		Depth	Depth t Water	Con	nment	S		
<u>o</u>																			



REPORT NUMBER

୍ପଓଞ	<u>.</u>			0_0				J 11200					18	396	3
CONTR			6 Gal	way City Transpor	rt Proj	ject -	Phase 3			DRIL	LHOLE NO		BH3 Shee		
O-ORI			(mΩF	527,254.48 E 726,893.52 N 70.64			RIG TYPE		Knebel		DRILLED		24/02 26/02		
LIENT		G	•	y County Council			FLUSH INCLINATION (deg) CORE DIAMETER (n	nm)	Air/Mist -90 80	l l	LED BY GED BY			Peter: O'She	
Downhole Depth (m) Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend		Descrip	tion		(20)	Depin (m)	Elevation	Standpipe Details	SPT (N Value)
10.30					_ H	++-	Very strong, thickly pink/red/brown/grey	/white/orand	e mottled.	porphyritic				°	
11 11.45	100	100	100	57	70.00000	+ + + + + + + +	medium to coarse-g slightly weathered. Dips are 35° to loca medium spaced, rou Apertures are tight t	rained, GRA	ANITE, frestontinuities and smooth, process, very thin	n to locally are widely lanar. brown clay	to		c		
12	100	100	100			+	smearing, slightly iro	on-oxide sta	ined. <i>(conti</i> i	nued)			c	•	
12.70					$\overline{}$	++									
13.70	100	96	88			+							c		
14 15 15.20	100	100	95		-	· + - · + + - · + + - · + + - · + +									
16.60	100	99	99	_	50.00000	+ + + + + +							c		
17.50	100	98	82			· + - · + - · + - · + -							c		
18.90	100	97	91	59	90.0000	+ + 00000001 + + - + + - + + + + + + + + + + + + + +							c		
19	100	97	93	14	- ⊢	· + - · + - · + - · + - · + -									
REMAR Hole ca		0.00-4	1.00m	1.			Water Strike	Casing Depth	Sealed At	Rise To	Time		ments		DETAILS
							Cuine	Борит	7.10		()	No	water	strike	e recorde
											_	ROL	JNDW	ATEF	R DETAIL
NSTAL						T	Date	Hole Depth	Casing Depth	Depth to Water	_				
Date 26-02-		Γίρ De 4.0 0		RZ Top RZ Base 0.50 4.00		Typ 50mm		16.60	4.00	2.50	Water leve	el mea	sured st	tart last	day drilling



REPORT NUMBER

1000														
CONTRACT	N6 Ga	alway City	Transpoi	rt Proje	ct - Phase 3				DRILL SHEE	.HOLE I	NO		3/18R et 3 of	
CO-ORDINA		527,25 ² 726,893	3.52 N		RIG TYPE			Knebel	DATE	DRILLE		24/0	2/2016	3
GROUND LE			70.64		FLUSH			Air/Mist		LOGGE			2/2016	
CLIENT ENGINEER	Galwa ARUP	y County	Council		CORE DIA	TON (deg) AMETER (mr		-90 80	I	ED BY			Peters O'She	
Downhole Depth (m) Core Run Depth (m) T.C.R.%	S.C.R.% R.Q.D.%	Frac Spac Lo (mr	cing og m)	Non-intact Zone		·	Description		,		Depth (m)	Elevation	Standpipe Details	SPT (N Value)
20.40	100 100	-			+ Very stro pink/red/b medium t	ng, thickly to brown/grey/v to coarse-gr	white/orange	mottled.	porphyritic, h to locally				0 0	
20.90	100 100					eathered. 35° to locall	v 80° Disco	ntinuitios	aro widoly to				0 0	
21.50	100 100	-		<u> </u> + +	+ Apertures + smearing	spaced, rough s are tight to g, slightly irou	gh to locally partly open	smooth, p	lanar. brown clay					
100	100 100		25	+ + + 500 +	.+] .+] .+] .+]								0 0	
23.00	100 100			+ + + + + + +	+ + + + +					2	24.50			
25 - 26 - 27 - 28 - 29						of Borehole	. Z 1.00 11							
REMARKS Hole cased 0) 00-4 00-	m				Water	Casing	Sealed	Rise	Time				DETAILS
REMARKS Hole cased (1) Hole cased (1) Hole cased (1) Hole cased (1) REMARKS Hole cased (1) Date 26-02-16	,.oo-4.00l	11.				Strike	Depth	At	To	(min)	N		er strike	e recorded
NSTALLATI	ON DETA	ILS				Date	Hole	Casing	Depth to Water	Comi			VALER	DEIAILO
Date 7 26-02-16		RZ Top 0.50	RZ Base 4.00		Type mm SP		Depth	Depth	vvaler					



REPORT NUMBER

ୀଉହ	217												000	
ONTR	ACT	N	6 Ga	llway City Transpo	ort Pro	oject -	Phase 3			DRILLHO	DLE NO		3/19R	
O-ORI			(mOl	527,395.72 E 727,015.07 N D) 61.46			RIG TYPE FLUSH		Knebel Air/Mist	DATE DE		03/0	et 1 of 3/2016 3/2016	3
LIENT			alwa RUP	y County Council			INCLINATION (deg) CORE DIAMETER (mr		-90 80	DRILLEI LOGGEI			Peter: O'She	
Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend		Descripti	on		Depth (m)	Elevation	Standpipe Details	SPT (N Value)
'				,		1/ 1/	SYMMETRIX DRILLI as TOPSOIL.		•		0.40	61.06		
						000	SYMMETRIX DRILLI as brown sandy grav	NG: No reco	overy, obse	rved by drille		60.26		
						++	SYMMETRIX DRILLI as weathered rock		•	•	r 1.70	59.76		
2.20						++	SYMMETRIX DRILLI as rock				r	59.26		
	100	100	96			+ +	Very strong, thickly to mottled, porphyritic, r fresh to locally slightl	nedium to c	oarse-grair	pink green led, GRANITI	Ξ,			
3.50						-	Dips are 20° to locally closely spaced, rough are tight to partly ope	n to locally s	mooth, pla	nar. Aperture				
	100	100	94			+ ' - + + - + + - + + -	5 ·· · · · · · · · · · · · · · · · · ·	,,	5.3	··· ' 9·				
5.00					770	+ + - + + - + + - + + -								
6.05	100	100	85			-								
7.55	100	100	93											
8.55	100	100	92			-								
	100	100	94			+ + + + + + + + + + + + + + + + + + +								
9.95 EMAR						[+ ⁺					WA	TER ST	RIKE	DETAIL
ole ca		0.00-2	2.20n	n.			Water Strike 0.50	Casing Depth 0.50	Sealed At N/S	To (m	me nin) Co	ommen Moderat	ts	
								Hole	Casing	Depth to			VATER	R DETAI
ISTAL Date				I LS RZ Top RZ Base	9	Тур	Date 07-03-16	Depth 9.20	Depth 2.20	Water `	Comment		start last	day drilling
	T		T											



REPORT NUMBER

1005		
CONTRACT N6 Galway City Transport Project	- Phase 3	DRILLHOLE NO BH3/19R SHEET Sheet 2 of 2
CO-ORDINATES 527,395.72 E 727,015.07 N	RIG TYPE Knebel	DATE DRILLED 03/03/2016
GROUND LEVEL (mOD) 61.46	FLUSH Air/Mist	DATE LOGGED 07/03/2016
CLIENT Galway County Council ENGINEER ARUP	INCLINATION (deg) -90 CORE DIAMETER (mm) 80	DRILLED BY S. Petersen LOGGED BY D. O'Shea
Core Run Depth (m) Core Run Depth (m) T.C.R.% S.C.R.% R.Q.D.% R.Q.D.% R.Q.D.% Non-intact Zone	Description	Depth (m) Elevation Standpipe Details SPT (N Value)
100 100 100 1140 + + + + + + + + + + + + + + + + + + +	iresh to locally slightly weathered.	d, ĞRANITE,
100 100 100 +++++++++++++++++++++++++++	are tight to partly open, very thin brown clay si (continued)	
13.50 93 88 + + + + + + + + + + + + + + + + + +		
+ + + + + + + + + + + + + + + + + + +		15.10 46.36
- 16 - 17 - 18 - 18	End of Borehole at 15.10 m	
REMARKS Hole cased 0.00-2.20m.	Water Casing Sealed F	WATER STRIKE DETAILS
REMARKS Hole cased 0.00-2.20m. INSTALLATION DETAILS Date Tip Depth RZ Top RZ Base	Strike Depth At	To (min) Comments 0.30 5 Moderate GROUNDWATER DETAILS
INSTALLATION DETAILS	Date Hole Casing [Depth to Water Comments
Date Tip Depth RZ Top RZ Base	pe Depth Depth Depth	vvaler



REPORT NUMBER

୍ରାପ୍ତ	3L/												- 1	890	3
ONTR			6 Ga	lway City Transp	ort Pro	oject -	Phase 3			DRILL SHEE	HOLE N	10		3/20R et 1 of 2	
O-ORI			(mOI	527,214.10 E 727,669.10 N 51.63	3		RIG TYPE FLUSH		Casagrand Air/Mist	ا ما	DRILLEI LOGGEI			3/2016 3/2016	
LIENT		G		y County Counci			INCLINATION (deg) CORE DIAMETER (m	ım)	-90 80	I	ED BY			SSL O'She	а
Downhole Depth (m) Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	- o Non-intact Zone	Legend		Descripti	ion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
3 4.10	100	45	34		<u> </u>		SYMMETRIX DRILL as sandy gravelly class sandy gravelly class sandy gravelly class sandy gravelly class weathered rock SYMMETRIX DRILL as rock Strong to very strong grained, very dark gentled, very dark	ING: No rec	overy, obse	rved by dri	iller 3	3.20	50.43 48.43 47.53		
5.10	100	66	31	L L		/	locally slightly weath Dips are 20° to local closely spaced, roug are tight to partly op	ered. ly 70°. Disco jh to locally s	ontinuities a smooth, pla	re medium nar. Apertu	n to ures				
6.10 7.10	100	77	66		(A : 9 A)										
8.10	100	86	71	E	700									0 0	
9.10	100	91	86		520										
	100	92	88				T					10/0		0 0	DETA!!
lole ca		0.00-4	4.10n	n.			Water		Sealed	Rise	Time	Т	mmen		DETAILS
							Strike	Depth	At	То	(min)				recorde
												GRO	DUNDV	VATER	DETAIL
				16			Date	Hole	Casing	Depth to Water	Comm	nents			
NSTAL Date				RZ Top RZ Bas		Тур		Depth	Depth	Water	0011111	TOTAL			



REPORT NUMBER

1005									
CONTRACT N6 (Salway City Transport Project	- Phase 3		DRILLH SHEET	IOLE NO		3/20R et 2 of		
CO-ORDINATES	527,214.10 E 727,669.10 N	RIG TYPE	Casagrand	DATE D	RILLED	29/0	3/2016	a (anlus) LdS PETAILS recorded	
GROUND LEVEL (m	DD) 51.63 yay County Council	FLUSH INCLINATION (deg)	Air/Mist -90	DRILLE	OGGED		3/2016 SSL	,	
ENGINEER ARU	-	CORE DIAMETER (mm		LOGGE			O'She	ea	
Core Run Depth (m) T.C.R.% S.C.R.%	(mm) viii Vou-int		Description		Depth (m)	Elevation	Standpipe Details	SPT (N Value)	
10 10.10	The state of the s	Strong to very strong, grained, very dark gre phenocrysts), Possible locally slightly weather Dips are 20° to locally	en (with angular crear BASALTIC ANDESI ed.	m TE, fresh to	0				
100 90 9	699.99999999999999999999999999999999999	closely spaced, rough	to locally smooth, pla	nar. Apertur	es		0 0 0		
100 89 8		1							
100 86 8	740	1							
15.00 97 8		1	at 15.00 m		15.00	36.63	0 0		
16		Water	Casing Sealed	Rise	Time o			DETAILS	
Hole cased 0.00-4.1	Jm.	Water Strike							
REMARKS Hole cased 0.00-4.1 INSTALLATION DET Date Tip Dept 31-03-16 14.00			No water strike						
NSTALLATION DET	AILS	Date	Date Hole Casing Depth to Depth Depth Water Comments					DETAILS	
Date Tip Dept 31-03-16 14.00	h RZ Top RZ Base T	pe n SP	Depth Depth	vvater	23.11.11011				



REPORT NUMBER

CONTR			16 Ga	alway City	Transpo	rt Pro	oject - Phase 3					ILLHOI EET	LE NO		3/22R et 1 of			
CO-OR GROUN			(mO	527,60 727,19 D)			RIG TYPE	į	nda	TE DRI		05/03/2016 10/03/2016						
CLIENT ENGINE			alwa RUP	ay County	Council		INCLINAT	TON (deg) AMETER (m	m)	Air/Mist -90 80		ILLED GGED			SL O'She	ea		
Downhole Depth (m) Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Frac Spa Lc (m	cing og m)	Non-intact Zone	Legend		Descripti	on			Depth (m)	Elevation	Standpipe Details	SPT (N Value)		
1							as clayey	<i>r</i> gravel	ING: No reco	·	·		1.70	41.76				
2.70	100	99	81	E			+ Very stro green/gre - + coarse-g weathere - + Dips are	ey/white mo rained, GRA ed. 20° to locall paced, roug	i, thickly to the titled, porphy ANITE, fresh by 70°. Disconding to locally s	ritic, med to locally ntinuities mooth, p	ium to slightly are medi lanar. Ape	ertures		40.76				
5.70	100	97	81				- + - are light - + - + - + - + - + - + - +		en, very thin					37.86				
7 7.20	100	97	77	F			+ - porphyrit + - moderate - + Dips are + - closely s	Very strong to strong, thickly to thinly banded, dark green, porphyritic, fine-grained, GRANITE, fresh to locally moderately weathered. Dips are 20° to locally 70°. Discontinuities are medium to closely spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing.										
8 8.70	100	97	90			<u> </u>	- + + + + + +											
9	100	77	61	Ē		A : \ \ /	+ + 1 0.70-0.7	om - Modera	ately weathe	rea, sligh red, sligh	t weakeni	ng. ng.						
	EMARKS							Motor	Cooina	Cooled	Diaa	T:		TER ST	RIKE	DETAILS		
Hole ca	ased	0.00-2	2.70r	m.				Water Strike	Casing Depth	Sealed At	Rise To	Tin (mi	in) Co	mmen lo wate		recorded		
														2112121	./A.T.	DETA:: C		
INCTA		1051 5	CT *					Dete	Hole	Casing	Denth	to			VAIEF	DETAILS		
INSTAL Date				RZ Top	R7 Rasa	.	Type	Date	Depth	Depth	Depth Wate	r C	omment	5				
Date		ט קיי.	Spui	.τ. 10μ	. \ <u>_</u>		1) 0											



REPORT NUMBER

		<u>-</u>																			
CON	CONTRACT N6 Galway City Transport Project - Phase 3 DRILLHOLE SHEET													NO	BH3/22R Sheet 2 of 2						
CO-C				(mO	527,60 727,19 D)				RIG TYPE Casagrande FLUSH Air/Mist INCLINATION (deg) -90 CORE DIAMETER (mm) 80					DATE	DRILL		ED 05/03/2016				
CLIE		=R		alwa RUP	y County	Council		INC							DRILLED BY LOGGED BY			SL O'She			
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Spa Lo (m	cture cing og m)	Non-intact Zone	puedend	THE DIAM	· · · · · · · · · · · · · · · · · · ·	Descrip			1200	<u> </u>	Depth (m)	Elevation	Standpipe Details	SPT (N Value)		
10 10	1.70	100	95	81				+ po + Dip + clc are + (cc	orphyritic oderately ips are 2 osely spate tight to ontinued ery strong	g to strong	ed, GRAN d. y 70°. Disc n to locally n, very thir	ontinuition smooth brown	es ar , plan clay s	e mediur ear. Apert smearing	n to cures	11.60	31.86				
12	3.20	100	100	93	_		= - - -	+ gre + co + we + Dip + clo	een/grey parse-gra eathered ps are 2 osely spa	//white mot ained, GRA	tled, porph NITE, fres y 70°. Disc n to locally	yritic, m th to loca ontinuition	ediur ally s es ar , plan	n to lightly e mediur aar. Apert	ures						
14	4.70	100	97	97	E			- +													
- 16 - 17 - 18 - 19 - 19			0.00-2	87 2.70r	n.			+++++++++++++++++++++++++++++++++++++++	End c	of Borehole Water Strike	Casing Depth	Sealed At		Rise To	Time (min)	WA1	mmen	ts	DETAILS		
63.GPJ 1G															No water strike recorded						
188																VATER	DETAILS				
TSMI D	Date Tip Depth RZ Top RZ Base Typ									Date	Hole Depth	Dep		Depth to Water Comments							
∸ ∟						1															



REPORT NUMBER

110	3S	노/												'	090	J
ON	TR/	ACT	N	6 Ga	lway City Transp	ort Pro	oject -	Phase 3				HOLE I	NO		3/23R	
0-0	ORD	INA	TES		527,773.63 E						SHEE		:D		et 1 of	
727,346.05 N GROUND LEVEL (mOD) 26.93 RIC								RIG TYPE		Casagran	اما	DRILLE LOGGE)2/2016)2/2016	
								FLUSH INCLINATION (de	a)	Air/Mist -90		ED BY			SSL	
								CORE DIAMETER		80		LOGGED BY			. O'She	a
Œ	Œ															
Downhole Depth (m)	bth (%.	٧.%	.Q.D.%	Fracture	one									etails	ê
e De	n De	T.C.R.%	S.C.R.%	R.Q.I	Spacing Log	ct Ze			Descri	ption			<u>_</u>	ے	De De	Valu
Vnho	Core Run Depth (m)	.	0,		(mm)	Non-intact Zone	Legend						Depth (m)	Elevation	Standpipe Details	SPT (N Value)
۵	ပ်				0 ²⁵⁰ 500	Nor	Leg						Dep	Ele	Sta	SP
0					,		8	SYMMETRIX DR as clayey gravell	ILLING: No re	ecovery, obse	erved by dr	ller				
								ao siayoy giaveli	, 5555105							
1																
							P=-C									
							0									
2																
							\sim						0 0 -			
<u> </u>							<u> </u>	SYMMETRIX DR	ILLING: No re	ecovery, obse	erved by dr		2.80	24.13		
3							0	as sandy gravelly	clay with occ	asional cobb	oles					
							8-	CVMMETRIVE	III I INIO. NI- "	2001/05/1-6-	ساح د ما امري		3.70	23.23		
4 4	.20						++	SYMMETRIX DR as greenish grey	weathered ro	ecovery, obse ck	erved by dr	ner ,	4.20	22.73	00	
							+++	Very strong to str	mottled, porp	hyritic, mediu	um to					
		100	31	14			++	coarse-grained, weathered.	GRANITE, fre	sh to locally r	moderately					
5		.00	51	1-7			++	Dips are 20° to lo	ocally 80°. Dis	continuities a	are widely to					
5	5.70					A A	++	medium spaced, Apertures are tig	rough to loca	lly smooth, pl	lanar.					
6							+	smearing. 4.20-5.30m - Mo	. , .		•					
		100	95	91			++	4.20-3.30III - IVIO	derately weat	icred, slight	weakeriirig.					
							- - -									
7 7	'.20						++									
						660	+									
8		100	100	93			- - -									
٦							++									
8	3.70					650	 - -									
9							+									
		100	100	100			++									
						1100	++									
	AR		00-/	1.20n				Wat	er Casing	Sealed	Rise	Time	T			DETAILS
1016	oas	ou U	.00-2	∓.∠UII	1.			Strik		At	To	(min)	Co	mmen	its	
													N	lo wate	er strike	recorde
	ΔΙΙ	ΔΤΙ	ט אכ	ETAI	ıs			Da	te Hole		Depth to Water	Comr			NATER	DETAIL
D	ate	Т			RZ Top RZ Bas		Тур	ре	Depth	n Depth	Water	COITI	HIGHL			
24-0)2-1	6	5.50	0	3.50 5.70		50mn	sP								



REPORT NUMBER

	ි	/				OLO!			AL OOI)					1	896	3
01	NTR	ACT	N	l6 Ga	lway Cit	y Transp	ort Pr	oject -	Phase 3				DRIL SHE	LHOLE	NO		3/23R et 2 of	
		D LE	VEL		727,34 D)	73.63 E 16.05 N 26.93			RIG TYPE FLUSH			Casagrar Air/Mist	DAT	E DRILLI E LOGGI		24/0 24/0	2/2016 2/2016	;
	ENT			alwa RUP	y County	y Council			INCLINATION CORE DIA		ım)	-90 80		LED BY			SL O'She	ea
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Spa L (m	cture acing og nm)	Non-intact Zone	Legend			Descrip	tion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10 1	10.20							+_	End o	of Borehol	e at 10.20 r	n			10.20	16.73		
11																		
13																		
14																		
15																		
16																		
17																		
18																		
19																		
	/IAR		0.00-4	4.20n	n.		•	-		Water	Casing	Sealed	Rise	Time		TER SI		DETAILS
										Strike	Depth	At	То	(min)				e recorde
			Ob.: =							5.	Hole	Casing	Denth to	0 0			VATER	DETAIL
[TAL Date 02-1	1	ON D Fip Do 5.50	epth		RZ Bas 5.70		Ty _j 50mn		Date	Depth	Depth	Depth to Water	Com	ment	S		



REPORT NUMBER

	35	ъ/			`	OLO	ILO	11111	JAL OOI	NL LO	INLOO	IND				1	896	3
ON	ITR/	ACT	N	6 Ga	lway Cit	y Trans	sport P	roject -	- Phase 3					LLHOLE	NO		3/24R	
		INAT		(mOl	727,52	36.05 E 20.61 N 25.	I		RIG TYPE			Knebel		EET TE DRILL TE LOGG		03/0	et 1 of 3/2016 3/2016	3
CLIE	ENT		G		y County				FLUSH INCLINATI CORE DIA		m)	Air/Mist -90 80		LLED BY			Peters O'She	
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Spa L	cture acing og nm)	Non-intact Zone	Legend			Descript	ion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
1	1.30							\$\frac{\frac{1}{2}}{2}\frac{1}{2}	SYMMET	OIL. RIX DRILL gravelly sa RIX DRILL	ING: No red ING: No red nd ING: No red	covery, obs	served by	driller		24.96 24.76 24.46 23.86		
2		100	95	51				# + + + + + + + + + + + + + + + + + + +	SYMMET as rock Very stror green/dar	RIX DRILL ng to strong k green mo prained, GF	ING: No red y, thickly to to ottled, porph RANITE, fre	hinly band	led, light to	/	1.00	20.00		
3	3.40	100	100	55	E		4	# + + + + + + + + + + + + + + + + + + +	Dips are 2 closely sp are tight to	20° to local aced, roug o partly ope	ly 70°. Disconding to locally en, very thin led fracture	smooth, p brown cla	lanar. Ape	rtures			0 0	
1 2	4.30	100	76	52	Ė			+ + + + + + + + +	-	·								
5	5.80	100	100	79	E		770	+++++++++										
5	7.00	100	93	78			690	+ + + + + + + + + + + + + + + + + + +	- - - -						7.00	18.16		
7	7.00							 	End	of Borehol	e at 7.00 m				7.00	10.10	0 0	
8																		
9																		
	IARI														WA	TER S	RIKE	DETAILS
lole	e cas	sed 0	0.00-1	1.30r	n					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)		mmen		e recorde
															GRO	OUNDV	VATER	R DETAIL
NST	Γ ALI Date			ETA		ID7 -				Date	Hole Depth	Casing Depth	Depth Water	to Com	ment	s		
	` '	T	: D	anth	RZ Top	DZ D		Tv	ре									



REPORT NUMBER

CC	NTR	ACT	N	6 Ga	lway City	/ Transpo	ort Pro	oject -	Phase 3				DRII	LHOLE	NO		3/25R et 1 of	
	ORE			(mOl	528,73 727,83 D)				RIG TYPE FLUSH			Comacch	DAT	E DRILL		26/0	2/2016 2/2016	3
CL	IENT GINE		G		y County				INCLINATION CORE DIA		n)	Air/Mist -90 80	I	LED B			SL O'She	ea
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Spa Lo (m	cture cing og m)	Non-intact Zone	Legend			Descrip	tion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
1 2 3 5 5 6 6 6 7 7 8 8	4.10 5.10 6.70	100	100	100 73			940		SYMMETI as weather Very stron grained, L and styloli Dips are 2 medium s	RIX DRILLI ground cons ground cons gred rock gg, thick to the IMESTONE tes), fresh to locall paced, rough are tight to	NG: No red hinly bedd E (locally fo to slightly v y 40°. Disc gh to locall	covery, obsed, blueish ssiliferous veathered.	er materia erved by o dark grey , localized are widely	driller , fine chert	3.80	1		
9	9.90	100	100	100			629.9999 680.0000											
RE	MAR		000	1 10						Water	Casing	Sealed	Rise	Time				DETAILS
RE HO	le ca	sed ().00-4	4.10r	n.					Strike	Casing Depth	At At	To	(min)	N		er strike	e recorded
2			ON: 5							D-4-	Hole	Casing	Denth t	0 0			VATER	RDETAILS
ווא\$	Date					RZ Base	Э	Тур	oe .	Date	Depth	Depth	Depth t Water	Con	nment	5		



REPORT NUMBER

	33				`	JLOI	LOI	IIVIC	AL OUI	\L LO) ILLOO					1	896	3
CON	ITR/	ACT	N	l6 Ga	lway City	/ Transpo	ort Pr	oject -	Phase 3					LHOLE	NO		3/25R	
		D LE		(mOl	528,73 727,83 O)	4.81 E 3.14 N 12.85			RIG TYPE FLUSH			Comacch		ET DRILLE LOGGE		26/0	et 2 of 2/2016 2/2016	3
	INE	ER		alwa RUP	y County	Council			INCLINATION CORE DIAI		m)	-90 80		LED BY GED BY			SL O'She	ea
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Spa Lo	cture cing og m)	Non-intact Zone	Legend			Descrip	tion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10 1	0.30	100	100	100					End o	of Borehole	e at 10.30 n	n			10.30	2.55		
11																		
13																		
14																		
15																		
16																		
17																		
18																		
19																		
REM	IARI	KS													WAT	TER ST	RIKE	DETAILS
			0.00-4	4.10r	n.					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Со	mmen	ts	
															N	o wate	r strike	e recorde
										_	Hole	Casing	Denth to) -			VATER	RDETAIL
	T ALI Date			epth	I LS RZ Top	RZ Bas	е	Ту	oe	Date 29-02-16	Depth 10.30	Depth 4.10	Depth to Water 9.60				10 mins a	after end of



REPORT NUMBER

ାର୍	35/															-		
CONTR	ACT	N	l6 Ga	lway City	/ Transpo	rt Pro	oject -	Phase 3					DRILLI SHEET		NO		3/26R et 1 of	
CO-OR	DINA	TES		528,81 727,92									DATE		ED.		2/2016	
GROUN	ND LE	VEL	(mOl		14.42			RIG TYPE FLUSH			Comacc Air/Mist	hio	DATE I	LOGGE	ΕD		2/2016	
CLIENT			Salwa RUP	y County	Council			INCLINATI	ON (deg) METER (mr	n)	-90 80		DRILLI LOGGI				SL O'She	ea
Downhole Depth (m) Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Frac Spa Lc (m	cing og m)	Non-intact Zone	Legend			Descript	ion				Depth (m)	Elevation	Standpipe Details	SPT (N Value)
1								as made o	RIX DRILLI ground cons RIX DRILLI	sisting of sh	ell & aug	er mat	erial	ler		14.02		
1.90	100	82	26	Ł		/		blueish da fossilifero	trong to ver ark grey, fin- us, localized derately we	e grained, L d chert and	IMESTO	NE (lo	cally					
3	100	100	84	F				medium to	norizontal to o closely sp onally undul y/gravel fille	aced, rough ose. Apertu	to locall res are ti	y smoo	oth, pla wide,					
3.50 3.70	100	100	100															
4	100	94	81															
5.10	100	100	78	E		7												
6 6.20	100	100	100		5	50												
7	100		84	F														
8 8.20	100	97	77															
9 8.90 9.10		100	100		F													
	67	47	47		<u> </u>			9.30-9.83i rounded.	m - Clay/gra	avel-filled fr	acture - s	ome g	ravel is	,				
10.00 REMAR			1		<	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		<u> </u>							WAT	ER ST	RIKE	DETAILS
Hole ca	sed	0.00-	1.40r	n.					Water Strike	Casing Depth	Sealed At	Ris To		Time (min)		mment o wate		e recorded
															GRO	DUNDV	VATER	DETAILS
NSTAL Date					RZ Base		Тур	oe	Date	Hole Depth	Casing Depth		pth to ater	Com	ments	5		



REPORT NUMBER

	ී	/							AL OOI	\L L \	, KLOO					1	896	3
CON	NTR	ACT	N	6 Ga	lway City	Transpo	ort Pro	oject -	Phase 3					LHOLE I	NO		3/26R	
		DINA.	TES	(mOl	528,810 727,920	6.97 E 0.32 N 14.42			RIG TYPE FLUSH			Comacch		ET DRILLE LOGGE		15/0	et 2 of 2 2/2016 2/2016	;
CLIE	ENT		G		y County				INCLINATION CORE DIA		m)	-90 80		LED BY GED BY			SL O'She	ea
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Frac Spac Lo (mi	cing g m)	Non-intact Zone	Legend			Descrip	tion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10						-			-1		/gravel-fille			1	10.70	3.72		
11									End o	of Borehole	e at 10.70 n	n						
12																		
13																		
13																		
14																		
15																		
16																		
17																		
18																		
15																		
19																		
	/IAR				I .				l	\\/-4	Os-in-	Contail	Dies	T:	WA	TER ST	RIKE	DETAILS
tole	e cas	sed ().00-′	1.40n	n.					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	+	mmen o wate		recorde
											Hole	Casing	Donth to				VATER	DETAIL
	TAL Date		ON D		RZ Top	RZ Bas	е	Ту	oe	25-02-16	Depth 10.70	Depth 1.40	Depth to Water 6.80		level m		10 mins a	after end of



REPORT NUMBER

СО	NTR/	ACT	N	l6 Ga	lway City Transp	ort Pro	oject -	Phase 3					LHOLE	NO		3/27R	
СО	-ORE	DINA	TES		528,960.43 E 728,133.26 N			RIG TYPE			Casagran	-1-	E DRILL		12/0	et 1 of 4/2016	3
				(mOI	<i>'</i>			FLUSH			Air/Mist	DAI	E LOGG			4/2016	5
	IENT GINE			alwa RUP	y County Council			INCLINATION CORE DIAI		m)	-90 80		LED B'			SSL . O'She	20
				101				CORE DIA	VIL I LIX (III		- 00	100	OLD B	<u>. </u>			za
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend			Descript	ion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0									RIX DRILL	NG: No rec	overy, obse	erved by o	Iriller				
								as clay									
	1.00						<u></u>	SYMMET	SIX DBILL	NG: No rec	overy obs	enved hv	Iriller	0.80			
1	1.00							∖as weathe	red rock					1.00	0.10		
2		93	93	93		1350		blueish da	ırk grey, fin us, localize	ry strong, th e grained, l d chert and	LIMESTON	E (locally					
:	2.50					X : \ /	H			y 40° & 80°			widely				
						Z		to medium Apertures	n spaced, r are tight to	ough to loca partly oper	ally smooth n, very thin	, planar. brown cla	У				
- - 3						X /		smearing. 2 90-3 00r	m - Clav-fill	ed fracture							
-		100	87	87			Щ	2.00 0.001	ii Olay iiii	ou muoturo							
						930	H										
- - - 4	4.00																
:		400	0.4	0.4		(a)√		4 31-4 53r	m - Clav-fill	ed fracture							
		100	84	64		(**, /*)		1.01 1.001	n Olay iiii	ou muoturo							
5	5.00																
		400	0.5	70		720	H										
		100	85	76		4	ļ;		01 611	16.							
6	6.00					/\ \ \ \ \ /		5.72-5.86r	n - Clay-fill	ed fracture							
		400	0.4	00		X = 1 /		6 26 6 51	m Clay fill	ed fracture							
		100	91	82				0.30-0.311	II - Clay-IIII	eu iraciure							
-7	7.00					(. ≥) ./	H	6 97-7 32r	m - Clav-fill	ed fracture							
		00	75	70		`\ \ . \ \]									
		90	75	70				}									
8	8.00					1080	Щ	1									
		100	80	30			H	1									
		100		30		A : /	H	8.59-8.71r	m - Clay-fill	ed fracture							
9	9.00						H	1									
							H	9.24-11.05	ōm - Clay-f	illed fracture	Э						
		20	20	20			H	1									
RE	MAR	KS	<u> </u>		1	(\ \ \ \ \		1						WA	L ΓER S1	RIKE	DETAILS
			0.00-	1.00n	n.				Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Co	mmen		
									Suike	Dehiii	AL	10	(111111)		o woto	r otrile	e recorded
														"	o wate	, outk	, recorded
									_	Hole	Casing	Denth t) -			VATER	RDETAILS
				ETAI			т	20	Date	Depth	Depth	Depth t Water	Con	nment	S		
	Date	+	ιрυ	epin	RZ Top RZ Bas	e	Тур	Je									



REPORT NUMBER

(102F	/															
CONTRA	СТ	N6 G	alway City	/ Transpo	rt Pro	ject -	Phase 3				DRIL	LHOLE	NO		3/27R et 2 of	
CO-ORDI			528,96 728,13 DD)	0.43 E 3.26 N 9.10			RIG TYPE FLUSH			Casagran	DAT	E DRILL E LOGG		12/0	4/2016 4/2016	3
CLIENT ENGINEE	R	Galw ARUI	ay County	Council			INCLINATION CORE DIAI		n)	-90 80	I .	LED BY			SL O'She	ea
Downho Core Ri	T.C.R.%	S.C.R.% R.Q.D.%	(m	cing og m)	Non-intact Zone	Legend			Descript	ion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10 10.50 11.80	92	58 58			750		End c	of Borehole	e at 11.80 m				11.80	-2.70		
13																
15																
17																
REMARK Hole case		00-1.00)m.					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)		TER ST		DETAILS
									Holo	Casing	Donath					e recorde
INSTALL				I =	_			Date	Hole Depth	Casing Depth	Depth t Water	O Com	nment	S		
Date	Tip	o Deptl	RZ Top	RZ Base		Тур	oe									



REPORT NUMBER

СО	NTR	ACT	N	6 Ga	lway City	Transpo	ort Pro	oject -	Phase 3					DRII SHE	LHOLE ET	NO		3/28R et 1 of	
СО	-ORE	OINA	TES		529,13			T							E DRILI	.ED		4/2016	
GR	OUN	DLF	VEL	(mOl	728,22 D)	1.35 N 18.86			RIG TYPE				agrand	4~	E LOGO			4/2016	
	ENT				y County				FLUSH INCLINATION	ON (dea)		Air/M -90	IIST	DRII	LED B	Y	IG	SL	
	GINE	ER		RUP					CORE DIA		m)	80		1	GED B			O'She	ea
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Frac Spa Lc (m	cing og m)	Non-intact Zone	Legend			Descrip	tion				Depth (m)	Elevation	Standpipe Details	SPT (N Value)
- 1									as gravelly	RIX DRILLI y clay RIX DRILLI y cobbly cla	NG: No re					1.20	17.66		
2										RIX DRILLI		COVERV	ohse	arved by	driller.	3.00	15.86		
4	4.10						540		as weathe		y strong, tl	nick to	thinly	bedded,		4.10	14.76		
5	5.60	97	97	94	E		/ ia		fossiliferor weathered Dips are 2 to medium Apertures	us, localize	d chert and y 40° & 80° ough to loc	l styloli °. Disco ally sm	ites), : ontinu	slightly uities are planar.	widely				
6		100	100	89			550.0000	00000001	smearing. 4.64-4.78i	m - Clay-fill	ed fracture								
8	7.20	100	100	100			1330												
9	9.60	100	84	57						m - Clay-fill of Borehole						9.60	9.26		
RE	MAR	KS	<u> </u>	I	I				<u> </u>							WAT	LER ST	RIKE	DETAILS
Hol			0.00-4	4.10r	n.					Water	Casing	Seale	ed	Rise	Time	Co	mmen		
RE Hol										Strike	Depth	At		То	(min)	N	o wate	r strike	e recorded
INIS	ΤΔΙΙ	ΔΤΙ	ON D	FΤΔ	II S					Date	Hole		sing	Depth t Water	O Cor	nment		-A1 L	DEIMED
L INS	Date				RZ Top	RZ Base	9	Тур	oe	Date	Depth		pth	Water	Cor	mient	<i>-</i>		
2																			



REPORT NUMBER

CO-ORD	OINA [*]	TES		529,48 728,33	9.29 E 4.05 N	ort Pro	ject -	Phase 3			Comacchi	SHE	LLHOLE ET E DRILL E LOGG	ED	Shee	3/29R et 1 of 2/2016 2/2016	<u>1</u>
GROUNI CLIENT ENGINEI		G		y County	13.73 Council			FLUSH INCLINATION CORE DIA		m)	Air/Mist -90 80	DRII	LLED BY	<u>'</u>	IG	SL O'She	
Downhole Depth (m) Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Frac Spa Lo (m 0 ²⁵⁰	cing og m)	Non-intact Zone	Legend			Descript	ion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0	100 100 100	97 93 73 85	90 67 33 83			900		SYMMETI as rock Medium si blueish da fossiliferor slightly we Dips are h wide to cloundulose moderatel slight iron-	RIX DRILLI trong to ve ink grey, fin us, localize eathered. corizontal to besely space to locally p y open, wit	-	overy, obsolick to thinly IMESTON stylolites), tical. Disco occasiona ures are tic	erved by one of the served by one of the served by one of the served by	driller ocally are n,	2.70 (2.80) (6.90)	11.03 10.93		
REMARI Hole cas		0.00-2	2.80r	n.					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Со	mmen	ts	DETAILS
																	recorded
I NSTALI Date				ILS RZ Top	RZ Base		Тур	pe	Date 12-02-16	Hole Depth 6.90	Casing Depth 2.80	Depth t Water 3.70	. 0011			10 mins a	after end of



REPORT NUMBER

CO-ORDINATES 531 041 18 E	HOLE NO	o BI	13/30F	
CO-ORDINATES 531 041 18 F		Sh	eet 1 of	
728,509.06 N GROUND LEVEL (mOD) 23.76 RIG TYPE Casagrande FLUSH Air/Mist	DRILLED	29	/02/201 /02/201	6
CLIENTGalway County CouncilINCLINATION (deg)-90DRILLIENGINEERARUPCORE DIAMETER (mm)80LOGGI			IGSL D. O'Sh	ea
Core Run Depth (m) Core Run Depth (m) T.C.R.% S.C.R.% R.O.D.% R.O.D.% Description Description	Don'th (m)	Depth (m) Elevation	Standpipe Details	SPT (N Value)
SYMMETRIX DRILLING: No recovery, observed by dril as made ground consisting of concrete clay and wire	1.6	60 22.1	6	
SYMMETRIX DRILLING: No recovery, observed by dril as gravelly cobbly clay	2.4	<u>40</u> 21.3	6	
SYMMETRIX DRILLING: No recovery, observed by dril as weathered rock Possible weathered rock - recovered as angular gravel and cobbles of limestone		70 21.0 30 20.4		
No recovery - driller notes clay band				
Very strong, thick to thinly bedded, blueish dark grey, fingrained, LIMESTONE (locally fossiliferous, localized chand stylolites), fresh to slightly weathered.	ne	19.9	Ö	
Dips are 20° to locally 40°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing. 4.16-4.40m - Clay-filled fracture 4.57-5.01m - Clay-filled fracture				
7.00 93 89 7.00 93 8				
7.22-7.75m - Clay-filled fracture	8.0	.00 15.7	6	
End of Borehole at 8.00 m				
REMARKS Hole cased 0.00-4.20m. Water Casing Sealed Rise	Time			DETAILS
= 11010 00000 0.00 1.E0111.	(min)		ter strik	e recorded
INSTALLATION DETAILS Date Hole Casing Depth to Depth Depth Water	Comme		JWATE	R DETAILS
Date Tip Depth RZ Top RZ Base Type				



REPORT NUMBER

്വദ്ദ	ட														1	896	3
CONTRA	ACT	N	6 Ga	lway City	/ Transp	ort Pr	oject -	Phase 3				DRII	LLHOLE	NO		3/31R et 1 of	
O-ORE			(mOI	531,27 728,42 D)		3		RIG TYPE FLUSH			Casagrar Air/Mist		E DRILLI E LOGGI		25/0	2/2016 2/2016	3
LIENT			alwa RUP	y County	Counci	I		INCLINATION CORE DIAI		m)	-90 80		LLED BY			SSL . O'She	ea
Downhole Depth (m) Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Frac Spa Lc (m ₀ ²⁵⁰	cing og m)	Non-intact Zone	Legend			Descrip	tion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
3								SYMMETF as grey sill	RIX DRILL ty gravelly	ING: No rec	covery, obs	served by o	driller	2.70 5.20	8.38 5.88		
5.70	100	84	63			(A = A)		as weathe Medium st blueish da fossiliferou locally mod	red rock we crong to ve rk grey, fir us, localized derately we orizontal to	ry strong, the grained, ed chert and eathered.	nick to thinl LIMESTON I stylolites)	ly bedded, NE (locally , slightly to	are	5.70	5.38		
7 7.20 8 8.70	100	63	45			590		to occasio locally clay 6.17-6.40r 7.34-7.74r 7.93-8.20r	nally undu //gravel fill m - Clay/gr m - Clay/gr m - Clay/gr	paced, roug lose. Aperti ed. avel-filled f avel-filled f avel-filled f	ures are tig racture racture racture						
9 10.00	100	48	29							avel-filled f				10 00	1.08		
REMAR Hole cas	KS	. 00 1	5 70.					End o	of Borehole Water	e at 10.00 n	n Sealed	Rise	Time	WA	TER S		DETAILS
ioie Gas	ocu (,.00-(J. 1 UII						Strike	Depth	At	To	(min)	+	mmen lo wate		e recorde
										Hole	Cacina	Donth t				VATER	RDETAIL
NSTAL I Date			epth	RZ Top 5.00	RZ Bas		Tyr 50mm		Date	Depth	Casing Depth	Depth t Water	.º Com	ment	s 		



REPORT NUMBER

/[ලි	<u>;</u> [_/														'	090	3
CC	NTR	ACT	N	16 Ga	alway City	Transpo	ort Pro	oject -	Phase 3				DRI	LLHOLE	NO	BH	3/32R	
CC		אווח	TEQ		521 N7:	1 10 5							SHE	EET				
				(mOl	728,31				RIG TYPE			Knebel						
- 1					-	Council			INCLINATION		n)	-90 80	I					
Ê	(F																	
Downhole Depth (I	Core Run Depth (r	T.C.R.%	S.C.R.%	R.Q.D.%	Spac Lo (mi	cing og m)	Non-intact Zone	Legend			Descript	ion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
- 0									Hole comr	menced by	Shell & Au	ger drilling	-					
1 2 3 4 4 5 5 RE									SYMMETI as made g	ground cons	sisting of Sh	nell & Aug	er materia	al	WA	TER S		DETAILS
Ho	le ca	sed (0.00-2	24.60	m.					Water Strike	Casing		Rise	Time	Со	mmen	ts	
										16.50 24.00	16.50 24.00	21.00 N/S	15.80 19.80	5 5				
CILENT Salway County Council SUCINATION (deg) -9.00 CORE DIAMETER (mm) -9.00 CORE DIAMETE				DETAILS														
į INS	STANDARD STANDARD																	
19																		



REPORT NUMBER

	ව ව	டு/													ı	890	3
CON	NTR/	ACT	N	l6 Ga	lway City Trans	sport Pr	roject -	Phase 3				DRIL	LLHOLE	NO		3/32R et 2 of	
		D LE		(mOI	531,971.12 E 728,317.72 N O) 24.	1		RIG TYPE FLUSH			Knebel Air/Mist	DAT	E DRILL		18/0	2/2016 2/2016	;
CLIE	ENT		G		y County Coun	cil		INCLINATION CORE DIAME		m)	-90 80	I	LLED BY			Peters	
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	8 8 Non-intact Zone	Legend			Descrip	tion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
11								as made gro (continued) SYMMETRIX as brown gre SYMMETRIX as orange bi	Und cor K DRILL ey sandy K DRILL	ING: No red gravelly cla ING: No red	hell & Aug covery, obs	er material	l driller		13.93		
12							× ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;										N = 50/24 mm (5, 8, 11, 15, 8)
14							X										N = 50/2: mm (7, 11, 15, 16)
15							× · · · · · · · · · · · · · · · · · · ·	SYMMETRIX as brown sa		ING: No red	covery, obs	served by o	driller	15.60	8.83		N = 50/20 mm (9, 14, 17, 12)
17							× × × × × × × × × × × × × × × × × × ×										N = 35 (4, 6, 7, 7 12)
18							× × × × × × × × × × × × × × × × × × ×										N = 50/2 mm (6, 7, 9, 1 28)
REN	//AR	KS					×) 						WA ⁻	TER ST	TRIKE	N = 50/2: mm (7, 10, 10,
lole	e cas	sed ().00-2	24.60	m.			-	Water Strike 16.50 24.00	Casing Depth 16.50 24.00	Sealed At 21.00 N/S	Rise To 15.80 19.80	Time (min) 5 5		ommen Slow lodera		
			- 140		1.0				Det	Hole	Casing	Denth t	0 0			WATER	DETAIL
	TAL Date 02- 1	1			RZ Top RZ B 7.00 15.0		Typ 50mn		Date	Depth	Depth	Depth t Water	Com	nment	S		



REPORT NUMBER

/n	ව ව	5/																
CON	NTR/	ACT	N	6 Ga	lway City	/ Transpo	ort Pro	oject -	Phase 3					LHOLE	NO		3/32R	
	ORD			(mOI	531,97 728,31 D)				RIG TYPE			Knebel Air/Mist		ET E DRILLI E LOGGI		18/0	et 3 of 02/2016 02/2016	6
CLIE	ENT		G		y County				INCLINATION CORE DIA		m)	-90 80	I	LED BY			. Peters	
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	8.C.R.%	R.Q.D.%	Spa Lo	cture cing og m)	Non-intact Zone	Legend			Descrip	tion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
20 21 22 22								X	SYMMETI as dark gr	RIX DRILLI ey slightly :	NG: No rec silty clay	covery, obs	served by c		20.40	4.03		N = 50/1 mm (9, 13, 22, 3) N = 50/1 mm (11, 14, 26, 7)
24	24.60 _.						\\ \(\(\) \\ \\ \(\) \\ \(\) \\ \(\) \\ \(\) \\ \(\) \\ \(\) \\ \(\) \\ \(\) \\ \(\) \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\	X	as grey ro Medium s blueish da	ck trong to ve irk grey, fin	NG: No rec ry strong, the grained, d chert and	nick to thin	ly bedded, NE (locally	driller	23.80 24.60	0.63		
226 227	25.80	67	55	48					Dips are 4 locally smovery thin b	derately we 0°. Discon ooth, plana rown clay s 56m - Gray	eathered. tinuities are ir. Aperture	e medium s s are open	spaced, rou	ugh to	<u>25.80</u>	-1.37		
28																		
29																		
SEV	/IARI	(S													WΔ٦	FER ST	 	DETAILS
			0.00-2	24.60)m.					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)		mmen		
										16.50 24.00	16.50 24.00	21.00 N/S	15.80 19.80	5 5	M	Slow lodera	te	
											Hele	Casim	D				NATER	R DETAIL
	Date	7	īp D		RZ Top			Ту		Date 19-02-16	Hole Depth 25.80	Casing Depth 24.60	Depth to Water 14.65		ments		start last	day drilling
	02-1		14.0		7.00	15.00		50mn										,



REPORT NUMBER

/																			
СО	NTR	ACT	N	6 Ga	alway City	Transpo	rt Pro	oject -	Phase 3					ORILLI SHEET		NO		3/33R et 1 of	
	-ORI		TES	(mO	532,10 728,30 D)				RIG TYPE FLUSH			Knebel Air/Mist		DATE I				2/2016 2/2016	
	IENT GINE			alwa RUP	y County	Council			INCLINATION CORE DIA		m)	-90 80		DRILLI LOGGI				Peters O'She	
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Frac Spa Lc (m	cing og m)	Non-intact Zone	Legend			Descripti	ion				Depth (m)	Elevation	Standpipe Details	SPT (N Value)
- 1 - 2 - 3 - 4								**************************************	as TOPSO SYMMETI as brown s	DIL. RIX DRILLI grey silty sa	NG: No rec NG: No rec andy gravel NG: No rec drock reco obles	overy, ob	served	by dril	ler	2.70	35.33		N = 50/235 mm (11, 14, 26, 19, 5, 0)
5	5.10	100	97	88	F		/		Medium siblueish da fossiliferor locally mo Dips are h medium to occasio	trong to ver trk grey, fin us, localize derately we norizontal to o closely sp nally undul	ry strong, the grained, Ld chert and eathered. b locally vertaced, rough ose. Apertu	ick to thir IMESTO stylolites tical. Disc	nly bedd NE (loc), slightl continuit	led, ally ly to ties are	e		31.23		
7	8.10	100	94	72	Ė		/		locally cla	y-filled.									
9	9.60	100	100	95	E	5	40.0000	000000001											
	MAR									107	0	0	5.		T:	WA	TER ST	RIKE	DETAILS
Hol	le ca	sed ().00-{	5.10r	n.					Water Strike	Casing Depth	Sealed At	Rise To		Time (min)	N		r strike	e recorded
											11.1		. -			GR	OUNDV	VATEF	RDETAILS
INS	STAL		ON D							Date	Hole Depth	Casing Depth	Dep Wa	oth to ater	Com	nment	s		
	Date		Γip D	epth	RZ Top	RZ Base		Тур	e										
							1				1	1			1				



REPORT NUMBER

CO-ORDINATES S02 10.2.93 E Sheet 2 of 2																				
CO-CONINATES 532, 102,93 E 782,803 1.5 N GROUND LEVEL (MDD) 35.83 STEP Flush Airfillist DATE LOGGED 17/02/2016 18	CON	TRA	CT	N	6 Ga	alway City	/ Transpo	rt Pro	ject -	Phase 3							NO			
CALLENT CALLENT CALLENT CALLENT CORE DIAMETER (mm) 80 DRILLED BY S. Petersen CORE DIAMETER (mm) 80 DOGGED BY D. O'Shea					(mO	728,30	6.15 N								DATE	DRILL		17/0	2/2016	6
			R			-	Council			INCLINATI		m)	-90							
Medium strong to very strong, thick to thinky bedded, but he weakening to the strong, the strong to the strong to the strong, the strong to the strong, the strong to the strong to the strong, the strong to the strong		П			Q.D.%	Frac Spa Lc (m	cing og m)	Non-intact Zone	Legend	JONE DIA	iste i EIV (III	•								
11.90 98 94 medium to closely spaced, rough to locally smooth, planar to occasionally undulose. Apertures are tight to wide, locally clay-filled. (continued) 13.13.10 100 73 63 13.80-14.08m - Moderately weathered, slight weakening. 14.70 100 88 77 20.000000000000000000000000000000000	ŧ l		100	100	92					blueish da fossilifero	ark grey, fin us, localize	e grained, d chert and	LIMESTO	DNE (I	ocally					
13.80-14.08m - Moderately weathered, slight weakening. 14.70 15.	-		100	98	94	F	=			medium to	o closely sp mally undu	oaced, roug lose. Aperti	h to local	ly smo	ooth, pla					
14.70	-		100	100	88	h	5	80												
14.88-15.04m - Clay-filled fracture 16.00 100 99 90 179.99989999999 17.00 18.63 End of Borehole at 17.00 m	E		100	73	63	E		(i) () (i		13.80-14.0	08m - Mod	erately wea	thered, s	light w	veakenii	ng.				
17.00 99 90 779.999999998 17.00 18.63 End of Borehole at 17.00 m	15		100	88	77		6	20.0000	0000000	14.88-15.0	04m - Clay	-filled fractu	ıre							
- 18 - 19	16 - - - - - - - - - - - - - - - - - - -		100	99	90		7	79.9999	99999998		(5)	1.47.00					17.00	18.63		
Hole cased 0.00-5.10m. Water Strike Casing Depth At To Comments No water strike recorded No water strike recorded Water Strike Depth Depth Casing Depth to Depth Depth Depth Depth Water Date Tip Depth RZ Top RZ Base Type 18-02-16 11.90 10.60 5.10 Water level measured start last day drilling	18									End	ot Borehole	e at 17.00 n								
Strike Depth At To (min) No water strike recorded Strike Depth At To (min) No water strike recorded	REM. Hole			0.00-5	5.10r	m.														DETAILS
INSTALLATION DETAILS Date Hole Depth Depth to Water Comments Date Tip Depth RZ Top RZ Base Type 18-02-16 11.90 10.60 5.10 Water level measured start last day drilling	3903.GFJ 1GSL.GD										Strike	Depth	At	Т	0	(min)	N	o wate	r strike	
Depth Depth Water Date Tip Depth RZ Top RZ Base Type 18-02-16 11.90 10.60 5.10 Water level measured start last day drilling	INCT	ΔΙΙ	ΔΤΙ	ם אס	FT^	II S					Data				epth to	Com			VAIER	DE I AILS
<u> </u>	Da						RZ Base		Тур	ре			Depth						start last	day drilling



REPORT NUMBER

/		_																	
co	NTR	ACT	N	6 Ga	alway City	/ Transpo	rt Pro	ect - Ph	nase 3					DRIL SHE	LHOLE	NO		3/34R et 1 of	
co	-ORI	DINA	TES		532,40 728,27	4.98 E 5.25 N						_		DAT	E DRILI	.ED		2/2016	
GR	OUN	D LE	VEL	(mOl		32.57		I	IG TYPE LUSH				sagran /Mist	DAT	E LOGO	SED	23/0	2/2016	5
	IENT				y County	Council		IN	ICLINATIO		1	-90)	1	LED B			SSL	
	GINE	ER	Al	RUP				CC	UKE DIAI	METER (mi	m)	80		LOG	GED B	Y 	D.	O'She	ea
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Frac Spa Lo (m	cing og m)	Non-intact Zone	Legend			Descrip					Depth (m)	Elevation	Standpipe Details	SPT (N Value)
1 2								as () () () () () () () () () (s clayey (gravelly co						2.30	30.27		
Ė	2.80						ŀ	⊥ S	SYMMETF is rock	RIX DRILLI	NG: No re	cove	ry, obse	erved by c	Iriller	2 80	29.77		
3	2.00	100	100	95			710	→ bl fo	lueish da ossiliferou	rk grey, fin	ry strong, to e grained, d chert and eathered.	LIME	ESTON	E (locally		2.00	20.77		
4	4.30						590.0000	m to	nedium to	closely sp nally undul	o locally ve paced, roug lose. Apert	h to	locally	smooth, p	lanar				
5	5.80	100	100	87			<u> </u>												
6		100	100	94			460												
8	7.30	100	100	95	Ę														
91/10	8.80	100	100	94	E													0 0	
RE HO	MAR le ca		0.00-2	2 80r	n					Water	Casing	Sea	aled	Rise	Time				DETAILS
IGSL RC FI 10M 18963.GPJ IGSL.GDT 17/8/16	ie Ud!	ocu (J.UU-2	LOUI	11.					Strike	Depth		At	To	(min)	00	mmen o wate		e recorded
M 186			01. -								Hole		Casing	Denth to	7 -			VATER	DETAILS
5 INS	Date -02-1	:	ON D Tip De 16.0	epth	RZ Top 8.50	RZ Base 17.40		Type i0mm SF	P	Date	Depth		Depth	Depth to Water	Cor	nment	S		
99																			



REPORT NUMBER

·						
CONTRACT N6 Galway City Transport Project - Phase 3		DRILLI SHEET	HOLE NO		3/34R et 2 of 2	
CO-ORDINATES 532,404.98 E 728,275.25 N GROUND LEVEL (mOD) 32.57 RIG TYPE FLUSH	Casagrand Air/Mist	40	ORILLED LOGGED	18/0)2/2016)2/2016	
CLIENT Galway County Council INCLINATION (deg) ENGINEER ARUP CORE DIAMETER (mm)	-90 80	DRILLE LOGGE			SSL . O'She	a
Core Run Depth (m) Core Run	scription		Denth (m)	Elevation	Standpipe Details	SPT (N Value)
Medium strong to very stron blueish dark grey, fine grain fossiliferous, localized chert locally moderately weathere	ed, LIMESTONI and stylolites),	E (locally			0 0	
Dips are horizontal to locally medium to closely spaced, in to occasionally undulose. A locally clay-filled. (continued)	rough to locally spertures are tigh	smooth, plai	e nar			
12 100 87 83 12.45-12.57m - Moderately	weathered, sligh	nt weakenin	g.			
14.80 100 97 100 97 100 97 100 100 97 100 100 100 100 100 100 100 100 100 10					0 0 0	
15						
100 100 100 100 959.999999997 17.40			17.	40 15.17		
End of Borehole at 17.	40 m					
REMARKS				IATER S	TRIKE D	DETAILS
NSTALLATION DETAILS			(111111)		er strike	recorded
INSTALLATION DETAILS Date Date	ole Casing	Depth to Water	Comme		WATER	DETAILS
Date Tip Depth RZ Top RZ Base Type	pth Depth	Water	Comme			



REPORT NUMBER

$/\mathbb{I}_{6}$	ಶS	<u>L</u> /													'	890	,,
CON	ITR/	ACT	N	l6 Ga	lway City Transเ	oort Pr	oject -	Phase 3				DRII SHE	LHOLE	NO		3/35R et 1 of	
		DINAT		(mOI	532,850.77 E 728,225.98 N O) 17.5	2		RIG TYPE FLUSH			Knebel Air/Mist	DAT	E DRILL E LOGG		23/0	2/2016 2/2016	6
CLIE			G		y County Counc	il		INCLINATION CORE DIAM		m)	-90 80	I	LED BY			Peter	
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	- S Non-intact Zone	Legend			Descrip	tion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
3 4								as TOPSC SYMMETF as silty sar SYMMETF as silty cla	RIX DRILL ndy gravel RIX DRILL nyey sand	ING: No recommendation in the second	covery, obs	served by o	driller driller	0.50 2.40 5.30	15.12		N = 50/13 mm (11, 14, 17 33) N = 50/10 n (25, 50) N = 50/19 mm (5, 11, 20, 17)
8								as silty cla	yey sand v	with many b	oulders	Served by (N = 50/10 r (25, 50) N = 50/40 r (15, 10, 5)
	IAR) ()()-'	21.60)m				Water	Casing	Sealed	Rise	Time				DETAILS
.510	Jak	JJ4 (0	•••				Strike 4.30 18.50	Depth 4.30 18.50	At 4.40 N/S	To 15.50	(min) 5	5	ommen Seepag Modera	je	
														GR	OUND	VATER	R DETAILS
NST	ΓALI	LATI	ON D	ETAI	LS				Date	Hole Depth	Casing Depth	Depth t Water	O Com	nment			
)ate 02-1		Гір D 18.0		RZ Top RZ Ba 10.50 19.50		Typ 50mn										



REPORT NUMBER

CONTRACT N	6 Galway City Trans	port Pro	ect - Phase 3						NO			
CO-ORDINATES GROUND LEVEL	728,225.98 N		RIG TYPE				DATE	DRILLE		23/0	2/2016	;
		oil										
Downhole Depth (m) Core Run Depth (m) T.C.R.% S.C.R.%	% Fracture Spacing Log (mm)	⊏-S Non-intact Zone	Legend		·				Depth (m)	Elevation	Standpipe Details	SPT (N Value)
- 10 - 11 - 12 - 13 - 14 - 15 - 16 - 17			as silty cli	ayey sand w	ith many bo	ulders (co.	ntinued)		14.50			N = 50/15 mr (9, 16, 50) N = 50/10 mr (25, 50) N = 50/50 mr (21, 4, 50)
REMARKS Hole cased 0.00-2	21.60m.			Water			Rise	Time				DETAILS
				4.30 18.50	4.30 18.50	4.40 N/S	15.50	(min) 5	s	eepag	je	
	DRDINATES 532,850.77 E 728,225.98 N DUND LEVEL (mOD) 17.52 ENT Galway County Council INEER ARUP GO G								GRO	DUNDV	VATER	DETAILS
				RIG TYPE								



REPORT NUMBER

1095															
CONTRACT	N6 G	alway City	/ Transpo	rt Proj	ject -	Phase 3				DRIL SHE	LHOLE FT	NO		3/35R et 3 of	
GROUND L		532,85 728,22 D)	0.77 E 5.98 N 17.52			RIG TYPE FLUSH			Knebel Air/Mist	DAT	E DRILL E LOGG		23/0	2/2016 2/2016	6
CLIENT ENGINEER	Galwa ARUF	ay County	Council			INCLINATION CORE DIA		n)	-90 80		LED BY			Peters O'She	
Downhole Depth (m) Core Run Depth (m) T.C.R.%	S.C.R.% R.Q.D.%	Frac Spa Lc (m	cing og m)	Non-intact Zone	Legend			Descript	ion	·		Depth (m)	Elevation	Standpipe Details	SPT (N Value)
- 20						as weathe	ered rock (c		·	•		20.90	-3.38		N = 50/10 mm (25, 50)
21 21.60						as rock Very stron	ıg (where c	NG: No recompetent), e grained, L	medium to	thinly bed		21.60	-4.08		
33	23 15		((fossiliferou locally hig Dips are h	us, localize hly weather orizontal to	d chert and red contributions locally 45° aced, rough	stylolites) iting to con. Discontin	, slightly to eloss. nuities are					
24 24.60	7 7		<u>{</u>			to occasio clay-filled. 22.00-23.0	nally undul 00m - No re	ose. Apertu ecovery, pos ecovery, pos	res are wi	de, locally -filled fract	ure ure	24.60	7 08		
25 - 26 - 27 - 28 - 29 - 29						End	of Borehole	at 24.60 m				WAI	FR SI	RIKE I	DETAII S
REMARKS Hole cased	0.00-21.6	0m.					Water	Casing	Sealed	Rise	Time		mmen		DETAILS
REMARKS Hole cased WOLL HOLE WO							Strike 4.30 18.50	Depth 4.30 18.50	4.40 N/S	To 15.50	(min) 5	S	eepag loderat	e te	
NSTALLAT	ION DETA	II S					Date	Hole	Casing	Depth to Water	Con	GRO		VATER	DETAILS
Date 24-02-16	Tip Depth		RZ Base 19.50		Typ 0mm		Bate	Depth	Depth	Water	3011				



REPORT NUMBER

1	35[노/												•	0903	
ON	TRA	CT	N	6 Ga	lway City Transpo	ort Pr	oject -	Phase 3				HOLE N	NO		3/36R	
0-0	ORD	INAT	ES		533,124.66 E						SHEET	r Drille	:n		et 1 of 2	
R∩	UNI) F\	VFI 4	(mOI	728,204.71 N 51.78			RIG TYPE		Knebel		LOGGE			2/2016 2/2016	
LIE		, <u>LE</u>			y County Council			FLUSH INCLINATION (deg)		Air/Mist -90	DRILLI				Peterser	
	NEE	R		RUP	,,			CORE DIAMETER (mm))	80	LOGG				O'Shea	
E) -	æ T															
Downhole Depth (m)	Core Run Depth (m)	%::	%:3	%"(Fracture	ne									Standpipe Details	<u>~</u>
בְּ	n De	T.C.R.%	S.C.R.%	R.Q.D.%	Spacing Log	Non-intact Zone			Descripti	ion			<u></u>	_	e De	SPT (N Value)
=	Rul Rul		0)	Ľ	(mm)	inta	pue						th (m	atior	didpi	Ź
١٥٥	Core				0 250 500	Non	Legend						Depth (m)	Elevation	Stan	SPT
1	\dashv				<u>,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u>		711/2	SYMMETRIX DRILLIN	G: No rec	overy, obse	ved by dril					
-	\dashv						1/ 1/	as TOPSOIL. SYMMETRIX DRILLIN	G: No rec	overy observ	ved by dril		0.50	51.28		
							H	as weathered rock	C. 140 160	overy, obser	ved by dill	IGI				
							H									
							H									
. 2	20						Ħ	SYMMETRIX DRILLIN	G: No rec	overy, obsei	ved by dril	I		49.88 49.58		
2	.20							as rock Very strong, thick to the		_	-	/	∠.∠U	49.08		
							井	grained, LIMESTONE and stylolites), fresh to	(locally for	ssiliferous, lo	ocalized ch	nert				
		100	88	57					• •		41					
								Dips are horizontal to I medium to closely spa	ced, rough	n to locally s	mooth, pla	e nar				
3	.80						\parallel	to occasionally undulog locally clay-filled.		•						
							H	3.50m - Evidence of ho	neycomb	solution we	athering					
		100	95	39												
	.00															
]	5.00-6.20m - Subvertion	al fracture	9						
		100	99	87												
		100	JJ	01		609.999	99999999									
6	.50						廿									
							+									
		100	05	97												
		100	95	87												
8	.00						 									
							F									
		100	00	70												
		100	98	79			H									
	.50						廿									
						510										
EM.	ARK	(S											WAT	ER ST	KA KA TRIKE DE	TAILS
			.00-2	2.20n	n.				Casing Depth	Sealed At		Time (min)		mmen		
												. /	N	o wate	er strike re	ecorde
									Hole	Casing	Donth to				VATER D	ETAII
	ALL ate			ETAI	LS RZ Top RZ Bas		T\ ~	Date	Depth	Depth	Depth to Water	Comr	ments	3		
	-112	1 1	1 16	-: II ()	LY IOD IKY BAS	C I	Ty	E								



REPORT NUMBER

୍ବାପ୍ତଥା	ւ/			0_0	0.									1	896	3
CONTRA			6 Gal	lway City Tran		oject -	Phase 3				DRIL SHEI	LHOLE ET	NO		3/36R et 2 of	
O-ORD			(mQD	533,124.66 728,204.71 51	E N .78		RIG TYPE			Knebel		E DRILLE E LOGGE			2/2016 2/2016	
LIENT		G		y County Cour			FLUSH INCLINATIO CORE DIAM		ım)	Air/Mist -90 80		LED BY			. Peters	
Downhole Depth (m) Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend			Descrip	tion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
	100	91	91			999999999	grained, LIN and stylolite	MESTON es), fresh	E (locally fo to slightly v	ssiliferous eathered.	s, localized	chert				
11.00 11 12 12.50	100	100	100		1910		Dips are ho medium to to occasion locally clay-	closely spally undu	paced, roug llose. Aperti	h to locally	smooth, p	lanar				
13	100	84	84		699.999	999999999999999999999999999999999999999										
14.00_ 14 15 15.50_	100	93	93		4	00000000										
16 17 17.10	100	94	94		1370											
	100	100	100		829.999	99999999	3									
19.75	100	100	100		1850			i Demol	1 40 75			,	19.75	32.03		
REMARK							Lnd of		e at 19.75 n		Dis.	T:	WA	L FER S1	 	DETAILS
Hole cas	ed 0	0.00-2	2.20m	l.				Water Strike	Casing Depth	Sealed At	Rise To	Time (min)		ommen lo wate		e recorde
									Hole	Casin~	Dorth t				VATER	DETAIL
Date 23-02-1	Т			LS RZ Top RZ E 11.50 19.	Base	Тур	oe	Date	Depth	Casing Depth	Depth to Water	Com	ment	s		



REPORT NUMBER

ાહક	<u>;</u> L/														'	090	J
ONTR	ACT	N	6 Ga	lway City	Transp	ort Pr	oject -	Phase 3					RILLHOLE	NO		3/38R et 1 of 2	
O-ORE			(mOI	534,249 727,540		7		RIG TYPE FLUSH			Casagrar Air/Mist	D/	HEET ATE DRILL ATE LOGG		17/0	2/2016 2/2016	
LIENT		G		y County	Counci	I		INCLINATION CORE DIAM		m)	-90 80		RILLED B'			SL O'She	а
Downhole Depth (m) Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Frac Spac Lo (mi	cing og m)	- o Non-intact Zone	Legend			Descrip	tion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
1 1.20								as clayey (SYMMETF as weathe	gravel RIX DRILL red rock	ING: No rec	covery, obs	erved b	y driller	1.00 1.20	44.27 44.07		
2.70	87	64	42	E	L	Δ · ο λ λ		grained, Ll and stylolit Dips are 2 to medium	IMESTON tes), fresh to local spaced, r	thinly bedde E (locally for to slightly well by 40° & 80° rough to loc to partly ope	essiliferous veathered. c. Discontinally smooth	, localize uities ar n, planar	ed chert re widely				
4.20	100	93	88			<u> </u>		1.20-1.66r	m - Modera m - Modera	ately weatho	ered, slight ered, slight	weaker weaker	ing. ing.			0 0	
5.70	100	100	94														
7.20	100	100	100			1050										0 0	
8.70	100	100	100			1570											
REMAR	100	100	100			600.0000	000000000							WA	TER ST		DETAILS
lole ca		0.00-2	2.70n	n.					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Co	mmen		/LIMILO
														N	lo wate	r strike	recorde
NSTAL Date				LS RZ Top	R7 Bas	se!	Туј	ne.	Date	Hole Depth	Casing Depth	Deptl Wat	n to Cor	GRO		VATER	DETAIL
18-02-1		8.3		2.80	10.30		50mn										



REPORT NUMBER

	ී	<u></u> 나/											'	890	,S
	NTR/			l6 Ga	alway City Transpo	ort Pr	oject -	Phase 3			DRILLHO SHEET	OLE NO		3/38R et 2 of	
		DINA [.]		(mOl	534,249.34 E 727,540.83 N D) 45.27			RIG TYPE FLUSH		Casagrando Air/Mist	DATE DE		17/0	2/2016 2/2016	3
	ENT			alwa RUP	y County Council			INCLINATION (deg		-90 80	DRILLEI LOGGEI			SL O'She	ea
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend		Descrip	tion		Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	10.30							End of Boreh	ole at 10.30 n	n		10.3	34.97	0 0	
11															
13															
14															
15															
16															
17															
18															
19															
	44.5	VC										187	TED 2		DETA:: 1
	MAR e cas		0.00-2	2.70r	n.			Water Strike		Sealed At		ime	ommen		DETAILS
								30					No wate	er strike	e recorde
NS.	TALI	LATIO	ON D	DETA	ILS			Date	Hole	Casing	Depth to Water	GR Commen		VATER	R DETAIL
[Date -02-1	1		epth	RZ Top RZ Bas 2.80 10.30	е	Ty 50mn	oe	Depth	Depth	vvater				



REPORT NUMBER

/II	ദ്യ	노/												-	000	
01	NTR/	ACT	N	6 Ga	lway City Transpo	ort Pr	oject -	Phase 3				HOLE N	10		3/39R	
RC		D LE	VEL	(mOl	534,360.45 E 727,402.19 N D) 41.88 y County Council			RIG TYPE FLUSH INCLINATION (deg)		Casagran Air/Mist -90	DATE	T DRILLE LOGGE .ED BY		16/02 17/02	et 1 of 2/2016 2/2016 SL	3
NG	INE	ER		RUP				CORE DIAMETER (mr	n)	80	I	ED BY		D.	O'She	ea
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend		Descripti				Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								SYMMETRIX DRILLI as made ground cons	NG: No rec	overy, obs	erved by dr I	iller	0.40	41.48		
								SYMMETRIX DRILLI as weathered rock								
1	1.10					4	H		la Santa da La	J. 1. 1	dealers	1	1.10	40.78		
						K'V \$ \?\	臣	Very strong, thick to t grained, LIMESTONE	E (locally for	ssiliferous,	localized o	hert				
		100	96	76		,	H	and stylolites), fresh			dium to ala	selv.				
2							Ħ	Dips are horizontal. I spaced, rough to loca undulose. Apertures	ally smooth,	planar to	occasionall	y				
	2.60					530		andulose. Apertures	are agrit to	wide, ioual	iy day-iiile('.				
3						F40	Ħ									
		100	91	88		510	屈									
	4 40					560	Ħ									
4 '	4.10					000	H									
		100	100	97		B20	Ħ									
5	5.30					<u> </u>	H									
						620	片									
6		100	100	100			H									
		. 50	. 30			560	H									
-	6.80					4										
7							H									
		100	100	100		1130	H									
8	8.20															
	-															
		100	100	100		b59.9999	9999999	,								
9						B40	H									
	9.70		4				H									
REN	/IARI	100 KS	100	80			Ш.						WA	TER ST	RIKE	 DETAILS
lole	e cas	sed 0	.00-	1.20n	n			Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Со	mment	s	
													N	o wate	r strike	e recorde
NO.	TA: .	A T1	2115	.CT 4 :	1.6			Diff	Hole	Casing	Depth to	0			/ATEF	RDETAIL
	T ALI Date			ETA l	RZ Top RZ Bas	е	Тур	Date	Depth	Depth	Depth to Water	Comn	nent	S		
		Ţ	. =													



REPORT NUMBER

/1	ලි වි	<u>;</u> L/															000	O
СО	NTR	ACT	N	16 Ga	alway City	/ Transpo	ort Pr	oject -	Phase 3					LHOLE	NO		3/39R	
		DINA ID LE	TES	(mO	534,36 727,40 D)	0.45 E 2.19 N 41.88			RIG TYPE			Casagrar Air/Mist	اماما	ET E DRILL E LOGG		16/0	et 2 of 2/2016 2/2016	;
	ENT			alwa RUP	y County	Council			INCLINATI	ON (deg) METER (mı	m)	-90 80		LED BY			SL O'She	ea
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Lo	cing og m)	Non-intact Zone	Legend			Descripti	on			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
11 12 13 13 14 15 17 18 19	10.10								End	of Borehole	e at 10.10 m				10.10	31.78		
	MAR e ca		0.00-	1.20r	n.					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)		rER ST		DETAILS
															N	o wate	r strike	erecorded
		_									Hole	Casing	Donth t	0			VATER	DETAILS
	TAL Date		ON D		ILS RZ Top	RZ Bas	е	Туј	pe	Date	Depth	Casing Depth	Depth to Water	Con	nments	S		



REPORT NUMBER

/-		7																	
co	NTR	ACT	N	6 Ga	lway City	Transpo	rt Pro	oject -	Phase 3					DRII SHE	LHOLI ET	E NO		3/40R et 1 of 1	
co	-ORE	DINA	TES		534,43										E DRIL	LED		2/2016	
GR	OUN	D LE	VEL	(mOl	727,29: D)	42.35			RIG TYPE FLUSH				nebel ir/Mist		E LOG			2/2016	
CL	IENT		G	alwa	y County	Council			INCLINATION	ON (deg)		- 9	,		LED B		S	Peters	sen
EN	GINE	ER	Α	RUP	1	Т			CORE DIA	METER (m	m)	80	0	LOG	GED B	SY	D	. O'She	ea
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Frac Spa Lo (m	cing og m)	Non-intact Zone	Legend			Descrip	otion	n			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
- 0								711/	SYMMETI	RIX DRILL	ING: No re	COV	ery, obs	erved by	driller	0.40	41.05		
1									as peaty T SYMMETI as possibl clay bands	RIX DRILL le weathere	ING: No re ed rock - re	COV	ery, observered as	erved by o	driller with	0.40			
Ė	2.80								SYMMETI	RIX DRILL	ING: No re	COV	ery, obs	erved by o	driller	2.60	39.75 39.55	6	
3		100	100	94					as rock Very stron grained, L	ng, thick to IMESTON ites), fresh	thinly bedd	led,	blueish liferous,	dark grey	, fine			0 0 0	
4	4.30				F				medium s	20° to locall paced, rou are tight to	gh to local	ly sn	mooth, p	lanar.				0 0	
5	5.90	100	100	95			310			m - Clay-fill	ed fracture	e							
7	7.40	100	100	100	E		800											0 0 0	
8	9.00	100	100	100			350												
16		100	100	100			770												
RE	MAR		200	2 00						Water	Casing	90	ealed	Rise	Time	, I			DETAILS
IGSL RC FI 10M 18963.GPJ IGSL.GDT 17/8/16 H O H O H O H O H O H O H O H O H O H	ie ca:	sed (0.00-2	∠.ŏUr	п.					Strike	Depth Depth		At	To To	(min) (0		er strike	e recorded
∑			O: -								Hole		Casing	Denth t	0 6			VATER	DETAILS
2 INS	Date 0-02-1	-	ON D Tip De 9.50	epth		RZ Base 10.10		Tyr 50mm		Date	Depth		Depth	Depth t Water	Co	mment	S		
<u>8</u>																			



REPORT NUMBER

	ී	/			G	EOII	LUI	IIVIC	AL COR	(L LO	NEGO					1	896	3
COI	NTR	ACT	N	6 Ga	lway City T	ranspo	ort Pro	oject -	Phase 3				DRIL	LHOLE I	NO		3/40R et 2 of :	
SRO	OUN		VEL (42.35			RIG TYPE FLUSH			Knebel Air/Mist	DATE	DRILLE	D	29/0: 29/0:	2/2016 2/2016	i
	ENT			alwa RUP	y County C	Council			CORE DIAM		m)	-90 80	I	LED BY GED BY			Peters O'She	
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fractu Spacii Log (mm	ng)	Non-intact Zone	Legend			Descrip	tion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	10.10								End o	of Borehol	e at 10.10 n	n		1	10.10	32.25	0 0	
11																		
13																		
14																		
15																		
16																		
17																		
18																		
19																		
	VAR		0.00-2	20n	1			I		Water	Casing	Sealed	Rise	Time				DETAILS
1010	Joan	Jou (Strike	Depth	At	To	(min)		mment o wate		e recorde
			ov = :								Hole	Casing	Denth to) 0			VATER	DETAIL
[TALI Date -02-1	. 1	ON DI Tip De 9.50	epth	RZ Top R	RZ Base 10.10		Ty _l 50mn		Date	Depth	Depth	Depth to Water	Comi	ment	S		



REPORT NUMBER

(I)(3ව	ይ/													090	J
CON	ITR/	ACT	N	6 Ga	lway City Transpo	ort Pr	oject -	Phase 3			DRILLH		0		3/41R	
		INA		/m0I	534,579.87 E 727,065.42 N			RIG TYPE		Casagrand	DATE D e DATE L	RILLED		15/02	et 1 of 2/2016 2/2016	
LIE	NT		G	(m Ol alwa RUP	y County Council			FLUSH INCLINATION (C CORE DIAMETE		Air/Mist -90 80	DRILLE	D BY		IG		
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend		Descr	iption			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
-							0_0	SYMMETRIX Das clayey grave SYMMETRIX Das weathered r	el DRILLING: No r			0.	.40	11.12		
1 1	1.20	100	61	14	Ł			Medium strong blueish dark gr fossiliferous, lo weathered. Dips are horizo	to very strong, ey, fine grained calized chert a ntal to locally 4	f, LIMESTONE nd stylolites), f 5°. Discontinu	E (locally resh to slight ities are	ntly	.20			
3	2.70	100	81	38		(i)) (i		medium to clos to occasionally clay-smeared. 1.20-3.60m - M 3.20-3.34m - M	undulose. Ape	rtures are wide bedded	e, locally	nar				
5		100	95	95	E											
7 7	7.20	100	100	100		690 970										
'	- 1	100	100	100				End of Bo	rehole at 7.50 r	m		7.	.50	34.02	0 0	
9																
		' C													DU/= :	
	cas		0.00-	1.20n	n.				ater Casing	Sealed		Time		ER ST nment		DETAILS
								Sti	rike Depth	At	To (min)				recorde
									1	1 1						
									Hole	e Casing	Depth to Water	(GRO	UNDV	/ATER	DETAIL



REPORT NUMBER

	ITRA			6 Ga	Iway City Trai		oject -	Phase 3				DRIL SHEE	LHOLE	NO		3/42R et 1 of 1	1
		INAT		(mOE	534,756.39 726,839.91)) 32			RIG TYPE FLUSH			Knebel Air/Mist		DRILLI		11/0	3/2016 3/2016	
	INE	ER .		alwa RUP	y County Cou	ncil		INCLINATION CORE DIAM		m)	-90 80		LED BY GED BY			Peters O'She	
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend			Descript	ion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								as TOPSC SYMMETF	DIL. RIX DRILLI	NG: No recond	covery, obs	•	Λ	1.00	32.45 31.65		
1								as possible	e weathere	NG: No reced rock	·			1.80	30.85 30.65		
2 2	2.30				_	(as rock with SYMMETF as rock Very strong	th clay ban RIX DRILL g, thick to	ds NG: No red thinly bedde	covery, obs	erved by d	riller		30.35		
	3.90	100	89	38	F			grained, Ll and stylolit Dips are 2 medium sp	IMESTONI tes), fresh 0° to locall paced, rou	E (locally fo to slightly w y 40°. Disco gh to locally partly ope	ssiliferous reathered. ontinuities r smooth, p	, localized of are widely blanar.	chert				
5		100	100	100	Ŀ	510		smearing.	are agricu	. Party OPGI	., vory um	. Siewii ola					
	5.45	100	100	100	E											0 0	
,	6.90	100	100	100	E												
8	3.45	100	100	100													
, ,	9.85	100	100	100										9.85	22.80		
EN	IAR	(S						End ¢		at 9.85 m				WA	L TER ST		ETAILS
lole	e cas	ed 0	.00-2	2.30m	1.				Water Strike 2.30	Casing Depth 2.30	Sealed At N/S	Rise To 2.20	Time (min) 20		mmen Seepag		
	ΓALL	_ATIC	ON D	ETAI	LS				Date	Hole Depth	Casing Depth	Depth to Water	Com	GRO		VATER	DETAIL
)ate 03-1		ip De		RZ Top RZ I 5.35 9.	Base 85	Typ 50mn			Deptil	Depin	vvalel					



REPORT NUMBER

1																			
co	NTR/	ACT	N	6 Ga	alway City	Transpo	rt Pr	oject -	Phase 3					DRILLI		NO		3/43R et 1 of	
co	-ORE	DINA	TES		534,62 726,78									DATE		ED		3/2016	
GR	OUN	D LE	VEL	(mOl		32.77			RIG TYPE FLUSH			Knebel Air/Mist		DATE I	OGG	ED	10/0	3/2016	5
	IENT				y County	Council			INCLINATI		\	-90		DRILLI				Peter	
	GINE	EK	A	RUP					CORE DIA	IVIE I ER (MI	m)	80		LOGG	⊆N R λ	•	D.	O'She	ea
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Frac Spa Lc (m	cing og m)	Non-intact Zone	Legend			Descript	ion				Depth (m)	Elevation	Standpipe Details	SPT (N Value)
- 0									SYMMETI as TOPS0	RIX DRILLI	NG: No rec	overy, ob	serve	d by dril	ler	0.20	32.57		
Ė									SYMMETI	RIX DRILLI	NG: No rec	overy, ob	serve	d by dril	ler				
<u> </u>									as brown	ciay with co	obbles and	boulders							
Ė.																			
Ē																			
2																			N = 25 (3, 4, 4, 6, 8,
E								2											7)
3									0.444==							3.00	29.77		
- 3								5	as brown	RIX DRILLI clay with co	NG: No red obbles and	overy, ob boulders	serve	d by dril	ler				
Ė																			N = 50/195 mm
4																4 30	28.47		(6, 11, 15, 19, 16)
Ė									SYMMETI as rock	RIX DRILLI	NG: No rec	overy, ob	serve	d by dril	ler	4.30	20.47		
Ē	5.00								as rock							5.00	27.77		
5									Very stron	g, thick to to	thinly bedde E (locally fo	ed, blueis ssiliferou	h dark s, loca	grey, fi	ne ert				
Ē		100	100	100				#	and styloli	tes), fresh	to slightly w	eathered	l. [']						
- 6											y 40°. Disco gh to locally								
Ē	6.45										partly ope								
Ē						ā	10												
7		100	100	100															
Ė								#											
- 8	7.85																		
Ė							/	#											
Ē		100	94	90				片											
-9																			
Ē	9.40				-	_		1											
146		100	92	92			60.0000	00000000		T									
RE Ho	MAR le cas		0.00-	5.00r	n.					Water	Casing	Sealed	Ris		Time		mmen		DETAILS
SL.GD.	_ 500				-					Strike 4.50	Depth 4.50	At N/S	4.0	0	(min) 20	100	Slow	ເຮ	
집 합														-					
IGSL RC FI 10M 18963.GPJ IGSL.GDT 17/8/16																			
M INIC	STAL	LΔTI	טא ט	FTA	II S					Date	Hole	Casing	g De	epth to Vater	Com	GRO		VATER	RDETAILS
	Date				RZ Top	RZ Base	<u> </u>	Тур	oe	Date	Depth	Depth	1 V	Vater	COII	micili			
GSL R																			
- L		L																	



REPORT NUMBER

	<u>.</u>					COI	LCI	IIVIC	AL CORE I	.OG KL	-001	ND .				1	896	3
		ACT		6 Ga			ort Pr	oject -	Phase 3				DRIL SHEI	LHOLE ET	NO		3/43R et 2 of 2	
		DINAT		(mOI	534,627 726,780 D)	7.31 E 0.71 N 32.77	7		RIG TYPE FLUSH			Knebel Air/Mist	DATE	E DRILLE E LOGGE		10/0	3/2016 3/2016	
	ENT			alwa RUP	y County	Counci	ı		INCLINATION (d			-90 80		LED BY GED BY			Peters O'She	
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Frac Spac Lo (mi	cing ng m)	Non-intact Zone	Legend		De	escripti	ion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	10.05								End of Bor	ehole at 10	0.05 m			ľ	10.05	22.72		
11																		
13																		
14																		
15																		
16																		
17																		
18																		
19																		
	/AR		000	- 00·			1		Wa	ter Cas	sing	Sealed	Rise	Time				DETAILS
ilor	e cas	sed C	v.UU-t	5.00n	п.				Stri 4.5	ke De	oth	At N/S	To 4.00	(min) 20	Со	Slow	ts	
	TAI.	ΙΔΤΙ	ON D	FΤΔΙ	ıs						Hole	Casing	Depth to Water	Com	GR0 ments		VATER	DETAIL
NS.	IALI										epth)	Depth	Water	00		_		



REPORT NUMBER

ાહ	3L/											'	090	J
ONTE	RACT	N	6 Ga	lway City Transpo	ort Pro	oject -	Phase 3			DRILLHO	LE NO		3/46R	
O-OR	RDINA	TES		531,749.54 E						SHEET			et 1 of 2	2
			(mOF	728,391.61 N			RIG TYPE		Casagrande	DATE DRI			3/2016	
LIEN	ND LE T			y County Council			FLUSH INCLINATION (deg)		Air/Mist -90	DRILLED			SSL	
NGIN			RUP	, Journal Journal	_		CORE DIAMETER (m	ım)_	-90 80	LOGGED			. O'She	a_
Ē							,			·				
Downnole Deptin (m.) Core Run Deptin (m.)	%	%	% _;	Fracture	ЭС								tails	_
Downnole Deptn (m) Core Run Depth (m)	T.C.R.%	S.C.R.%	.Q.D.%	Spacing	t Zor			Descript	tion				Det	alue)
Run	Η.	Ś	2	Log (mm)	ntac	pt pt		35			(m)	tion	lpipe	ž Z
ore				o 250 500	Non-intact Zone	Legend					Depth (m)	Elevation	Standpipe Details	SPT (N Value)
				0 ²⁵⁰ 500	Z	° – °	SYMMETRIX DRILL	ING: No rec	covery observ	ed by driller		Т Ш	N N	S
						0-0	as clayey gravel		-	-	0.50	29.31		
							SYMMETRIX DRILL as rock	ING: No rec	covery, observ	ed by driller				
1 1.20	0				_	Щ					1.20	28.61		
							Very strong, thick to grained, LIMESTON	thinly bedde	ed, blueish da	rk grey, fine				
					//		and stylolites), fresh	to slightly w	eathered.	5511 253 011011				
2	100	91	61			H	Dips are 20° to local							
2.70						Ħ	medium spaced, rou Apertures are tight t							
2.70	\Box					F	smearing.							
3														
	100	92	56											
4.20	0					H								
5	100	97	93			Ħ								
<u> </u>						臣								
5.70	0					H								
,						H								
	100	99	93			片								
	1				Δ 5 λ Δ	H								
7.20	0					H								
						\blacksquare								
	100	400				片								
3	100	100	92											
8.70						H								
	Ĭ													
)					(. ·). (.									
	100	100	100			H								
EMAR ole ca	RKS ased (0.00-	1.20m	າ.			Water	Casing	Sealed I	Rise Tir	ne	TER S	TRIKE D	ETAIL:
3.	- \						Strike	Depth	At	To (m	in)		er strike	record
												01.11.12.	A/A ===	DET
JSTAI	LLATI	ח אט	FTAI	ıs			Date	Hole	Casing	Depth to Water	GR commen		NATER	DETAI
Dat				RZ Top RZ Base	Э	Тур		Depth	Depth	Water	Juliuen	i.o		
	-16	16.0		11.50 16.40		50mn			1 1	1				



REPORT NUMBER

	33	5/														3
CON	TRA	ACT	N	6 Ga	lway City Transpo	rt Pro	ject -	Phase 3			DRILLH	OLE N	0		3/46R	
 :O-C	ORD	INAT	ΓES		531,749.54 E						SHEET				et 2 of	
					728,391.61 N			RIG TYPE		Casagrand	DATE D				3/2016 3/2016	
) LE		(mOI				FLUSH		Air/Mist	DATE					,
LIE NG	:N I INEE	≣R		alwa RUP	y County Council			INCLINATION (deg		-90 80	DRILLE LOGGE				SL O'She	ea
_									,						- 3.10	
Downhole Depth (m)	Core Run Depth (m)	%	%	%	Fracture	<u>e</u>									ails	
De	Dep	T.C.R.%	S.C.R.%	.Q.D.%	Spacing	t Zor			Descrip	otion			_		Det	alue)
hole	Run	<u> </u>	S.	쬬	Log (mm)	ntac	ρι					,	E E	tion	pipe) Z
ow	ore				250 500	Non-intact Zone	Legend						Depth (m)	Elevation	Standpipe Details	SPT (N Value)
그 10 10					0 250 500	_		Very strong, thick	to thinly hedd	led blueish o	lark grev fin			Ш	M K	S
	_ںے.ں							grained, LIMESTC and stylolites), fres	NE (locally for	ossiliferous, I	ocalized che	ert				
								,								
11		100	89	89				Dips are 20° to loc medium spaced, re	ough to locall	y smooth, pl	anar.					
								Apertures are tight smearing (continu	to partly ope <i>ed)</i>	en, very thin I	orown clay					
1	1.70					\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		11.60-11.82m - Cl		ed fracture						
12																
		100	95	95												
					6	90	\coprod									
13 13	3.20						H									
							H									
		100	65	41	7	19.9999	9999999									
14						(; , A										
14	4.70															
15																
		100	100	100		C									0 0	
															0 🖯 0	
16 16	6.20														。□。	
16	6.40	100	100	100				End of Boreh	ole at 16.40 r	n		16	5.40	13.41		
17																
10																
18																
19																
REM	AR	KS			I								۷A٦	TER ST	RIKE	DETAILS
lole	cas	sed 0	0.00-	1.20n	n			Water Strike		Sealed At		ime min)	Со	mmen	ts	
													N	o wate	r strike	e recorde
									llala			(GRO	DUNDV	VATER	R DETAIL
										('acina	Danth to	_				
	ALL ate			ETAI	RZ Top RZ Base		Туј	Date	Hole Depth	Casing Depth	Depth to Water	Comm	ent	S		



REPORT NUMBER

	ී	ጌ/						16903
CON	NTR/	ACT	N	6 Ga	lway City Trans	port P	roject -	
20-	ORD	INAT	ΓES		533,062.37 E			SHEET Sheet 1 of 2
					728,286.02 N			RIG TYPE Casagrande DATE DRILLED 16/03/2016 DATE LOGGED 21/03/2016
		D LE		(mOI				FLUSH Air/Mist
	ENT SINEI	ΞR		alwa RUP	y County Coun	CII		INCLINATION (deg) -90 DRILLED BY IGSL CORE DIAMETER (mm) 80 LOGGED BY D. O'Shea
Т			,,					2000000
Downhole Depth (m)	Core Run Depth (m)	%	%	%	_	l o		
Dep	Dept	T.C.R.%	S.C.R.%	.Q.D.%	Fracture Spacing	Zon		Description ()
Jole	Sun	<u>–</u>	S.	R.	Log (mm)	ltact	٥	
own	ore				, ,	ි Non-intact Zone	Legend	Depth (m) Elevation Standpipe Details SPT (N Value)
0	O				0 ²⁵⁰ 5	00 Z		
							<u> </u>	SYMMETRIX DRILLING: No recovery, observed by driller as gravelly clay
1								
							<u>~</u>	
							0 -	
2							0	
							0	
							-	
3							0	
							<u>~</u>	
4							\$ \frac{1}{2}	4.00 00 54
7								SYMMETRIX DRILLING: No recovery, observed by driller 4.50 33.24
							H	as clayey cobbles SYMMETRIX DRILLING: No recovery, observed by driller
5								as weathered rock
	5.60							5.60 32.14
								Very strong, thick to thinly bedded, blueish dark grey, fine grained, LIMESTONE (locally fossiliferous, localized chert
6		100	87	87			+	and stylolites), fresh to slightly weathered.
	6.60						+	Dips are 20° to locally 40° & 80°. Discontinuities are widely
								to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing
7		100	75	75		/		sincaring.
	7.60					Λ ο λ		
8		100	95	75			+++	
	g 60						+	
	8.60							
9		100	93	83			#	
	9.60						#	
	/ARI		.00	1 50.				WATER STRIKE DETAILS Water Casing Sealed Rise Time Comments
1016	e cas	ea U	v.UU-4	1.50n	1.			Strike Depth At To (min) Comments
								No water strike records
								GROUNDWATER DETAIL
	TALI			ETAI	LS RZ Top RZ Ba	ise	Ту	Date Hole Casing Depth to Comments



REPORT NUMBER

CONTR	ACT		6.0	dura: O'	Te	D	io-4	Dha ^				חפוו ו	LHOLE	NO.	DU.	2//70)
CONTR			o Ga			oπ Pro	ject -	Phase 3				SHEE		. 140		3/47R et 2 of	
CO-ORI			(mOl	533,06: 728,28(D)				RIG TYPE FLUSH			Casagran	مام	DRILL			3/2016 3/2016	
CLIENT				y County	Council			INCLINATION		m)	-90	I	LED B			SSL	
ENGINE	EK	Al	RUP					CORE DIA	wEIEK (M	111)	80	LOGG	GED B	ī	ט	O'She	ea
Downhole Depth (m) Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Frac Spac Lo (mi	cing og m)	Non-intact Zone	Legend			Descript	ion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	100	100	100			590		grained, L	IMESTON	thinly bedde E (locally fo	ssiliferous,	dark grey, localized o	fine chert			0 0	
10.60 - 11 11.60	100	100	100			770.0000 549.9999		and styloli Dips are 2 to medium Apertures	tes), fresh 20° to local n spaced, r are tight to	to slightly w y 40° & 80° ough to loca partly oper	eathered. Discontinually smooth	uities are w , planar.	videly				
- 12 12.60	100	100	100			660											
- 13 13.50	100	100	100					End o	of Borehole	e at 13.50 m	1			13.50	24.24	0 0	
-15 -16 -17 -18																	
REMAR Hole ca		0.00-4	1.50n	n.					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Co	mmen	ts er strike	DETAILS e recorded
INSTAL	LATI	ON D	ETAI	LS					Date	Hole Depth	Casing Depth	Depth to Water	Con	nment		VALE	DL I AILO
Date 21-03-		Tip De 12.0		RZ Top 7.00	RZ Base 13.50		Typ 50mm			Бори	Борит						



REPORT NUMBER

1 ଓଡ଼	27															
ONTE	RACT	N	l6 Ga	lway City Transp	ort Pr	oject -	Phase 3					LHOLE	NO		3/48R	
O-OR	RDINA	TES		534,396.60 E							SHE				et 1 of 3	
	ND LE		(mOF	727,197.18 N	2		RIG TYPE			Casagrar	ndo	E DRILLI E LOGGI			4/2016 4/2016	
LIEN				y County Counc			FLUSH INCLINATION	ON (dea)		Air/Mist -90		LED BY			SSL	
NGIN			RUP	,,			CORE DIAM		m)	80		GED BY			. O'Shea	ı
Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	- o Non-intact Zone	Legend			Descripti	on			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
						0-	SYMMETF as gravelly		ING: No rec	overy, obs	erved by d	Iriller	0.70	40.02		
							SYMMETF as weathe		ING: No rec	overy, obs	erved by d	Iriller				
2.80	100	85	54				blueish da fossiliferou weathered Dips are h medium to to occasio	irk grey, finus, localized. Indicate the control of the control o	ry strong, thing grained, Lond chert and chert and colocally 45° colocally 45° coloced, rough lose. Apertu	.IMESTON stylolites), . Disconting to locally	IE (locally slightly uities are smooth, p	lanar	1.30	39.42		
4.30	100	89	83		540			n - Clay-fil	ed fracture							
5.80	100	97	92		830		5.40-5.58r	m - Clay-fill	ed fracture							
7.30	100	91	55	Ł												
8.80	100	95	93		730											
	100	100	100		Н	0000000							18/8	TED OT		=TA!
emai ole ca	ased (0.00-	1.30m	າ.				Water		Sealed	Rise	Time		mmen	TRIKE DE	= I AIL
								Strike	Depth	At	То	(min)	N	o wate	er strike r	
ISTAI	LLATI	טא ס	FTAI	ıs				Date	Hole	Casing	Depth to Water	Com	GRO		VATER [DETA
Dat 05-04-	te -		epth	RZ Top RZ Bas 10.00 20.30		Ty _l 50mn		Date	Depth	Depth	Water	Com	ııı c iil			



REPORT NUMBER

/																			
со	NTR	ACT	N	6 Ga	lway City	Transpo	rt Pro	ject -	Phase 3					DRIL SHE	.LHOLE ET	NO		3/48R et 2 of	
		DINA.	TES VEL	(mOl	534,396 727,197				RIG TYPE			Casag		DAT	E DRILL E LOGG		04/0	4/2016 4/2016	6
	ENT				y County				FLUSH INCLINATION	ON (deg)		Air/Mis	st	DRIL	LED BY	·		SSL	
EN	GINE	ER	Α	RUP	I				CORE DIAI	METER (mi	m)	80		LOG	GED BY	<u>(</u>	D	. O'She	ea
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Frac Spac Lo (mi	cing og m)	Non-intact Zone	Legend			Descript					Depth (m)	Elevation	Standpipe Details	SPT (N Value)
- 10	10.30							\pm	blueish da	rk grey, fin	ry strong, th e grained, l	IMEST	ONE	(locally				0 0	
111	11.80	100	100	100			520		fossiliferou weathered Dips are h medium to to occasio	us, ľocalize I. iorizontal to o closely sp	d chert and b locally 45° baced, rough lose. Apertu	stylolite . Discor	es), s ntinui ally si	lightly ities are mooth, p	lanar				
12	13.30	100	100	100			1030	000,00001										0 0 0	
14	14.80	100	100	100			510												
15	15.80	100	100	100			1430												
16		100	100	100			359.9999 370.0000	999999999										0 0	
18	17.30 18.80	100	100	100	Ŀ			99999999											
- 19		100	100	93			559.9999	99999999		Γ									
RE Hol	MAR le ca		0.00-1	1.30n	n.					Water	Casing	Sealed		Rise	Time		mmen		DETAILS
										Strike	Depth	At		То	(min)	N	o wate	er strike	e recorded
i luc	TA1	LAT	ON: D	CT A						Dete	Hole	Casi	ng	Depth to	0 0			NATER	DETAILS
	NSTALLATION DETAILS									Date	Depth	Dep		Depth to Water	Com	nment	•		



REPORT NUMBER

Je	35	/ /			Ì	JEU I	_0.		, L	\\	, KLOO	- 12				1	896	3
CON	TR/	CT	N	6 Ga	lway City	/ Transp	ort Pr	oject -	Phase 3					LHOLE	NO		3/48R	
		INAT	TES VEL	(mOl	534,39 727,19))	6.60 E 7.18 N 40.72	<u>)</u>		RIG TYPE FLUSH			Casagrar Air/Mist		E I E DRILLI E LOGGI		04/0	et 3 of 4/2016 4/2016	;
NG	NT	ĒR		alwa RUP	y County	/ Council	I		INCLINATION CORE DIA		m)	-90 80		LED BY GED BY			SL O'She	ea
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Spa Lo	oture icing og im)	Non-intact Zone	Legend			Descrip	tion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
20	0.30				,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				End o	of Borehole	e at 20.30 n	n			20.30	20.42	0 0	
21																		
23																		
24																		
25																		
26																		
27																		
28																		
29																		
	AR		0.00-1	1 200	1				I	Water	Casing	Sealed	Rise	Time				DETAILS
iole	oas	ocu U	,.00-		1.					Strike	Depth	At	To	(min)	+	ommen lo wate		recorde
											Hole	Casing	Donth to				VATER	DETAIL
D	ALL ate 04-1	Т	ON D ip De 20.0	epth	RZ Top 10.00	RZ Bas 20.30		Ty 50mn		Date	Depth	Depth	Depth to Water	Com	ment	ts		



REPORT NUMBER

2.50 12.92 (4, 5, 9, 7)	(100																		
CO-CRINATES 528,277.05 E 727,648.55 N GROUND LEVEL (mOD) 15.42 FLUSH Knebel FLUSH K	CON	ΓRΑC	СТ	N	6 Ga	lway City	Transpo	rt Pr	oject -	Phase 3						E NO			
Service Serv					(mOl	727,64	8.55 N										09/0	3/2016	3
Symmetrix Drilling: No recovery, observed by driller as light grey silty gravelly clay with angular cobbles clay Symmetrix Drilling: No recovery, observed by driller as light grey silty gravelly clay with angular cobbles clay Symmetrix Drilling: No recovery, observed by driller as light grey silty gravelly clay with angular cobbles clay Symmetrix Drilling: No recovery, observed by driller as light grey silty gravelly clay with angular cobbles clay Symmetrix Drilling: No recovery, observed by driller as light grey silty gravelly clay with angular cobbles clay Symmetrix Drilling: No recovery, observed by driller as light grey silty gravelly clay with angular cobbles clay Symmetrix Drilling: No recovery, observed by driller Symmetrix Drilling: No recovery, o			₹			y County	Council			INCLINATION			-90						
SYMMETRIX DRILLING: No recovery, observed by driller as light grey silty sandy clay 2 SYMMETRIX DRILLING: No recovery, observed by driller as light grey silty gravelly clay with angular cobbles clay 3 SYMMETRIX DRILLING: No recovery, observed by driller as light grey silty gravelly clay with angular cobbles clay 4 SYMMETRIX DRILLING: No recovery, observed by driller as light grey silty gravelly clay with angular cobbles clay 5 SYMMETRIX DRILLING: No recovery, observed by driller as light grey silty gravelly clay with angular cobbles clay 8 SYMMETRIX DRILLING: No recovery, observed by driller as light grey silty gravelly clay with angular cobbles clay 8 SYMMETRIX DRILLING: No recovery, observed by driller as light grey silty gravelly clay with angular cobbles clay 8 SYMMETRIX DRILLING: No recovery, observed by driller as light grey silty gravelly clay with angular cobbles clay 8 SYMMETRIX DRILLING: No recovery, observed by driller as light grey silty gravelly clay with angular cobbles clay 8 SYMMETRIX DRILLING: No recovery, observed by driller as light grey silty gravelly clay with angular cobbles clay 8 SYMMETRIX DRILLING: No recovery, observed by driller as light grey silty gravelly clay with angular cobbles clay 8 SYMMETRIX DRILLING: No recovery, observed by driller as light grey silty gravelly clay with angular cobbles clay 8 SYMMETRIX DRILLING: No recovery, observed by driller as light grey silty gravelly clay with angular cobbles clay 8 SYMMETRIX DRILLING: No recovery, observed by driller as light grey silty gravelly clay with angular cobbles clay 8 SYMMETRIX DRILLING: No recovery, observed by driller as light grey silty gravelly clay with angular cobbles clay 8 SYMMETRIX DRILLING: No recovery, observed by driller as light grey silty gravelly clay with angular cobbles clay 8 SYMMETRIX DRILLING: No recovery, observed by driller as light grey silty gravelly clay with angular cobbles clay 8 SYMMETRIX DRILLING: No recovery, observed by driller as light grey silty gravelly clay with angular cob					R.Q.D.%	Spa Lo (m	cing og m)	Non-intact Zone	Legend										
SYMMETRIX DRILLING: No recovery, observed by driller										as TOPSO SYMMETI	DIL. RIX DRILLI	NG: No reco	-	-	,	0.30	15.12		
Symmetrix Drilling: No recovery, observed by driller 8.40 7.02 7.02 7.03 7.03 7.03 7.04 7.05 7										SYMMETI as light gr	RIX DRILLI ey silty grav	NG: No recovelly clay wit	overy, obs h angula	served by cobbles	driller clay	2.50	12.92		N = 32 (4, 5, 9, 10, 6 7)
N = 56																			N = 50/90 mi (9, 16, 39, 11) N = 50/40 mi
REMARKS Hole cased 0.00-8.60m. Water Strike Depth At To (min) Comments Strike Depth At To (min) Comments B.50 B.50 N/S B.00 20 Moderate INSTALLATION DETAILS Date Hole Depth Depth Depth Water Comments Date Depth Depth Depth Depth Water Comments Comments Comments Comments Comments Comments Comments																			N = 50/185 mm (8, 13, 16, 1:
REMARKS Hole cased 0.00-8.60m. Water Casing Depth At To (min) Comments 8.50 8.50 N/S 8.00 20 Moderate GROUNDWATER DETAIL Hole Casing Depth to Water Depth Depth Water Depth Water Comments	8.					-					RIX DRILLI	NG: No reco	overy, obs	served by	driller				N = 50/170 mm (7, 8, 21, 18 11)
Hole cased 0.00-8.60m. Water Strike Depth At To (min) Comments 8.50 8.50 N/S 8.00 20 Moderate Casing Depth At To (min) Comments	9.	90 _		89	74						I					18/4	TED 07		DETAILO
INSTALLATION DETAILS Date Hole Depth Depth Depth Water Comments				3-00.	3.60r	n.					Strike	Depth	At	То	(min)	Co M	mmen loderat	ts te	
Depth Depth Water Comments	INCT	ΔΙΙ /	\TIC	ט ואכ	ETV	II S					Data		Casing	Depth	to Cor			VATER	DETAILS
							RZ Base	9	Тур	oe	Date	Depth	Depth	Wate	er Cor	imient			



REPORT NUMBER

		3/																
СО	NTR	ACT	N	6 Ga	alway City	/ Transpo	ort Pro	ject -	Phase 3				DRII SHE	LHOLE ET	NO		3/52R et 2 of	
	-ORE		TES	(mO	528,27 727,64 D)	7.05 E 8.55 N 15.42			RIG TYPE FLUSH			Knebel Air/Mist	DAT	E DRILL E LOGG		09/0	3/2016 3/2016	3
CLI	ENT		G	alwa	y County	Council			INCLINATI		>	-90	I .	LED B			Peter	
	GINE	Ŀĸ	A	RUP					CORE DIA	METER (MI	m)	80	LOG	GED B	Y	D.	O'She	ea
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Frac Spa Lo (m	cing og m)	Non-intact Zone	puegend			Descript				Depth (m)	Elevation	Standpipe Details	SPT (N Value)
- 10 - - - - - - 11	11.20	100	100	100			1050		grained, L and styloli Dips are h medium to	IMESTONI ites), fresh norizontal to o closely sp	thinly bedden thinly bedden to slightly we have a locally 45° paced, roughlose. Apertu	ssiliferous eathered. . Disconti n to locally	nuities are	chert				
- 12	12.70	100	100	100	_		600.0000	0000000	clay-filled.	(continued	ose. Aperii /)	nes ale w	ide, locally					
13	14.00	100	100	100			600											
15	15.30	100	100	100			1030		End	of Borehole	a at 15 30 m				15.30	0.12		
16 16 17 18 19 19 18 18 19 19 19 19 19 19 19 19 19 19 19 19 19	8								End	Water	e at 15.30 m	Sealed	Rise	Time	C0			DETAILS
Hol	e ca	sed (J.UU-8	s.6Ur	TI.					Strike	Depth	At	То	(min)	C0	mmen		
63.GPJ IGSL										8.50	8.50	N/S	8.00	20		loderat	re	
M 185											Hole	Casing	Denth t	0 -			VATER	DETAILS
.	Date		ON D		RZ Top	RZ Base	9	Тур	pe	Date	Depth	Depth	Depth t Water	Con	nment	S		
∸ ∟						1				1								



REPORT NUMBER

ONTR	RACT	N	16 Ga	lway City	Transpo	rt Proj	ect - Phase 3				DRI SHE	LLHOLE	NO		3/53R et 1 of	
O-OR			(mOl	528,43 727,69 D)			RIG TYPE			Knebel Air/Mist	DAT	E DRILL		08/0	3/2016 3/2016	3
LIENT			alwa RUP	y County	Council		INCLINATI	ION (deg) METER (mi		-90 80	I	GGED B			Peters O'She	
Downhole Depth (m) Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Frac Spa Lo (m ₀ 250	cing og m)	Non-intact Zone	Legend		Description	on			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
1 2 2 3 3							\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	OIL. RIX DRILLI	NG: No reco	very, ob:	served by	/ driller	0.10	9.96		N = 24 (5, 6, 9, 4, 4) N = 31 (4, 5, 3, 9, 7)
6.40	100	100	100			569.999995	as possib SYMMET as rock w Very stror grained, L	RIX DRILLI ith clay ban ng, thick to LIMESTONI ites, commo	ING: No reco	overy, obs d, blueish siliferous	served by a dark grey	driller /, fine	6.10 6.40	3.96 3.66		N = 50/1 mm (8, 13, 27,
7.85 3 9 9.35	100	100	95			660	Dips are 20° to locally 40° & 80°. Discontinuities are widely to medium spaced, rough to locally smooth, planar. Apertures are tight to partly open, very thin brown clay smearing.									
REMAR lole ca		0 00 4	6 40-	n				Water	Casing	Sealed	Rise	Time				DETAILS
iole Ca	1560	U.UU-(o.4Uľ	11.				Strike	Depth	At	To	(min)		mmen lo wate		e recorde
								_	Hole	Casing	Denth	to -			VATER	RDETAIL
NSTAL Date				ILS RZ Top	RZ Base	9	Туре	Date	Depth	Depth	Depth Wate	r Cor	nment	s 		
		.د م	- 1 1				Jr -									
					1					1						



REPORT NUMBER

7	<u>අත</u>	5/														•		
COI	NTR/	ACT	N	6 Ga	alway City	/ Transp	ort Pr	oject -	Phase 3				DRIL SHE	LHOLE	NO		3/53R et 2 of	
		D LE	TES VEL	(mOl	528,43 727,69 D)				RIG TYPE FLUSH			Knebel Air/Mist	DAT	E DRILL E LOGG		08/0	3/2016 3/2016	3
1	ENT	ER		alwa RUP	y County	Council			INCLINATI CORE DIA		m)	-90 80		LED BY			Peters O'She	
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Frac Spa Lc (m ₀ ²⁵⁰	cing og m)	Non-intact Zone	Legend			Descript	ion			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	10.90	100	100	100			1470		grained, L	.IMESTONI ites, comm	thinly bedde E (locally fo on quartz ve	ssiliferous	, localized	chert				
11	12.35	100	100	98			980		to mediun Apertures	n spaced, r	y 40° & 80° ough to loca partly oper)	ally smoot	h, planar.					
13	13.55	100	79	79			1230											
- 14 - 14 - 15	15.10	100	100	100			580 520			(5)	14540				15.10	-5.04		
16									End	of Borehole	e at 15.10 m	1						
REN	MAR e cas		0.00-6	3 40r	n			'	•	Water	Casing	Sealed	Rise	Time				DETAILS
REM Hold	5 540			. 101	•••					Strike	Depth	At	То	(min)	N		r strike	e recorded
			o								Hole	Casing	Denth to	2 2			VATER	RDETAILS
INS	TALI Date		ON D		RZ Top	RZ Bas	е	Тур	oe	Date	Depth	Depth	Depth to Water	Com	nment	S		
-																		



REPORT NUMBER

CONTR			l6 Ga	alway City	Transpo	ort Pro	oject -	Phase 3					RILLH HEET	HOLE	NO		3/54R et 1 of	
CO-ORI GROUN			(mO	528,60 727,75 D)				RIG TYPE FLUSH			Casagra	DA	ATE C	RILL .OGG		31/0	3/2016 4/2016	3
CLIENT	•	G	•	y County			- 1	INCLINATION CORE DIA		m)	-90 80			ED BY			SL O'She	ea
Downhole Depth (m) Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Frac Spa Lc (m	cing og m)	Non-intact Zone	Legend			Descripti		1			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0	100	94	94			<u> </u>		SYMMETI as sandy of same same same same same same same same	RIX DRILLI gravelly cla RIX DRILLI gravelly cla RIX DRILLI ered rock trong to vere ark grey, fin us, localize d. 20° to locall a spaced, re are tight to	NG: No reco	overy, obscional cobovery,	served by bedde NE (local, slightly nuities arn, planar	y drill y drill d, lly	ler	3.20	5.09		
7.20 8.8 8.70	100	99	99			940	000000001											
REMAR	KS	-	1												WAT	TER ST	RIKE	DETAILS
Hole ca		0.00-	4.20r	n.					Water		Sealed	Rise		Time		mmen		
									Strike	Depth	At	То		(min)	+			e recorded
															GRO	DUNDV	VATEF	RDETAILS
NSTAL	LATI	ON D	ETA	ILS					Date	Hole	Casing	Deptl Wat	n to	Com	ments	S		
Date				RZ Top	RZ Base	е	Тур	e		Depth	Depth	vvat	CI					
-							7.5											



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1000														
CONTRACT	N6 C	Salway City	y Transpor	t Project -	Phase 3				DRILI SHEE	HOLE	NO		3/ 54R et 2 of	
CO-ORDINA	TES	528,60 727,75	1.20 E 57.95 N		RIG TYPE			Casagran	DATE	DRILLI		31/0	3/2016	6
GROUND LE		OD)	8.29		FLUSH			Air/Mist	DATE	LOGGI			4/2016	S
CLIENT ENGINEER	Galv ARU	<i>r</i> ay County P	/ Council		CORE DIA	ON (deg) METER (mr	n)	-90 80	I	LED BY SED BY			SL O'She	ea
Downhole Depth (m) Core Run Depth (m) T.C.R.%	S.C.R.%	Frac Spa Lo	cture icing og im)	Non-intact Zone Legend		·	Descripti	on			Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10 10.20	92 92	2	55	00 00 00 00	blueish da fossiliferou weathered Dips are 2 to medium Apertures smearing.	ark grey, find us, localized d. 20° to locally a spaced, ro are tight to (continued)	y strong, this grained, Ld chert and 40° & 80°. bugh to local partly open	IMESTON stylolites), Discontin lly smooth , very thin	IE (locally slightly uities are w					
13 13.20	94 94	1	98	9.9999999999999999999999999999999999999	-	40m - Clay-	filled fractur	e						
14 14.20	100 10	0	24	330										
100	100 10	0			- - - -						15.20	6 01		
16	0.00-4.20	Om.			End	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	WA1	TER ST	ts	DETAILS
18963.GPJ											GRO	OUNDV	VATER	DETAILS
NSTALLATI	ION DET	AILS				Date	Hole Depth	Casing Depth	Depth to Water	Com	ments		41 <u>I-1</u>	. JEINIEU
Date Date	Tip Dept	h RZ Top	RZ Base	Ту	pe		Берш	Берш	770101					

BH3/03R Box 1 of 2



BH3/03R Box 2 of 2



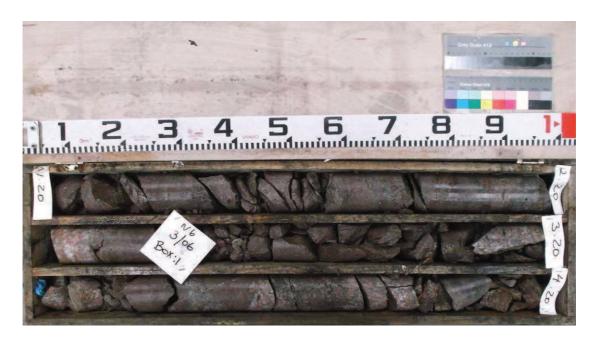
BH3/04R Box 1 of 2



BH3/04R Box 2 of 2



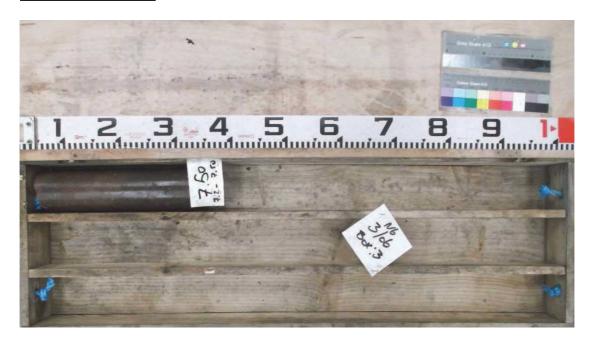
BH3/06R Box 1 of 3



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BH3/06R Box 3 of 3



BH3/07R Box 1 of 2



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BH3/08R Box 1 of 3



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BH3/08R Box 3 of 3



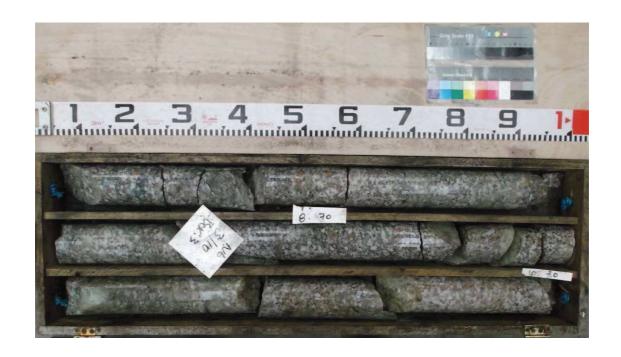
BH3/10R Box 1 of 6



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BH3/10R Box 5 of 6



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BH3/11R Box 1 of 3



BH3/11R Box 2 of 3



BH3/11R Box 3 of 3



BH3/13R Box 1 of 3



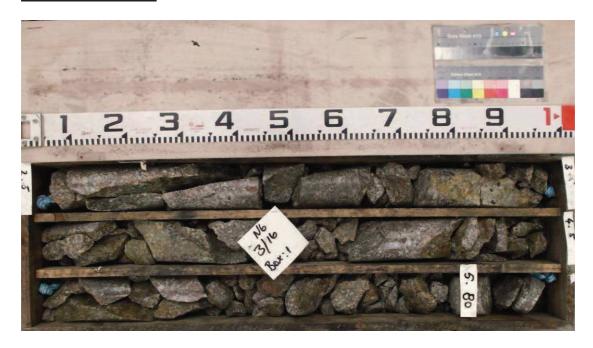
BH3/13R Box 2 of 3



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BH3/16R Box 1 of 3



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BH3/17R Box 1 of 2



BH3/17R Box 2 of 2



BH3/18R Box 1 of 8



BH3/18R Box 2 of 8



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BH3/18R Box 4 of 8



BH3/18R Box 5 of 8



BH3/18R Box 6 of 8



BH3/18R Box 7 of 8



BH3/18R Box 8 of 8



BH3/19R Box 1 of 5



BH3/19R Box 2 of 5



BH3/19R Box 3 of 5



BH3/19R Box 4 of 5



BH3/19R Box 5 of 5



BH3/20R Box 1 of 4



BH3/20R Box 2 of 4



BH3/20R Box 3 of 4



BH3/20R Box 4 of 4



BH3/22R Box 1 of 5



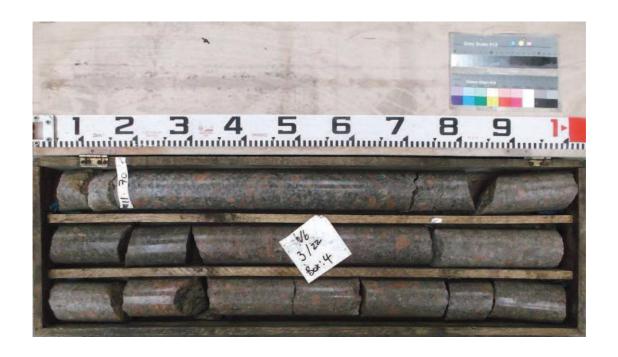
BH3/22R Box 2 of 5



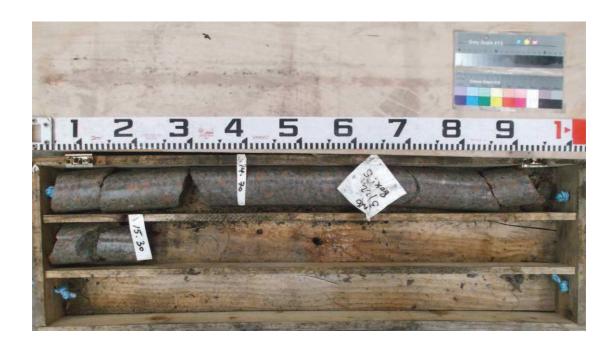
BH3/22R Box 3 of 5



BH3/22R Box 4 of 5



BH3/22R Box 5 of 5



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BH3/23R Box 2 of 2



BH3/24R Box 1 of 3



BH3/24R Box 2 of 3



BH3/24R Box 3 of 3



BH3/25R Box 1 of 3



BH3/25R Box 2 of 3



BH3/25R Box 3 of 3



BH3/26R Box 1 of 4



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BH3/26R Box 4 of 4



BH3/27R Box 1 of 4



BH3/27R Box 2 of 4



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BH3/27R Box 4 of 4



BH3/28R Box 1 of 2



BH3/28R Box 2 of 2



BH3/29R Box 1 of 2



BH3/29R Box 2 of 2



BH3/30R Box 1 of 2



BH3/30R Box 2 of 2



BH3/31R Box 1 of 2



BH3/31R Box 2 of 2



BH3/32R Box 1 of 1



BH3/33R Box 1 of 5



BH3/33R Box 2 of 5



BH3/33R Box 3 of 5



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BH3/34R Box 1 of 5



BH3/34R Box 2 of 5



BH3/34R Box 3 of 5



BH3/34R Box 4 of 5



BH3/34R Box 5 of 5



BH3/35R Box 1 of 1



BH3/36R Box 1 of 7



BH3/36R Box 2 of 7



BH3/36R Box 3 of 7



BH3/36R Box 4 of 7



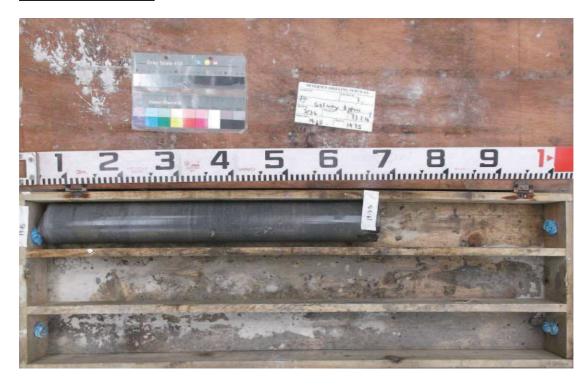
BH3/36R Box 5 of 7



BH3/36R Box 6 of 7



BH3/36R Box 7 of 7



BH3/38R Box 1 of 4



BH3/38R Box 2 of 4



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BH3/39R Box 1 of 4



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BH3/40R Box 1 of 3



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BH3/41R Box 1 of 3



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BH3/42R Box 1 of 3



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BH3/46R Box 3 of 6



BH3/46R Box 4 of 6



BH3/46R Box 5 of 6



BH3/46R Box 6 of 6



BH3/47R Box 1 of 3



BH3/47R Box 2 of 3



BH3/47R Box 3 of 3



BH3/48R Box 1 of 7



BH3/48R Box 2 of 7



BH3/48R Box 3 of 7



BH3/48R Box 4 of 7



BH3/48R Box 5 of 7



BH3/48R Box 6 of 7



BH3/48R Box 7 of 7



BH3/52R Box 1 of 3



BH3/52R Box 2 of 3



BH3/52R Box 3 of 3



BH3/53R Box 1 of 3



BH3/53R Box 2 of 3



BH3/53R Box 3 of 3



BH3/54R Box 1 of 4



BH3/54R Box 2 of 4



BH3/54R Box 3 of 4



BH3/54R Box 4 of 4



Appendix 4

Photographs of machine-excavated inspection pit at BH3/30R

BH3/30R - 1 of 4



BH3/30R - 2 of 4



BH3/30R - 3 of 4



BH3/30R - 4 of 4



Appendix 5

Trial Pit Logs and Photographs

Exploratory Hole Number	Method of Construction [Machine Excavated / Hand Dug]
TP3/01	ME
TP3/02	HD
TP3/03	ME
TP3/04	ME
TP3/05	ME
TP3/06	ME
TP3/07	ME
TP3/08	ME
TP3/09	ME
TP3/10	HD
TP3/11	HD
TP3/12	ME
TP3/13	ME
TP3/14	HD
TP3/15	ME
TP3/16	ME
TP3/17	ME
TP3/18	ME
TP3/19	ME
TP3/20	ME
TP3/21	ME
TP3/22	ME
TP3/23	ME
TP3/24	ME
TP3/25	ME
TP3/27	ME
TP3/28	ME
TP3/29	ME
TP3/30	ME

TP3/31	ME
TP3/32	ME
TP3/33	ME
TP3/34	ME
TP3/35	ME
TP3/36	ME
TP3/37	ME
TP3/39	ME
TP3/40	ME
TP3/41	ME
TP3/42	ME
TP3/43 (formerly BH3/05)	HD
TP3/44	ME
TP3/45	ME



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/01** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 521,346.87 E DATE STARTED 14/01/2016 **LOGGED BY** A.Chryst 722,589.22 N DATE COMPLETED 14/01/2016 GROUND LEVEL (m) EXCAVATION Hitachi Zaxis 80 **CLIENT Galway County Council** METHOD **ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Legend Depth Depth (m) Type <u>M. 11</u> AA37828 В 0.00-0.40 Dark brown/black sandy gravelly very fibrous PEAT 1/ 1/6 / M. 11 0.40 9.70 Light grey clayey/silty very sandy fine to coarse angular GRAVEL with many cobbles and occasional boulders 1.0 AA37829 В 1.00 1.40 8.70 Obstruction - Possible Rockhead End of Trial Pit at 1.40m 2.0 3.0 4.0 **Groundwater Conditions** Dry

18963.GPJ IGSL.GDT 26/6/17 Stability

TP LOG IGSL Good

General Remarks

0.50hr Clearance required to gain access to pit location



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/02** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 521,334.47 E **DATE STARTED** 25/01/2016 **LOGGED BY** A.Chryst 722,752.56 N 25/01/2016 DATE COMPLETED GROUND LEVEL (m) 17.84 **EXCAVATION** Hand dug **CLIENT Galway County Council** METHOD **ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth Depth (m) Type 711/ TOPSOIL 1/ 1/1/ 1 0-X0 0-X0 0-X0 0.30 17.54 Grey clayey/silty very sandy fine to coarse GRAVEL with many cobbles and boulders AA44496 D 0.50 AA44497 В 0.50 0.70 17.14 Obstruction - Possible Rockhead End of Trial Pit at 0.70m 1.0 2.0 3.0 4.0 **Groundwater Conditions** Dry

Stability Good

General Remarks

1.50hr Taking down stone wall. TP location inaccessible with machine due to steep granite outcrop which emerged during clearing works. Reinstating wall.

TP LOG 18963.GPJ IGSL.GDT 26/6/17

IGSL



REPORT NUMBER

18963

CON	NTRACT	N6 Galway City Transport Project					TRIAL PIT NO. TP3/03 SHEET Sheet 1 of 1					
LOC	GED B	A.Chryst	CO-ORDINAT	ES	521,3 722,9	35.24 E 96.25 N		DATE ST	TARTED	21/0	1/2016 1/2016	
CLII	ENT	Galway County Council ARUP	GROUND LEV	/EL (m)	30.56			EXCAVATION METHOD		Hitad	Hitachi Zaxis	
									Samples	а)		neter
		Geotechnical Description		Legend	Depth (m)	Elevation	Water Strike	Sample Ref	Туре	Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0	COBE very s GRO	BLES and BOULDERS with some broaden grandy GRAVEL with many rootlets (P	ERS with some brown black silty th many rootlets (Possible MADE			30.36		AA44478 AA44479 AA44480	D D B	0.50 0.50 0.50		
1.0	Dark brown/black sandy gravelly SILT/CLAY (Possible MADE GROUND) Grey brown silty very sandy fine to coarse angular				1.00	29.56		AA44481	D	1.00		
2.0	Grey GRA\	brown silty very sandy fine to coarse /EL with many cobbles and occasion	arse angular sional boulders		1.60	28.96	(Slow)	AA44482 AA44483 AA44484	D D B	1.60 1.60 1.60		
-		uction - Possible Rockhead f Trial Pit at 2.40m			2.40	28.16						
3.0												
4.0												
		e r Conditions nflow at 1.70m										
Stal	oility											
Gen	eral Rer	narks										
-												
<u>i</u>												



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/04** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 523,645.55 E **DATE STARTED** 25/01/2016 **LOGGED BY** 724,286.79 N A.Chryst 25/01/2016 DATE COMPLETED GROUND LEVEL (m) 36.82 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council** METHOD **ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth (m) Depth Type 711. 111 TOPSOIL 0.15 36.67 11, 11, Soft dark brown black PEAT 1, 11, 1 AA44498 D 0.50 1, 11, 1 AA44499 D 0.50 0.70 36.12 Grey brown clayey/silty very gravelly SAND with many cobbles and boulders. Gravel is angular fine to coarse. 89 AA44500 В 0.50 .xO AA49501 D 0.80 AA49502 0.80 1.00 35.82 Obstruction - Possible Rockhead End of Trial Pit at 1.00m 2.0 3.0 4.0 **Groundwater Conditions** Seepage at 0.70m 26/6/17

Stability
Good
General

IGSL TP LOG

General Remarks

0.25hr Clearance required to access trial pit location



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/05** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 521,603.76 E **CO-ORDINATES DATE STARTED** 21/01/2016 **LOGGED BY** A.Chryst 723,516.84 N 21/01/2016 DATE COMPLETED GROUND LEVEL (m) 40.97 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council METHOD ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) ₩ater Strike Geotechnical Description Elevation Sample Ref Legend Depth (m) Depth Type TOPSOIL 0.20 40.77 Soft dark brown fibrous PEAT 1/ 1/1/ 11/11/ AA44473 D 0.50 AA44474 D 0.50 1, 11, 1 AA44475 В 0.50 11, 11, 0.90 40.07 9 0 0 0 - X 0 Grey slightly clayey/silty very sandy fine to coarse GRAVEL with many cobbles of granite 1.0 AA44476 1.00 D 1.10 39.87 AA44477 В 1.00 Obstruction - Possible Rockhead End of Trial Pit at 1.10m 2.0 3.0 4.0 **Groundwater Conditions** Ingress from surface 26/6/17

Stability

18963.GPJ IGSL.GDT

TP LOG

IGSL

General Remarks

1.25hr Clearing route to trial pit. Difficult access (large granite boulders, steep granite outcrops, soft ground in places). 0.75hr Difficult track back to main road.



REPORT NUMBER

18963

co	NTRA	CT	N6 Galway City Transport Proje					TRIAL P	IT NO.	TP3	/06 et 1 of 1		
LO	GGED	BY	A. Chryst	CO-ORDINAT		723,8	54.39 E 56.76 N		DATE S	TARTED OMPLETI	12/01	1/2016 1/2016	
	IENT GINEE	:R	Galway County Council ARUP	GROUND LEV	/EL (m)	48.76		ı	EXCAVA METHOI	ATION D	Hitad	hi Zaxis	80
										Samples		oa)	meter
			Geotechnical Descriptio	ו	Legend	Depth (m)	Elevation	Water Strike	Sample Ref	Туре	Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0	10	PSOI	k brown black fibrous PEAT		\(\frac{1}{2}\) \(\frac{1}{2}\	0.20	48.56						
1.0		on darr	K DIOWII DIACK IIDIOUS PEAT						AA35350 AA37803	D B	0.50-0.50 0.50-1.10		
	Bro	own g gular	rey slightly clayey/silty sandy fine GRAVEL with many angular cob	to coarse bles of granite.			47.66	(Seepage)	AA37804 AA37805	D B	1.10-1.10 1.10-1.50		
3.0	En	ostruct	tion - Possible Granite bedrock rial Pit at 1.50m			1.50	47.26						
-													
l _	epage	at 1.3			1		1				1		
See Sta See See See See See See See See See Se													



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/07** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 521,718.09 E **DATE STARTED** 12/01/2016 **LOGGED BY** A. Chryst 723,627.37 N DATE COMPLETED 12/01/2016 GROUND LEVEL (m) 46.47 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council** METHOD **ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth Depth (m) Type TOPSOIL 0.20 46.27 0.20-0.50 0.20-0.50 Grey brown silty very gravelly fine to coarse SAND with 0 AA37806 D .XO AA37807 cobbles of granite. В . Ø. 0.50 45.97 Obstruction- Possible Granite bedrock End of Trial Pit at 0.50m 1.0 2.0 3.0 4.0 **Groundwater Conditions** Dry TP LOG 18963.GPJ IGSL.GDT 26/6/17

Stability Good

IGSL

General Remarks

0.50hr Clearance required in tracking machine to trial pit location. 0.25hr Reinstatement during track out of field



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/08** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 527,097.40 E DATE STARTED 14/01/2016 **LOGGED BY** A.Chryst 726,120.24 N 14/01/2016 **DATE COMPLETED** GROUND LEVEL (m) 35.55 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council** METHOD **ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth (m) Depth Type TOPSOIL 0.08 35.47 Dark grey clayey/silty very sandy fine to coarse GRAVEL with occasional cobbles (MADE GROUND) AA37818 D 0.50 0.60 34.95 Dark grey/brown COBBLES and BOULDERS with some AA37819 В 0.50 dark grey clayey sand (MADE GROUND) 1.0 1.20 34.35 Light grey clayey/silty very sandy fine to coarse angular GRAVEL with many cobbles AA37820 1.20-1.70 D AA37821 В 1.20-1.70 800 (Rapid) 1.70 33.85 Obstruction End of Trial Pit at 1.70m 2.0 3.0 4.0 **Groundwater Conditions** Rapid water ingress at 1.60m

TP LOG 18963.GPJ IGSL.GDT 26/6/17

IGSL

Stability Good

General Remarks



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/09** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 527,025.70 E **DATE STARTED** 26/01/2016 **LOGGED BY** A.Chryst 727,259.02 N 26/01/2016 DATE COMPLETED GROUND LEVEL (m) 65.80 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council** METHOD **ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) ₩ater Strike Geotechnical Description Elevation Sample Ref Legend Depth (m) Depth Type 711. 111 TOPSOIL 0.15 65.65 191 111 Soft black to dark brown slightly gravelly PEAT 1/ 1/6 1 0.50 65.30 COBBLES and BOULDERS of granite AA49503 D 0.50 O AA49504 D 0.50 0.70 65.10 Obstruction - Possible Rockhead End of Trial Pit at 0.70m AA49505 В 0.50 1.0 2.0 3.0 4.0 **Groundwater Conditions** Rapid ingress of surface water 26/6/17

Stability

Good

IGSL

General Remarks

TP LOG 18963.GPJ IGSL.GDT 0.50hr Clearance required in order to allow tracking to trial pit location. 0.75hr Reinstatement during track from field



REPORT NUMBER

18963

CON	ITRACT	N6 Galway City Transport Project	et - Phase 3					TRIAL P	PIT NO.	TP3	8/ 10 et 1 of 1	
LOG	GED BY	JL	CO-ORDINAT		723,9	63.10 E 47.78 N					1/2016 1/2016	
CLIE	NT INEER	Galway County Council ARUP	GROUND LEV	/EL (m)	56.56			EXCAV/ METHO		Hand	d dug	
									Samples		a)	neter
		Geotechnical Description		Legend	Depth (m)	Elevation	Water Strike	Sample Ref	Туре	Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
2.0	Soft brown to dark brown sandy peaty organic CLAY with frequent rootlets Loose brown clayey sandy GRAVEL with a medium cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of granite. Cobbles are subangular to subrounded of granite. Obstruction - Possible Granite bedrock / boulders End of Trial Pit at 0.50m				0.40 0.50	56.16 56.06	(Seepage)					
Grou	ındwater (Conditions										
Wate	er seepag	e at 0.50m										
Stab Mod	i lity erate											
Hand	eneral Remarks and dug pit carried out due to lack of available access for track machine and abundant granite outcrops in area. 0.50hr accessing and aving site.											

Stability Moderate

			TRIAL PIT	RECO		18963						
CON	TRACT	N6 Galway City Transport Project	t - Phase 3					TRIAL P	IT NO.	TP3		
LOG	TRACT N6 Galway City Transport P GED BY A. Chryst INT Galway County Council INEER ARUP	A. Chryst	CO-ORDINA	TES	522,4 724,0	13.85 E 62.10 N		DATE ST				
CLIE	NT INEER		GROUND LE	VEL (m)	51.74			EXCAVA METHOI		Hand	l dug	
								Samples		s	- F	eter
		Geotechnical Description		Legend	Depth (m)	Elevation	Water Strike	Sample Ref	Туре	Depth	Vane Test (KPa)	Hand Penetrometer
1.0	Brown g GRAVE Obstruc	grey clayey/silty very sandy fine to c L with cobbles of granite. tion - Possible Granite bedrock	coarse angular	9.50	0.25 0.40	51.49 51.34	Sīow)	AA37814	В	0.25-0.40		
2.0												
3.0												
4.0												

Groundwater Conditions Slow ingress at 0.20m

Stability Good

IGSL TP LOG 18963.GPJ IGSL.GDT 26/6/17 General Remarks
TP location inaccessible for excavator. 1hr accessing and leaving site by foot.



REPORT NUMBER

18963

	CON	TRACT	N6 Galway City Transport Proje	ct - Phase 3					TRIAL P	IT NO.	TP3	/ 12 t 1 of 1	
	LOG	GED BY	A.Chryst	CO-ORDINAT	ES	522,74 724,2	42.48 E 10.61 N		DATE S	TARTED OMPLETI	20/01	1/2006 1/2016	
- 1	CLIE ENGI	NT INEER	Galway County Council ARUP	GROUND LEV	/EL (m)	50.27			EXCAVA METHO	ATION	Hitachi Zaxis 8		80
										Samples		a)	neter
			Geotechnical Description	1	Legend	Depth (m)	Elevation	Water Strike	Sample Ref	Туре	Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
	- 1.0 - 2.0 - 3.0	SILT/CL	IL - Dark brown/black sandy grav.AY tion - Possible Rockhead rial Pit at 0.30m	elly organic			49.97		AA44457		0.10-0.30		
-													
- 1	Grou Dry Stabi		Conditions										
IGSL TP LOG 18963.GPJ IGSL.GDT 26/6/17	Gene 0.20h	General Remarks .20hr Minor clearance work required to gain access to trial pit.											



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/13** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 522,883.59 E **DATE STARTED** 20/01/2016 LOGGED BY A.Chryst 724,266.07 N 20/01/2016 DATE COMPLETED GROUND LEVEL (m) 46.73 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council** METHOD **ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) ₩ater Strike Geotechnical Description Elevation Sample Ref Legend Depth Depth (m) 711. 111 TOPSOIL - Dark brown black slightly sandy gravelly 0.10-0.30 0.10-0.30 SILT/CLAY with many cobbles AA44458 D 1/ 1/1/ AA44459 В 0.30 46.43 Soft to firm brown grey sandy slightly gravelly SILT with many cobbles and occasional boulders **₹**9.× × × × × × × AA44460 D 0.50 AA44461 В 0.50 × , , 0.90 45.83 Obstruction - Possible Rockhead End of Trial Pit at 0.90m 1.0 2.0 3.0 4.0 **Groundwater Conditions** Rapid inflow of water from surface 26/6/17

Stability

IGSL

TP LOG 18963.GPJ IGSL.GDT **General Remarks**

0.40hr Taking down stone wall. 0.50hr Reinstating stone wall.



REPORT NUMBER

18963

TRIAL PIT NO. TP3/14 CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 523,204.92 E **DATE STARTED** 13/01/2016 **LOGGED BY** A. Chryst 724,220.77 N **DATE COMPLETED** 13/01/2016 GROUND LEVEL (m) 39.73 **EXCAVATION** Hand dug **CLIENT Galway County Council** METHOD **ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Depth (m) Depth Type TOPSOIL 0.20 39.53 Dark brown black slightly clayey/silty sandy fine to coarse AA37815 В 0.20-0.40 GRAVEL with cobbles of granite. 0.40 39.33 Obstruction - Possible Granite bedrock End of Trial Pit at 0.40m 1.0 2.0 3.0 4.0 **Groundwater Conditions** Slow ingress at 0.20m 26/6/17

Stability

Good

18963.GPJ IGSL.GDT

TP LOG

IGSL

General Remarks

Hand dug pit carried out due to lack of available access for track machine and abundant granite outcrops in area. 0.50hr accessing and leaving site by foot without assistance of track machine for clearance.



REPORT NUMBER

IGSL	,	INALFIII	NECO	ΝD					189	963	
CONTRACT	N6 Galway City Transport Project	- Phase 3					TRIAL P	IT NO.	TP3	/ 15 t 1 of 1	
LOGGED BY CLIENT ENGINEER	A.Chryst Galway County Council ARUP		CO-ORDINATES GROUND LEVEL (m)		523,703.17 E 724,344.09 N 36.49			DATE STARTED DATE COMPLETE EXCAVATION METHOD			
								Samples		a)	neter
	Geotechnical Description		Legend	Depth (m)	Elevation	Water Strike	Sample Ref	Туре	Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
Obstruc	OIL - Dark brown black slightly grave	lly PEAT	1	0.40	36.09		AA44486 AA44486	D B	0.10-0.40		
Groundwater of Dry	Conditions										
Stability											
Stability General Rema	ırks										



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/16** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 524,043.03 E **DATE STARTED** 13/01/2016 **LOGGED BY** A. Chryst 724,679.85 N DATE COMPLETED 13/01/2016 GROUND LEVEL (m) 29.81 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council** METHOD **ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth Depth (m) Type TOPSOIL 0.20 29.61 Brown slightly clayey/silty very sandy fine to coarse GRAVEL with cobbles of granite. 9 - 0 0 - 0 × 0.20-0.50 0.20-0.50 AA37816 D AA37817 В 0.50 29.31 Obstruction - Possible Granite bedrock End of Trial Pit at 0.50m 1.0 2.0 3.0 4.0 **Groundwater Conditions** TP LOG 18963.GPJ IGSL.GDT 26/6/17

Stability Good

IGSL

General Remarks

1hr Clearing. Difficult access (narrow laneway, granite outcrops, steep, long distance). 0.75hr Reinstatement.



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/17** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 524,724.12 E 725,124.75 N **DATE STARTED** 21/01/2016 **LOGGED BY** A.Chryst 21/01/2016 DATE COMPLETED GROUND LEVEL (m) 44.04 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council** METHOD **ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth Depth (m) Type 711/ TOPSOIL 1/ 1/1/ 1 0.30 43.74 Orange brown COBBLES and BOULDERS with some clayey/silty sandy gravel AA44487 D 0.50 AA44488 В 0.50 AA44489 0.50 0.90 43.14 Obstruction - Possible Rockhead End of Trial Pit at 0.90m 1.0 2.0 3.0 4.0 **Groundwater Conditions** Dry TP LOG 18963.GPJ IGSL.GDT 26/6/17

Stability

IGSL

General Remarks

0.50hr Clearance required to gain access to pit location. 0.50hr Reinstatement of access route following machine excavation at pit



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/18** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 525,081.67 E DATE STARTED 14/01/2016 **LOGGED BY** A.Chryst 725,407.94 N 14/01/2016 **DATE COMPLETED** GROUND LEVEL (m) 49.67 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council** METHOD **ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Legend Depth Depth (m) Type 711. 111 TOPSOIL - Dark brown black sandy gravelly SILT/CLAY 0.15 49.52 101 111 Soft black gravelly PEAT AA37825 В 0.15 1/ 1/6 1 0.50 49.17 Light grey/brown clayey/silty sandy fine to coarse GRAVEL with many cobbles and occasional boulders 1.0 AA37826 В 1.00 0 0×0 2.0 AA37827 В 2.00 2.20 47.47 Obstruction - Possible Rockhead End of Trial Pit at 2.20m 3.0 4.0 **Groundwater Conditions** Moderate water ingress at 1.10m 26/6/17

Stability

IGSL

General Remarks

TP LOG 18963.GPJ IGSL.GDT 1hr tracking in total to and from trial pit location



REPORT NUMBER

CLIENT Galway County Council ENGINEER ARUP Geotechnical Description	525,455 725,711 59.04	9.43 N		EXCAVA METHOD	TARTED OMPLETE	22/01 ED 22/01	et 1 of 1 1/2016 1/2016	
CLIENT Galway County Council ENGINEER ARUP Geotechnical Description Geotechnical Description	725,71 59.04	9.43 N		DATE ST DATE CO EXCAVA METHOD	OMPLETE ATION	22/01 ED 22/01	1/2016 1/2016	
TOPSOIL TOPSOIL	epth n)	_						80
TOPSOIL TOPSOIL	epth n)	_			Samples		a)	neter
		Elevation	Water Strike	Sample Ref	Туре	Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
(Medium dense to dense) COBBLES and BOULDERS with some dark brown clayey/silty very sandy gravel	0.15	58.89		A A 4 4 4 0 0	5	0.50		
Obstruction - Possible Rockhead End of Trial Pit at 0.70m	0.70	58.34		AA44490 AA44491 AA44492	D B B	0.50 0.50 0.50		
2.0								
3.0								
4.0								
Groundwater Conditions Dry								
Stability								
General Remarks								



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/20** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 525,602.13 E **DATE STARTED** 14/01/2016 **LOGGED BY** A.Chryst 725,756.44 N **DATE COMPLETED** 14/01/2016 GROUND LEVEL (m) 57.06 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council METHOD ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth (m) Depth Type TOPSOIL (MADE GROUND) 0.15 56.91 Dark brown black very fibrous PEAT (MADE GROUND) AA37822 В 0.15-0.40 0.40 56.66 Dark brown black very fibrous PEAT with concrete, timber, metal, glass, copper pipe, lead pipe and ceramic pipe (MADE GROUND) 1.00 56.06 Dark brown grey very sandy GRAVEL with concrete, timber, metal, glass, copper pipe, lead pipe and ceramic pipe (MADE GROUND) 1.0 AA37823 В 1.00 AA37824 В 1.00-1.30 1.00-1.30 AA37824 Env 1.30 55.76 Obstruction - Possible Rockhead End of Trial Pit at 1.30m 2.0 3.0 4.0 **Groundwater Conditions** Rapid water ingress at 0.40m 26/6/17

Stability

IGSL

General Remarks

18963.GPJ IGSL.GDT 0.50hr Tracking to and from site including reinstatement of routeway following excavation TP LOG



REPORT NUMBER

12063

100	3SL/									103	903	
CON	ITRACT N6 Galway City Tran	nsport Project	- Phase 3					TRIAL P	IT NO.	TP3	3/21 et 1 of 1	
LOG	GGED BY A.Chryst		CO-ORDINAT	ES	526,36	61.74 E 84.13 N		DATE S	TARTED	22/01/2016		
			GROUND LEV	/EL (m)	60.01				OMPLET		22/01/2016 Hitachi Zaxis	
CLIE	Galway County Coul RINEER ARUP	ncil						EXCAVA METHOI	D	Tillacili Zaxis 60		00
									Samples	s		eter
	Control physical	December					e e				Vane Test (KPa)	Hand Penetrometer (KPa)
	Geotechnical	Description		pu	ر	ation	Water Strike	ole		ر	Test	l Pene
				Legend	Depth (m)	Elevation	Wate	Sample Ref	Туре	Depth	Vane	Hand (KPa
0.0	TOPSOIL					59.86						
-	(Medium dense to dense) CO brown black clayey/silty sandy	BBLES with so	ome dark	* * * * * * * * * * * * * * * * * * *	0.15			AA44493 AA44494	D B	0.15-0.40 0.15-0.40 0.15-0.40		
-	Obstruction - Possible Rockhe End of Trial Pit at 0.40m	ead			0.40	59.61		AA44495	В	0.15-0.40		
_												
1.0												
-												
-												
-												
2.0												
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-												
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3.0												
-												
-												
-												
-												
4.0												
-												
1	undwater Conditions											
Stab	oility											
Gene	eral Remarks											
Stab Gene 1hr t	tracking in total to and from trial	pit location										



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/22** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 533,297.22 E 728,311.06 N **CO-ORDINATES DATE STARTED** 19/01/2016 LOGGED BY A.Chryst DATE COMPLETED 19/01/2016 GROUND LEVEL (m) 56.03 EXCAVATION Hitachi Zaxis 80 **CLIENT Galway County Council** METHOD **ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth Depth (m) Type TOPSOIL 0.15 55.88 AA33946 AA33947 0.15-0.45 0.15-0.45 Soft brown sandy slightly gravelly SILT D B ×°× 0.45 55.58 Obstruction - Possible Bedrock End of Trial Pit at 0.45m 1.0 2.0 3.0 4.0 **Groundwater Conditions** IGSL TP LOG 18963.GPJ IGSL.GDT 26/6/17

Stability

General Remarks

1hr tracking in total to and from trial pit location inclusive of reinstatement



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/23** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 533,040.76 E DATE STARTED 19/01/2016 **LOGGED BY** A.Chryst 728,019.86 N DATE COMPLETED 19/01/2016 GROUND LEVEL (m) 46.26 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council METHOD ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth (m) Depth Type **TOPSOIL** 0.15 46.11 Soft to firm light brown slightly sandy slightly gravelly SILT × °°× . × °,× > × o × o AA33940 D 0.50 AA33941 В 0.50 × o×. × × ₀× 1.0 1.10 45.16 Soft to firm light brown/grey slightly sandy gravelly SILT AA33942 D 1.10 AA33943 with some cobbles В 1.10 Ó × S× \$\int \cdot 1.80 44.46 *9._× Very stiff light brown/grey slightly sandy gravelly SILT with some cobbles and occasional boulders 2.0 AA33944 D 2.00 AA33945 В 2.00 2.30 43.96 Obstruction - Possible Rockhead End of Trial Pit at 2.30m 3.0 4.0 **Groundwater Conditions** Dry 26/6/17

Stability

18963.GPJ IGSL.GDT

IGSL TP LOG

Slightly unstable

General Remarks

Plate bearing test carried out in pit at 1.20m bgl. 1hr tracking in total to and from trial pit location.

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REPORT NUMBER

18963

TRIAL PIT NO. **TP3/24** N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 529,752.24 E **DATE STARTED** 26/01/2016 LOGGED BY A.Chryst 728,388.27 N 26/01/2016 DATE COMPLETED GROUND LEVEL (m) 13.69 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council** METHOD **ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Legend Sample Ref Depth Depth (m) Type TOPSOIL 0.10 13.59 Angular COBBLES and BOULDERS of limestone with some light brown clayey/silty sandy GRAVEL y 0 AA49456 D 0.50 AA49457 В 0.50 0.70 12.99 Obstruction - Possible Rockhead End of Trial Pit at 0.70m 1.0 2.0 3.0 4.0 **Groundwater Conditions** Dry 26/6/17 18963.GPJ IGSL.GDT

Stability Good

TP LOG IGSL **General Remarks**

0.75hr Tracking to stone wall en route to trial pit location. 0.15hr Taking down stone wall. 0.50hr Reinstating wall upon trial pit completion.



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/25** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 530,843.30 E DATE STARTED 18/01/2016 **LOGGED BY** A.Chryst 728,535.88 N DATE COMPLETED 18/01/2016 GROUND LEVEL (m) 34.75 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council METHOD ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth Depth (m) Type 711/ **TOPSOIL** 0.15 34.60 AA33934 AA33935 0.15-0.40 0.15-0.40 (Loose to medium dense) Dark brown silty very sandy GRAVEL with rootlets D B 0.40 34.35 Light brown grey clayey/silty very sandy fine to coarse GRAVEL with many cobbles and occasional boulders 1.0 AA33936 1.00 D AA33937 В 1.00 1.80 32.95 Light brown grey slightly sandy gravelly SILT/CLAY with **®** . × some cobbles 2.0 AA33938 D 2.00 2.10 32.65 Obstruction - Possible Rockhead AA33939 В 2.00 End of Trial Pit at 2.10m 3.0 4.0 **Groundwater Conditions** Dry 26/6/17

Stability

18963.GPJ IGSL.GDT

TP LOG

IGSL

Slightly unstable

General Remarks

1.5hr tracking to and from location inclusive of reinstatement. Some soft ground.



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/27** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 531,637.55 E DATE STARTED 19/01/2016 **LOGGED BY** A.Chryst 728,342.72 N DATE COMPLETED 19/01/2016 GROUND LEVEL (m) 30.68 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council METHOD ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth (m) Depth Type **TOPSOIL** 0.15 30.53 Firm dark brown slightly sandy gravelly SILT/CLAY with -XO rootlets C AA44451 D 0.50 0.60 30.08 Firm grey brown slightly sandy slightly gravelly SILT with AA44452 В 0.50 occasional cobbles 1.0 AA44453 1.00 D AA44454 В 1.00 <u>*</u> 1.80 28.88 Very stiff grey and light brown slightly sandy slightly gravelly SILT with occasional cobbles and boulders × × 8× °, 2.0 AA44455 D 2.00 AA44456 В × 2.00 2.40 28.28 Obstruction - Possible Rockhead End of Trial Pit at 2.40m 3.0 4.0 **Groundwater Conditions** Dry 26/6/17

Stability Good

IGSL.GDT

18963.GPJ

TP LOG

IGSL

General Remarks

1.15hr tracking to and from location together with padlock removal and reinstatement upon completion



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/28** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 532.797.33 E DATE STARTED 15/01/2016 **LOGGED BY** A.Chryst 727,833.55 N DATE COMPLETED 15/01/2016 GROUND LEVEL (m) 28.41 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council METHOD ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth (m) Depth Type **TOPSOIL** 0.20 28.21 Ö_× Firm light brown slightly sandy gravelly SILT with some × × × cobbles and occasional boulders AA37830 D 0.50-0.50 AA37831 В 0.50-0.50 1.0 AA37832 1.00-1.00 D AA37833 В 1.00-1.00 Ó 1.80 26.61 Stiff to very stiff light brown slightly sandy slightly gravelly SILT/CLAY with many cobbles and occasional boulders **₩** 2.0 AA37834 D 2.00-2.00 В 2.00-2.00 AA37835 3.0 AA37836 3.00-3.00 D AA37837 В 3.00-3.00 3.30 25.11 End of Trial Pit at 3.30m 4.0 **Groundwater Conditions** Dry 26/6/17 IGSL.GDT

Stability Good

18963.GPJ

TP LOG IGSL **General Remarks**

Pit terminated at 3.30m due to very slow progress



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/29** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 521,662.74 E **DATE STARTED** 12/01/2016 **LOGGED BY** 723,484.36 N DATE COMPLETED 12/01/2016 GROUND LEVEL (m) **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council METHOD ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth (m) Type Firm to spongy dark brown to black fibrous PEAT 1, 11, 1 11/11/ 0.50m Rare glass bottle AA37808 D 0.50 0.60 41.24 0.60m Many subangular to subrounded BOULDERS of AA37809 В 0.50 granite (up to 600mm) Soft light brown mottled grey brown sandy gravelly slightly organic SILT/CLAY with some cobbles, frequent decaying 1.0 AA37810 D 1.00 organic rootlets and occasional lense of clayey/silty sandy В AA37811 1.00 gravel. Sand is fine to coarse. 1.30 40.54 Soft brown grey brown and dark grey brown clayey/silty very sandy GRAVEL with some cobbles. Sand is fine to ·oX ٠× coarse. Gravel is subangular to subrounded of granite. `o_X 1.60-1.80 AA37812 D AA37813 В 1.60-1.80 1.80 40.04 Possible Highly Weathered Rockhead recovered as light grey COBBLES and GRAVEL of weathered granite ්රී 0 2.0 2.10 39.74 End of Trial Pit at 2.10m 4.0 **Groundwater Conditions** Seepage at 0.60m 26/6/17

Stability

Good

.GDT

GPJ

TP LOG

IGSL

General Remarks

1hr tracking to and from location inclusive of selection of specific machine trackway and reinstatement upon completion



REPORT NUMBER

18963

100	227											
CON	ITRACT	N6 Galway City Transport Project	- Phase 3					TRIAL P	IT NO.	TP3	/ 30 et 1 of 1	
LOGGED BY A.Chryst		CO-ORDINATES GROUND LEVEL (m)		534,741.61 E 726,867.42 N 31.74			DATE STARTED DATE COMPLETE EXCAVATION METHOD		22/03/2016			
									Hitachi 13T			
	74.67							Sample		,	a)	neter
	Geotechnical Description				Depth (m)	Elevation	Water Strike	Sample Ref	Туре	Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 - -	TOPSO Firm bro	IL own slightly sandy gravelly SILT with and boulders of limestone	many angular	*** **********************************	0.10	31.64		AA49484	В	0.10-0.50		
Obstruction - Possible Rockhead End of Trial Pit at 0.50m			× · (0)	0.50	31.24							
1.0												
- - -												
-												
2.0												
- - -												
3.0												
- - -												
4.0												
-												
-												
Gro u Dry	 undwater (Conditions										
Stab Goo	bility d											

Dry

Stability
Good

General Remarks
Pit terminated on possible shallow rockhead



REPORT NUMBER

18963

TRIAL PIT NO. TP3/31 CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 532,602.82 E **DATE STARTED** 27/01/2016 **LOGGED BY** A.Chryst 728,253.70 N DATE COMPLETED 27/01/2016 GROUND LEVEL (m) 22.27 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council METHOD ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth (m) Depth Type **TOPSOIL** 0.20 22.07 ×®× Soft light brown slightly sandy gravelly SILT with many ××°° cobbles and occasional boulders 8× ° AA49458 D 0.50 AA49459 В 0.50 1.0 AA49460 D 1.50 AA49461 В 1.50 0× 0× 0× 0× 0× 0× 2.0 · ~ *~ *~ *~ AA49462 2.50 2.50 D B AA49463 ××× \$\frac{\pi}{\pi} \pi \frac{\pi}{\pi} \frac{\pi 3.0 3.10 19.17 **™**× Soft to firm light brown grey slightly sandy gravelly SILT with many cobbles and boulders Ó 3.50 3.50 AA49464 D B AA49465 4.0 Ø ×°. ×°. ×°. ×°. ×°. % × Q 4.50 17.77 End of Trial Pit at 4.50m **Groundwater Conditions** Dry 26/6/17

Stability

GDT

18963.GPJ

IGSL TP LOG

Slightly unstable

General Remarks

TM required to gain access to field gate (N17). 0.50hr Set up TM. 0.50hr Clearing access at entrance gate.



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/32** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 534,462.87 E **DATE STARTED** 27/01/2016 **LOGGED BY** A.Chryst 727,096.99 N DATE COMPLETED 27/01/2016 GROUND LEVEL (m) 41.71 EXCAVATION Hitachi Zaxis 80 **CLIENT Galway County Council** METHOD **ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth Depth (m) Type TOPSOIL 0.15 41.56 Soft dark brown sandy slightly gravelly SILT with rootlets × °^X ×₀× × D D AA49466 0.40 AA49467 0.40 0.60 41.11 Obstruction - Possible Limestone Rockhead AA49468 0.40 End of Trial Pit at 0.60m 1.0 2.0 3.0 4.0 **Groundwater Conditions** Dry IGSL TP LOG 18963.GPJ IGSL.GDT 26/6/17

Stability Good

General Remarks

TM required to gain access to field gate (Briarhill Junction). 0.50hr setting up TM.



REPORT NUMBER

18963

	3SL/									10	903	
CON	TRACT	N6 Galway City Transport Proje	ct - Phase 3					TRIAL P	IT NO.	TP3		
LOG	GED BY	A. Chryst	CO-ORDINA	CO-ORDINATES 522,045.06 E			DATE STARTED		12/0	Sheet 1 of 1 12/01/2016		
-			GROUND LI	GROUND LEVEL (m)		723,748.24 N 48.44			DATE COMPLETED EXCAVATION		12/01/2016 Hitachi Zaxis 80	
CLIE ENGI	INEER	Galway County Council ARUP						METHO	D	Tillac	JII Zaxis	
								Samples				ter
							0	'			Vane Test (KPa)	Hand Penetrometer (KPa)
	Geotechnical Description			pt	_	tion	Water Strike	<u>e</u>			Test	Pene
				Legend	Depth (m)	Elevation	Wate	Sample Ref	Туре	Depth	Vane	Hand (KPa)
0.0	TOPSO	IL - Black gravelly sandy organic	SILT/CLAY	11 11 11 11 11 11 11 11 11 11 11 11 11				AA35349		0.00-0.20		
-	Obstruc	tion - Possible Granite bedrock Frial Pit at 0.20m		[/, ,\./,' ,\	0.20	48.24						
-	Liid Oi i	mai i it at 0.20m										
-												
1.0												
2.0												
_												
-												
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3.0												
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_												
_												
4.0												
- 4.0												
-												
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-												
Grou	ındwater (Conditions										
Dry	uwatei	oonallons										
Stab	ility											
Good	u 											
Gene 0.75	eral Rema hr Trackin	rks g to and from pit location										



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/34** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 521,962.32 E **DATE STARTED** 20/01/2016 **LOGGED BY** A.Chryst 723,827.95 N 20/01/2016 **DATE COMPLETED** GROUND LEVEL (m) 48.89 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council METHOD ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth (m) Depth Type 711. 111 **TOPSOIL** 48.74 0.15 11/11/ Soft dark brown black PEAT 1, 11, 1 11/ 11/ AA44464 D 0.50 1, 11, 1 AA44465 D 0.50 AA44466 В 0.50 <u>/ //</u> 11/ 0.90 47.99 Soft to firm grey brown slightly sandy slightly gravelly 1.0 SILT/CLAY with frequent cobbles AA44467 D 1.00 AA44468 В 1.00 AA44471 **CBR** 1.00 AA44472 **CBR** 1.00 1.70 47.19 0 NO Grey clayey/silty sandy fine to coarse angular GRAVEL with many cobbles and occasional boulders 2.0 AA44469 D 2.00 2.10 46.79 Obstruction - Possible Rockhead End of Trial Pit at 2.10m AA44470 В 2.00 3.0 4.0 **Groundwater Conditions** Water seepage at 0.90m 26/6/17

Stability

Good

IGSL.GDT

GPJ

TP LOG

IGSL

General Remarks

Carried out near location BH3/01. Additional samples acquired at 1.0m under instruction from ARUP - samples taken for CBR analysis. 0.75hr tracking to and from location.



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/35** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 522,857.21 E **DATE STARTED** 20/01/2016 **LOGGED BY** A.Chryst 724,233.35 N DATE COMPLETED 20/01/2016 GROUND LEVEL (m) 46.89 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council** METHOD **ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) ₩ater Strike Geotechnical Description Elevation Sample Ref Legend Depth Depth (m) Type TOPSOIL 01101 01101 0.20 46.69 Soft dark brown black fibrous PEAT with boulders of AA44462 D 0.50 AA44463 В 0.50 0.90 45.99 Obstruction - Possible Granite bedrock 1.0 End of Trial Pit at 0.90m 2.0 3.0 4.0 **Groundwater Conditions** Rapid inflow of water from surface 26/6/17

Stability

IGSL

General Remarks

TP LOG 18963.GPJ IGSL.GDT Carried out near location BH3/02. 0.50hr reinstatement following completion of pit.



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/36** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 529,700.01 E **DATE STARTED** 20/04/2016 **LOGGED BY** A.Chryst 728,410.10 N 20/04/2016 DATE COMPLETED GROUND LEVEL (m) 13.66 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council** METHOD **ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth (m) Depth Type **TOPSOIL** Q × 0.20 13.46 Firm dark brown slightly sandy slightly gravelly SILT/CLAY with frequent rootlets AA43065 0.40 0.50 13.16 Firm light brown grey slightly sandy gravelly SILT/CLAY $\overline{\otimes}$ AA43066 В 0.40 with a low to medium cobble and boulder content. Cobbles and boulders are of limestone. AA43067 В 0.80 AA43068 В 0.80 1.0 1.50 12.16 Obstruction - Possible Rockhead End of Trial Pit at 1.50m 2.0 3.0 4.0 **Groundwater Conditions** Dry

Dry

Stability
Good

General
Pit termi

IGSL

General Remarks



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/37** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 521,359.17 E DATE STARTED 14/04/2016 **LOGGED BY** A.Chryst 722,614.44 N 14/04/2016 **DATE COMPLETED** GROUND LEVEL (m) 10.98 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council** METHOD **ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth Depth (m) Type 711/ TOPSOIL 1/ 1/1/ 1 0.30 10.68 Brown grey clayey/silty very sandy angular fine to coarse GRAVEL with a high cobble and low to medium boulder content. Cobbles and boulders are angular of granite. AA49488 В 0.50 0 20 0.90 10.08 Brown very sandy very gravelly CLAY 1.0 AA49489 В 1.00 1.10 9.88 Obstruction - Possible Rockhead End of Trial Pit at 1.10m 2.0 3.0 4.0 **Groundwater Conditions** Moderate water strike at 1.0m 26/6/17

Stability
Good

General

Bit tornii

IGSL TP LOG

General Remarks



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/39** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 525,045.94 E **CO-ORDINATES DATE STARTED** 18/04/2016 **LOGGED BY** A.Chryst 725,382.41 N 18/04/2016 **DATE COMPLETED** GROUND LEVEL (m) 49.79 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council** METHOD **ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth (m) Depth Type **TOPSOIL** - <u>- 0</u> 0.20 49.59 Brown slightly clayey/silty sandy angular fine to coarse GRAVEL of granite with a high cobble and boulder AA49491 0.50-1.00 1.0 1.10 48.69 Grey and brown very sandy angular fine to coarse GRAVEL of granite with a high cobble and boulder AA49492 В 1.10-1.60 2000 content. Cobbles and boulders are angular. 1.60 48.19 Obstruction - Possible Rockhead End of Trial Pit at 1.60m 2.0 3.0 4.0 **Groundwater Conditions** Seepage at 0.60m 26/6/17 18963.GPJ IGSL.GDT

Stability

TP LOG IGSL Slightly unstable

General Remarks



REPORT NUMBER

18963

CON	TRACT	N6 Galway City Transport Proj						TRIAL P	IT NO.	TP3	/40 et 1 of 1	
LOGGED BY A.Chryst			CO-ORDINAT	CO-ORDINATES 525,397.63 E 725,677.10 N			DATE STARTED 1			18/04/2016 18/04/2016		
CLIE	NT INEER	Galway County Council ARUP	GROUND LE	/EL (m)	59.65			EXCAVA METHOI		Hitac	thi Zaxis	80
								Samples			a)	neter
		Geotechnical Description	n	Legend	Depth (m)	Elevation	Water Strike	Sample Ref	Туре	Depth	Vane Test (KPa)	Hand Penetrometer
0.0	TOPSOIL Brown clayey/silty very sandy angular fine to coarse GRAVEL of granite with a low to medium cobble and				0.25	59.40		A A 40400	D	0.30-0.60		
	boulder	content		0 × 0	0.60	59.05		AA49490	В	0.30-0.00		
	Brown grey COBBLES and BOULDERS of gran		of granite	076	0.80	58.85						
1.0	End of	ction - Possible Rockhead Trial Pit at 0.80m										
2.0												
3.0												
3.0												
4.0												
Grou Dry	ındwater	Conditions										
j												
Stab Good	ility											
Gene Pit te	eral Rema erminated	arks on possible shallow rockhead										



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/41** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 529,897.01 E DATE STARTED 19/04/2016 **LOGGED BY** A.Chryst 728,377.37 N DATE COMPLETED 19/04/2016 GROUND LEVEL (m) 22.57 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council** METHOD **ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth (m) Depth Type TOPSOIL 11 111 1 0.40 22.17 Firm orange brown sandy slightly gravelly CLAY with a high cobble and boulder content. Cobbles and boulders AA43057 В 0.50 are of limestone. AA43058 D 0.50 0.80 21.77 Possible Highly Weathered Rockhead recovered as Grey COBBLES and BOULDERS of limestone 9 1.0 0 2 1.40 21.17 Obstruction - Possible Rockhead End of Trial Pit at 1.40m 2.0 3.0 4.0 **Groundwater Conditions** Dry

TP LOG 18963.GPJ IGSL.GDT 26/6/17

IGSL

General Remarks

Stability Good



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/42** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 529,931.08 E DATE STARTED 19/04/2016 **LOGGED BY** A.Chryst 728,410.99 N DATE COMPLETED 19/04/2016 GROUND LEVEL (m) 23.89 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council** METHOD **ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth (m) Depth Type TOPSOIL 0.20 23.69 _XO-___ Firm dark brown sandy gravelly CLAY/SILT with frequent AA43059 В 0.40 0.50 23.39 Firm light grey slightly sandy slightly gravelly CLAY _____ AA43060 В 0.80 AA43061 D 0.80 1.0 1.40 22.49 Brown clayey/silty gravelly fine to coarse SAND AA43062 В 1.50 2.0 2.50 AA43063 В 3.0 3.20 20.69 Grey brown clayey/silty very sandy subangular to rounded fine to coarse GRAVEL AA43064 В 3.50 4.0 4.40 19.49 End of Trial Pit at 4.40m **Groundwater Conditions** Dry

TP LOG 18963.GPJ IGSL.GDT 26/6/17

IGSL

Stability Good

General Remarks



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/43** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 524,111.34 E **DATE STARTED** 25/02/2016 **LOGGED BY** J.Duggan 724,725.07 N DATE COMPLETED 25/02/2016 GROUND LEVEL (m) 19.85 **EXCAVATION** Hand Dug **CLIENT Galway County Council METHOD ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth (m) Depth Type 11/11/11/ **TOPSOIL** 0.15 19.70 0.15-0.45 0.15-0.45 0.15-0.45 0.45-0.90 Soft dark brown to black sandy gravelly slightly organic SILT/CLAY with occasional rootlets AA39973 AA39974 D D XO-17/ AA39976 AA39975 B B 0.45 19.40 % = 0 0-X0 Grey brown and dark brown clayey/silty sandy GRAVEL with a medium cobble content. Sand is coarse. Gravel is 8 × 0 angular to subangular coarse. Cobbles are of weathered 0.90 18.95 Obstruction - Possible granite rockhead 1.0 End of Trial Pit at 0.90m 2.0 3.0 4.0 **Groundwater Conditions** Dry

Stability Moderate

General Remarks

Carried out at original location of BH3/05. Hand dug pit carried out due to lack of suitable access for track machine. 0.75hr accessing and leaving site by foot.

26/6/17 IGSL.GDT GPJ TP LOG

IGSL



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/44** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 533.740.76 E DATE STARTED 19/04/2016 **LOGGED BY** A.Chryst 728,060.11 N DATE COMPLETED 19/04/2016 GROUND LEVEL (m) 54.81 **EXCAVATION** Hitachi Zaxis 80 CLIENT **Galway County Council METHOD ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth (m) Depth Type GRAVEL surface dressing - Possible CI.804 (MADE 0.15 54.66 GROUND) Angular to subangular COBBLES of crushed stone with occasional fragments of concrete and red brick (MADE GROUND) 0.80 54.01 Firm light brown slightly sandy slightly gravelly SILT/CLAY with a high cobble content. Cobbles are of limestone. 1.0 AA49493 1.00 В AA49494 В 1.00 AA49495 D 1.00 1.80 53.01 Stiff to very stiff light brown grey slightly sandy slightly gravelly CLAY with a high cobble content. Cobbles are of limestone. 2.0 AA49496 В 2.00 AA49497 2.00 2.00 B D Ö AA49498 2.50 52.31 End of Trial Pit at 2.50m 3.0 4.0 **Groundwater Conditions** Dry 26/6/17 IGSL.GDT

Stability Good

GPJ

TP LOG

IGSL

General Remarks

Pit terminated at 2.50m due to very slow progress



REPORT NUMBER

18963

TRIAL PIT NO. **TP3/45** CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 533,837.88 E **DATE STARTED** 19/04/2016 **LOGGED BY** A.Chryst 728,015.11 N DATE COMPLETED 19/04/2016 GROUND LEVEL (m) 53.28 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council METHOD ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth (m) Depth Type GRAVEL surface dressing - Possible CI.804 (MADE 0.15 53.13 GROUND) Angular to subangular COBBLES of crushed stone with occasional fragments of concrete and boulders of limestone (MADE GROUND) 1.0 1.20 52.08 Soft to firm light brown slightly sandy slightly gravelly SILT/CLAY with a high cobble and low to medium boulder content. Cobbles and boulders are of limestone. AA43051 В 1.50 AA43052 B D 1.50 AA43053 1.50 2.0 2.20 51.08 Stiff to very stiff light brown grey slightly sandy slightly gravelly SILT/CLAY with a high cobble and low to medium <u></u>₩ Ð boulder content. Cobbles and boulders are of limestone. 2.50 2.50 2.50 AA43054 B B AA43055 AA43056 D 3.00 50.28 End of Trial Pit at 3.00m 4.0 **Groundwater Conditions** Dry 26/6/17 IGSL.GDT

Stability Good

GPJ

TP LOG

IGSL

General Remarks

Pit terminated at 3.0m due to very slow progress

TP3/01 - 1 of 2



TP3/01- 2 of 2



TP3/02 - 1 of 2



TP3/02 - 2 of 2



TP3/03 - 1 of 2



TP3/03 - 2 of 2



TP3/04 - 1 of 2



TP3/04 - 2 of 2



TP3/05 - 1 of 2



TP3/05 - 2 of 2



TP3/06 - 1 of 2



TP3/06 - 2 of 2



TP3/07 - 1 of 2



TP3/07 - 2 of 2



TP3/08 - 1 of 2



TP3/08 - 2 of 2



TP3/09 - 1 of 2



TP3/09 - 2 of 2



TP3/10 - 1 of 2



TP3/10 - 2 of 2



TP3/11 - 1 of 2



TP3/11- 2 of 2



TP3/12 - 1 of 2



TP3/12 - 2 of 2



TP3/13 - 1 of 2



TP3/13 - 2 of 2



TP3/14 - 1 of 2



TP3/14 - 2 of 2



TP3/15 - 1 of 2



TP3/15 - 2 of 2



TP3/16 - 1 of 2



TP3/16 - 2 of 2



TP3/17 - 1 of 2



TP3/17 - 2 of 2



TP3/18 - 1 of 2



TP3/18 - 2 of 2



TP3/19 - 1 of 2



<u>TP3/19 - 2 of 2</u>



TP3/20 - 1 of 2



TP3/20 - 2 of 2



TP3/21 - 1 of 2



TP3/21- 2 of 2



TP3/22 - 1 of 2



TP3/22 - 2 of 2



TP3/23 - 1 of 2



TP3/23 - 2 of 2



TP3/24 - 1 of 2



TP3/24 - 2 of 2



TP3/25 - 1 of 2



TP3/25 - 2 of 2



TP3/27 - 1 of 2



TP3/27 - 2 of 2



TP3/28 - 1 of 2



TP3/28 - 2 of 2



TP3/29 - 1 of 2



TP3/29 - 2 of 2



TP3/30 - 1 of 2



TP3/30 - 2 of 2



TP3/31 - 1 of 2



TP3/31- 2 of 2



TP3/32 - 1 of 2



TP3/32 - 2 of 2



TP3/33 - 1 of 2



TP3/33 - 2 of 2



TP3/34 - 1 of 2



TP3/34 - 2 of 2



TP3/35 - 1 of 2



TP3/35 - 2 of 2



TP3/36 - 1 of 2



TP3/36 - 2 of 2



TP3/37 - 1 of 2



TP3/37 - 2 of 2



TP3/39 - 1 of 2



TP3/39 - 2 of 2



TP3/40 - 1 of 2



TP3/40 - 2 of 2



TP3/41 - 1 of 2



TP3/41- 2 of 2



TP3/42 - 1 of 2



TP3/42- 2 of 2



TP3/43 - 1 of 2



TP3/43- 2 of 2



TP3/44 - 1 of 2



TP3/44- 2 of 2



TP3/45 - 1 of 2



TP3/45- 2 of 2



Appendix 6

Hand-excavated pit record from Trial Pit TP3/43 (formerly BH3/05)



$\textbf{Hand Dug Trial Pit Log} \ \ (\textbf{Formerly Cable Percussive BH3/05})$

See TP Log also

LOCATION PROJECT PROJECT REF. DATE

TP3/43 (formerly known as BH3/05) GCTP Phase 3 Contract 1 18963 25/02/2016

PHOTOS

Hand Dug Pit at TP3/43



Spoil Heap at TP3/43



LOG

0.00	0.15	TOPSOIL
0.15	0.45	Soft dark brown to black sandy gravelly slightly organic SILT/CLAY with
		occasional rootlets
0.45		Grey brown and dark brown clayey/silty sandy GRAVEL with a medium cobble
		content. Sand is coarse. Gravel is angular to subangular coarse. Cobbles are of
		weathered granite.
0.90		OBSTRUCTION - Possible Weathered Granite Rockhead / Boulder

SAMPLES	D	0.15	to	0.45	AA39973
	D	0.15	to	0.45	AA39974
	В	0.15	to	0.45	AA39976
	В	0.45	to	0.90	AA39975

GROUNDWATER Water strike at 0.70m

Appendix 7

Soakaway Test Records

SW3/01 SW3/02



TRIAL PIT RECORD

REPORT NUMBER

18963

TRIAL PIT NO. SW3/01 CONTRACT N6 Galway City Transport Project - Phase 3 SHEET Sheet 1 of 1 **CO-ORDINATES** 529,698.76 E **DATE STARTED** 20/04/2016 LOGGED BY A.Chryst 728,401.42 N DATE COMPLETED 21/04/2016 GROUND LEVEL (m) 13.33 **EXCAVATION** Hitachi Zaxis 80 **CLIENT Galway County Council** METHOD **ENGINEER** ARUP Hand Penetrometer (KPa) Samples Vane Test (KPa) Water Strike Geotechnical Description Elevation Sample Ref Legend Depth Depth (m) TOPSOIL 0.20 13.13 Firm dark brown slightly sandy slightly gravelly CLAY with 0.50 12.83 Firm light brown silty slightly sandy gravelly CLAY with $\overline{\otimes}$ occasional cobbles and occasional boulders. 1.0 1.50 11.83 Obstruction - Possible limestone rockhead End of Trial Pit at 1.50m 2.0 3.0 4.0 **Groundwater Conditions** Dry TP LOG 18963.GPJ IGSL.GDT 16/8/16

Stability Good

IGSL

General Remarks

Pit terminated on possible shallow rockhead



TRIAL PIT RECORD

REPORT NUMBER

18963

CONTRACT N6 Galwa		N6 Galway City Transport Project	way City Transport Project - Phase 3					TRIAL PIT NO. SW3/02 SHEET Sheet 1 of 1				
LOGGED BY A.Chryst CLIENT Galway County Council ENGINEER ARUP		GROUND LEVEL (m)		532,683.26 E 728,117.63 N 21.03			DATE STARTED 26/04/ DATE COMPLETED 27/04/		4/2016 4/2016			
									Hitad	Hitachi Zaxis 80		
				Legend	Depth (m)	Elevation		Samples		'a)	neter	
Geotechnical Description			Water Strike				Sample Ref	Туре	Depth	Vane Test (KPa)	Hand Penetrometer (KPa)	
0.0	TOPSOIL Soft to firm brown sandy slightly gravelly SILT/CLAY with rootlets			X X X X X X X X X X X X X X X X X X X	0.20	20.83		AA46069	В	0.50		
1.0	Soft light brown slightly sandy gravelly SILT/CLAY with many cobbles and occasional boulders		0.85		20.18	AA46070	В	1.00				
-	End of	Trial Pit at 1.44m		* (-)	1.44	19.59						
2.0												
- - - -												
3.0												
4.0												
- - -												
- -	Industra:	Conditions										
Groundwater Conditions Dry												
Stability Good												

IGSL TP LOG 18963.GPJ IGSL.GDT 16/8/16

General Remarks

Soakaway Design f -value from field tests **IGSL** Contract: GCTP Phase 3 Contract No. 18963 Test No. SW 3/01 test 1 Client Galway Co Co Date: 20.04.16 Summary of ground conditions Description Ground water 0.00 0.20 TOPSOIL Dark brown sligtly sandy slightly gravelly CLAY with rootlets 0.20 0.50 DRY 0.50 1.50 Light brown silty slightly sandy slightly gravelly CLAY Notes: Field Data Field Test Depth to Depth of Pit (D) 1.50 m Elapsed Width of Pit (B) Water Time 1.15 m (min) Length of Pit (L) 1.50 (m) m 0.85 0.00 Initial depth to Water = 0.85 m Final depth to water = 0.85 0.50 1.40 m 0.85 1.00 Elapsed time (mins)= 1200.00 0.85 1.50 2.00 Top of permeable soil 0.86 0.86 2.50 Base of permeable soil 0.86 3.00 0.86 3.50 0.86 4.00 4.50 0.86 0.86 5.00 Base area= 1.725 m2 0.86 6.00 *Av. side area of permeable stratum over test p 2.00075 m2 0.87 7.00 Total Exposed area = 3.72575 m2 0.87 8.00 0.87 9.00 10.00 Infiltration rate (f) = Volume of water used/unit exposed area / unit time 0.87 0.88 30.00 f= 0.00021 m/min 3.569E-06 m/sec 0.91 90.00 or 1.40 1200.00 Depth of water vs Elapsed Time (mins) 1400.00 1200.00 Elapsed Time(mins) 1000.00 800.00 600.00 400.00 200.00 0.00 0.00 0.50 1.00 1.50 Depth to Water (m)

Soakaway Design f -value from field tests **IGSL** Contract: GCTP Phase 3 Contract No. 18963 Test No. SW 3/01 test 2 Client Galway Co Co Date: 21.04.16 Summary of ground conditions Description Ground water 0.00 0.20 TOPSOIL Dark brown sligtly sandy slightly gravelly CLAY with rootlets 0.20 0.50 DRY 0.50 1.50 Light brown silty slightly sandy slightly gravelly CLAY Notes: Field Data Field Test Depth to Depth of Pit (D) 1.50 m Elapsed Width of Pit (B) Water Time 1.15 m (min) Length of Pit (L) 1.50 (m) m 0.00 Initial depth to Water = 0.82 0.82 m 0.82 0.50 Final depth to water = 1.28 m 0.82 1.00 Elapsed time (mins)= 1365.00 0.82 1.50 2.00 Top of permeable soil 0.82 0.82 2.50 Base of permeable soil 0.82 3.00 0.82 3.50 0.82 4.00 4.50 0.82 0.82 5.00 Base area= 1.725 m2 0.82 6.00 *Av. side area of permeable stratum over test p m2 2.385 0.82 7.00 Total Exposed area = 4.11 m2 0.82 8.00 0.82 9.00 10.00 Infiltration rate (f) = Volume of water used/unit exposed area / unit time 0.82 0.84 30.00 f= 0.00014 m/min 2.357E-06 m/sec 0.86 90.00 or 1.28 1365.00 Depth of water vs Elapsed Time (mins) 1600.00 1400.00 Elapsed Time(mins) 1200.00 1000.00 800.00 600.00 400.00 200.00 0.00 0.00 0.50 1.00 1.50 Depth to Water (m)

Soakaway Design f -value from field tests **IGSL** Contract: GCTP Phase 3 Contract No. 18963 Test No. SW 3/01 test 3 Client Galway Co Co Date: 22.04.16 Summary of ground conditions Description Ground water 0.00 0.20 TOPSOIL Dark brown sligtly sandy slightly gravelly CLAY with rootlets 0.20 0.50 DRY 0.50 1.50 Light brown silty slightly sandy slightly gravelly CLAY Notes: Field Data Field Test Depth to Depth of Pit (D) 1.50 m Elapsed Width of Pit (B) Water Time 1.15 m (min) Length of Pit (L) 1.50 (m) m 0.79 0.00 Initial depth to Water = 0.79 m 0.79 0.50 Final depth to water = 0.84 m 0.79 1.00 Elapsed time (mins)= 90.00 0.79 1.50 Top of permeable soil 0.79 2.00 m 0.79 2.50 Base of permeable soil 0.79 3.00 0.79 3.50 0.79 4.00 4.50 0.79 5.00 0.79 Base area= 1.725 m2 0.79 6.00 *Av. side area of permeable stratum over test p m2 3.6358 0.79 7.00 Total Exposed area = 5.3608 m2 0.79 8.00 0.79 9.00 10.00 Infiltration rate (f) = Volume of water used/unit exposed area / unit time 0.79 0.81 30.00 f= 0.00017 m/min 2.86E-06 m/sec 0.82 45.00 or 0.84 90.00 Depth of water vs Elapsed Time (mins) 100.00 90.00 Elapsed Time(mins) 80.00 70.00 60.00 50.00 • 40.00 30.00 20.00 10.00 0.00 0.78 0.79 0.80 0.81 0.82 0.83 0.84 0.85 Depth to Water (m)

Soaka	away D	Design	f -val	ue fro	m field	tests	IGSL
Contract:	GCTP Phas	se 3				Contract No.	18963
	SW 3/02						
Client	Galway Co	Со					
Date:	26.04.16						
_	of ground o						I .
from	to		Description				Ground water
0.00	0.20	TOPSOIL					
0.20	0.85				LAY with root		DRY
0.85	1.44	Light brown sl cobbles and o		-	silty SILT/CLA	with many	
Notes:		coppies and o	ccasional be	diders			
E: 11.5 ·				F: 11.			
Field Data				Field Test	<u>t</u>		
Depth to	Elapsed			Depth of	Pit (D)	1.44]m
Water	Time			Width of		1.10	m
(m)	(min)			Length of		1.30	m
(111)	(11111)			zengai 0	(L)	1.50	7
0.85	0.00			Initial der	oth to Water =	0.85]m
0.85	0.50				th to water =	1.16	m
0.85	1.00				ime (mins)=	348.00	
0.85	1.50			apoca t	(/////////	3 10.00	1
0.85	2.00			Top of ne	ermeable soil]m
0.85	2.50				ermeable soil		m
0.85	3.00			2430 OI P	J.11100010 3011		٦
0.85	3.50						
0.85	4.00						
0.85	4.50						
0.85	5.00			Base area	1=	1.43	lm2
0.85	6.00	*Av. side area	of permeat		1 over test per		m2
0.86	7.00				osed area =	3.518	m2
0.86	8.00					0.0.0	J–
0.86	9.00						
0.87	10.00	Infiltration rat	e (f) =	Volume o	f water used/	unit exposed are	a / unit time
0.90	30.00	1	. ,			,	-
1.00	90.00	f=	0.0004	m/min	or	6.03E-06	m/sec
1.16	348.00	-	•		-		
	400.00 -	Dep	th of water	vs Elapse	d Time (mins)		
(90	350.00 - 300.00 - 250.00 - 200.00 -						
Ē	300.00 -						\dashv
و	250.00 -						_
E ;	- 200.00 -						
ī a	150.00						
ב ב	150.00 - 100.00 -						
<u>п</u>	100.00 -				*		\dashv
	50.00 -						
	0.00 -		ı		*		
	0.	00	0.50		1.00		1.50
			De	epth to W	ater (m)		

Soaka	way D	esign f -value	e from field tes	sts	IGSL
	GCTP Phase			Contract No.	18963
Test No.	SW 3/02				
Client	Galway Co	Co			
Date:	27.04.16				
Summary c	of ground co				
from	to	Description			Ground water
0.00		TOPSOIL			
0.20		Brown sandy slighlty grave			DRY
0.85	1.44	Light brown slightly sandy and occasional boulders	gravelly silty SIL1/CLAY w	with many cobbles	
lotes:					
ield Data			Field Test		
Depth to	Elapsed		Depth of Pit (D)	1.44	m
Water	Time		Width of Pit (B)	1.10	m
(m)	(min)		Length of Pit (L)	1.30	m
0.83	0.00		Initial depth to Water =	0.83	m
0.83	0.50		Final depth to water =	1.44	m
0.83	1.00		Elapsed time (mins)=	1403.00	
0.83	1.50				
0.83	2.00		Top of permeable soil		m
0.83	2.50		Base of permeable soil		m
0.83	3.00				
0.83	3.50				
0.83	4.00				
0.85	4.50		Page area-	1 // 2	m2
0.83	5.00 6.00	*Av. side area of permeable	Base area=	1.43 1.464	m2 m2
0.84	7.00	Av. side alea di perificable	e stratum over test period Total Exposed area =	2.894	m2
0.84	8.00		. Jean Exposed area -	2.057	
0.84	9.00				
0.85		Infiltration rate (f) =	Volume of water used/ur	nit exposed area /	unit time
0.89	30.00	()		,	-
0.98	90.00	f= 0.00021	m/min or	3.581E-06	m/sec
1.44	1403.00	. 0.0001	,	0.00.2	, 555
	1600.00	Depth of water v	rs Elapsed Time (mins)		\neg
	1400.00	_		•	_
į.	1200.00				
ي ع	100000				
Ē	1000.00				
E #	800.00				
– a Janced Time(minc)	600.00				
2	400.00				
ш	•				
	200.00		•		
	0.00	100	*	1.50	
	C	0.00 0.50	1.00	1.50	2.00
		D	epth to Water (m)		
		U	epui to water (iii)		

Soaka	way D	esign f -value	e from field to	ests	IGSI
Contract:	GCTP Phas	se 3		Contract No.	18963
	SW 3/02				
	Galway Co	Co			
	28.04.16	and the transport			
	of ground o				Constant
from	to	Description			Ground water
0.00	0.20	TOPSOIL	CILT/CLAYth		
0.20	0.85	Brown sandy slighlty gravelly			DRY
0.85	1.44	Light brown slightly sandy g cobbles and occasional bould		with many	
Notes:		•			
Field Data		E	ield Test		
Depth to	Elapsed		epth of Pit (D)	1.44	m
Water	Time		Vidth of Pit (B)	1.10	m
(m)	(min)	L	ength of Pit (L)	1.30	m
0.81	0.00	lr.	nitial depth to Water =	0.81	lm
0.82	0.50		inal depth to water =	0.97	m
0.82	1.00		lapsed time (mins)=	90.00	
0.82	1.50	_		30.00	I
0.82	2.00	т	op of permeable soil		lm
0.82	2.50		Base of permeable soil		m
0.82	3.00		acc of permeable soil		ı
0.82	3.50				
0.82	4.00				
0.82	4.50				
0.83	5.00	R	Base area=	1.43	m2
0.83	6.00	*Av. side area of permeable			m2
0.83	7.00		otal Exposed area =	4.07	m2
0.83	8.00		otal Exposod aloa	1101	···-
0.83	9.00				
0.84	10.00	Infiltration rate (f) = V	olume of water used/ur	nit exposed area	/ unit time
0.87	30.00		oldine of water asca, ar	пс схрозей игей	, and three
		f= 0.0006 r	n/min or	1.041E-05	m/000
0.90	45.00	1= 0.0006 r	n/min or	1.0416-05	m/sec
0.97	90.00				
	100.00 -	Depth of water vs	Elapsed Time (mins)		
	90.00 -			•	
(v				•	
– в Flansed Time(mins)	70.00				
je (r	60.00				
_ <u> </u>	EO 00				
E +	50.00		•		
. 9	40.00 -				_
<u></u>	30.00 -	•			
	20.00 -				=
	10.00	- AMM			\dashv
	0.00 -		Т	Т	_
	0.	80 0.85	0.90).95	1.00
		Don	th to Water (m)		
		Den	THE REPORT OF THE PARTY OF THE		
		200	an co macon (m)		

Falling Head Permeability Test Records

BH3/35R

BH3/46R

BH3/47R

BH3/48R

MW3

Varia	ible Head	d Permea	ability	Test Repo	ort Sheet		IGSL	.(F4B)
ontract:	GCTP Phase	3		TEST RES	PONSE ZONE D	ETAILS	:	
umber	18963							
lient:	Galway Co C	0	Top (mbg	ıl):				12.0
ngineer	ARUP		Bottom (nbgl):				18.0
ocation	BH3/35	(Elev.=17.521	Length (r	n):				6.0
ole No.	BH3/35		*** Diame	ter (m):				0.10
est No.	1		Initial Sta	nding Water Lev	/el			9.0
ate	27/04/2016		(m below	top of casing / s	standpipe):			
Elapsed	Depth	Ht/Ho	Height of	casing or stand	pipe:			0.3
Time	to Water*		above gr	ound level (m)				
(mins)	(m)		Falling o	Rising Head Te	st?	F	alling	
0.00	0.94	1.00						
0.25	1.69	0.91	1.0	00 🗖				
0.50	2.13	0.85	1.'	" I				
0.75	2.62	0.79		8				
1.00	2.82	0.77						
1.50	3.40	0.70		<u> </u>				
2.00	3.88	0.64		<u> </u>				
2.50	4.30	0.59		10				
3.00	4.72	0.53		 				
4.00	5.33	0.46		11				
5.00	5.81	0.40						
6.00	6.14	0.36		4 \				
7.00	6.45	0.32	0	 ₽				
8.00	6.70	0.29	Ht/Ho	<u> </u>				
9.00	6.98	0.25	ΙΞ	<u> </u>				
10.00	7.22	0.22		I				
11.00	7.26	0.22		7				
12.00	7.38	0.20		Q				
13.00	7.53	0.19		 				
14.00	7.71	0.16						
15.00	7.77	0.16						
16.00	7.84	0.15		🕇				
17.00	7.94	0.14		i i				
18.00	7.95	0.13						
19.00	7.98	0.13						
20.00	8.06	0.12	0.	10 1				
25.00	8.32	0.09		0.00	50.00		10	00.00
30.00	8.50	0.07			Time (min)			
40.00	8.63	0.05			Time (min)			
50.00	8.75	0.04						
60.00	8.84	0.02	**Diamete	er of standpipe/bo	rehole (m)			0.10
70.00	8.87	0.02		onal area of BH/S	· /	A=		0.0080
80.00	8.90	0.02	Shape Fa		ap.po	F=		9.023
00.00	3.00	0.00		each Ht/Ho = 0.37	(sec)	T=		3.020
		0.00		ted Yes/No	(555)	'		1
		0.00		t of Permeability	(A/FT) (m/s)	K=		2.61E-0
		0.00	Socilioiei	Corr Cirricability	(, 4,1,1) (111/3)	11—		2.0 IL-(

Depth of water below top of casing/standpipe 'A' is calculated from the standpipe or piezometer tube, or the borehole casing diameter if the test is carried out during the course of boring operations.

^{***} This is normally the diameter of the borehole since the response zone includes the gravel surround Time lag is taken as the elapsed time corresponding to a value of H/Ho = 0.37. If H/Ho does not reach 0.37, it will be necessary to extrapolate the graph and assess the time.

Varia	able Head	ole Head Permeability Test Report Sheet GCTP Phase 3 TEST RESPONSE ZONE DETAIL							
Contract:	GCTP Phase	3		TEST RES	PONSE ZONE D	ETAILS:			
lumber	18963								
Client:	Galway Co Co)	Top (mbg	gl):			12.		
ngineer	ARUP		Bottom (mbgl):			18.		
ocation	BH3/35	(Elev.=17.521	Length (ı	n):			6.		
lole No.	BH3/35		*** Diame	eter (m):			0.10		
est No.	2		Initial Sta	inding Water Lev	/el		9.		
ate	27/04/2016		(m below	top of casing /	standpipe):				
Elapsed	Depth	Ht/Ho	Height of	casing or stand	pipe:		0.		
Time	to Water*		above gr	ound level (m)					
(mins)	(m)		Falling o	r Rising Head Te	st?	Fa	alling		
0.00	0.00	1.00							
0.25	1.00	0.89	1	00 🖵					
0.50	1.44	0.84	I '''	T L					
0.75	1.76	0.81		<u> </u>					
1.00	2.14	0.76		<u> </u>					
1.50	2.95	0.67		44					
2.00	3.29	0.64		F					
2.50	3.82	0.58		10					
3.00	4.20	0.54		 					
4.00	4.92	0.46		11					
5.00	5.42	0.40							
6.00	5.88	0.35		 					
7.00	6.23	0.31	0						
8.00	6.57	0.27	он/4н	I					
9.00	6.82	0.25	Ξ	1 7					
10.00	6.94	0.23		 					
11.00	7.08	0.22		<mark> </mark>					
12.00	7.22	0.20		<u> </u>					
13.00	7.36	0.19		 					
14.00	7.49	0.17		<u> </u>					
15.00	7.61	0.16		70-0-0					
16.00	7.72	0.15		7					
17.00	7.82	0.13							
18.00	7.90	0.13							
19.00	7.95	0.12		7					
20.00	7.98	0.12	0.	10					
25.00	8.29	0.08		0.00	50.00		100.00		
30.00	8.46	0.06			Time a (main)				
40.00	8.69	0.04			Time (min)				
50.00	8.74	0.03							
60.00	8.83	0.02	**Diamete	er of standpipe/bo	rehole (m)		0.10		
70.00	8.85	0.02		onal area of BH/S		A=	0.008		
80.00	8.87	0.02	Shape Fa		apipo	F=	9.023		
00.00	3.07	0.02		each Ht/Ho = 0.37	(sec)	T=	3.023		
		0.00		ted Yes/No	(555)	. –	J		
		0.00		nt of Permeability	(A/FT) (m/s)	K=	2.67E-		
		0.00		it of Formicability	(, 41 1) (111/3)	11-	∠.01 ∟-		

Depth of water below top of casing/standpipe

^{&#}x27;A' is calculated from the standpipe or piezometer tube, or the borehole casing diameter if the test is carried

out during the course of boring operations.

*** This is normally the diameter of the borehole since the response zone includes the gravel surround Time lag is taken as the elapsed time corresponding to a value of H/Ho = 0.37. If H/Ho does not reach 0.37, it will be necessary to extrapolate the graph and assess the time.

Varia	able Head	Permea	ability Te	est R	eport	She	eet		IGS	L(F4E
Contract:	GCTP Phase	3		TEST	RESPON	ISE ZO	ONE DE	TAILS	S:	
Number	18963									
Client:	Galway Co Co)	Top (mbgl):							13
Engineer	ARUP		Bottom (mbg	gl):						16
Location	BH3/46	(Elev.=29.882	Length (m):							3
Hole No.	BH3/46	•	*** Diameter	(m):						0.10
Test No.	1		Initial Standi	ing Wate	r Level					12
Date	08/04/2016		(m below top	of casi	ng / stand	dpipe)	:			
Elapsed	Depth	Ht/Ho	Height of cas	sing or s	standpipe):				0
Time	to Water*		above groun	nd level (m)					
(mins)	(m)		Falling or Ri		•				Falling	l
0.00	12.32	1.00								
0.50	12.39	0.88	1.00 (
1.00	12.42	0.83	1.00 (T						
1.50	12.45	0.78	1	<u>R</u>						
2.00	12.47	0.74		₫						
2.50	12.48	0.72		₽						
3.00	12.49	0.71		E						
3.50	12.50	0.69		┫┈ ╬						
4.00	12.51	0.67			դ					
4.50	12.52	0.66			'					
5.00	12.52	0.66			 					
6.00	12.52	0.64		4	- \					
7.00	12.54	0.62								
8.00	12.55	0.60	он/лн		🖳					
9.00	12.55	0.60	1 2		\bot					
10.00	12.57	0.57								
11.00	12.60	0.53				\				
						P				
12.00	12.61	0.50								
13.00	12.62	0.48								
14.00	12.64	0.45					, j			
15.00	12.65	0.43					\			
16.00	12.66	0.41					\			
17.00	12.68	0.38								
18.00	12.69	0.36					$ \setminus $			
19.00	12.70	0.34	0.10				<mark> </mark>			
20.00	12.71	0.33	0.10	00			4.0	00	-	00.00
25.00	12.77	0.22	0.	.00	20.00	J	40.	.00		60.00
30.00	12.80	0.17				Time	(min)			
35.00	12.84	0.10					,			
40.00	12.87	0.05								
45.00	12.89	0.02	**Diameter of	f standpip	oe/boreho	le (m)				0.10
50.00	12.90	0.00	** X-sectiona					A=		0.008
		0.00	Shape Factor					F=		5.264
		0.00	Time to reach		0.37 (sed	c)		T=		10
		0.00	Extrapolated		(-5)	,		•		
		0.00	Coefficient of		bility (A/F	T) (m/	s)	K=		1.46E
		0.00			, (, ,,	, (,	,	. •		

Notes
* Depth of water below top of casing/stand

Depth of water below top of casing/standpipe
 'A' is calculated from the standpipe or piezometer tube, or the borehole casing diameter if the test is carried out during the course of boring operations.

^{***} This is normally the diameter of the borehole since the response zone includes the gravel surround Time lag is taken as the elapsed time corresponding to a value of H/Ho = 0.37. If H/Ho does not reach 0.37, it will be necessary to extrapolate the graph and assess the time.

			ability Te	st Report Sheet	IGSL(F4B
Contract:	GCTP Phase	3		TEST RESPONSE ZONE DE	TAILS:
Number	18963				
Client:	Galway Co Co)	Top (mbgl):		9.
Engineer	ARUP		Bottom (mbgl):	12.
Location	BH3/47	(Elev.=37.737			3.
Hole No.	BH3/47		*** Diameter (0.10
Test No.	1			g Water Level	10.
Date	06/04/2016			of casing / standpipe):	
Elapsed	Depth	Ht/Ho		ing or standpipe :	0.
Time	to Water*		above ground		
(mins)	(m)		Falling or Ris	ing Head Test?	Falling
0.00	7.68	1.00			
0.50	7.94	0.91	1.00 📮		
1.00	7.99	0.89	l I		
1.50	8.02	0.88			
2.00	8.05	0.87	l T		
2.50	8.08	0.86			
3.00	8.11	0.84		<u> </u>	
3.50	8.13	0.84	1		
4.00	8.15	0.83	I ∔		
4.50	8.17	0.82			
5.00	8.19	0.82		$ \cdot	
6.00	8.21	0.81	I I		
7.00	8.23	0.80	우		
8.00	8.25	0.79	OH/JH		
9.00	8.27	0.79	-		
10.00	8.30	0.78			
11.00	8.32	0.77			
12.00	8.35	0.76	l 1		
13.00	8.37	0.75	1		
14.00	8.39	0.74			
15.00	8.41 8.43	0.74 0.73			
16.00	8.46	0.73			
17.00	8.48	0.72			
18.00 19.00	8.50	0.71			
20.00	8.52	0.70	0.10	<u> </u>	
25.00	8.61	0.70	0.0	0 50.00 100.00 1	150.00 200.00
30.00	8.70	0.63	3.0		200.00
35.00	8.79	0.60		Time (min)	
40.00	8.89	0.56			
45.00	8.98	0.53	**Diameter of	standpipe/borehole (m)	0.10
50.00	9.07	0.50		area of BH/Standpipe	A= 0.008
55.00	9.07	0.30	Shape Factor	area or britotariupipe	F= 5.264
60.00	9.10	0.47		Ht/Ho = 0.37 (sec)	T= 5.204
90.00	9.74	0.43	Extrapolated Y		1- 41
120.00	10.16	0.20		Permeability (A/FT) (m/s)	K= 3.70E-
150.00	10.10	0.00		5odomey (701 1) (111/3)	0.70L-
Notes	1 .5.15	1 0.00	1		

Depth of water below top of casing/standpipe

^{** &#}x27;A' is calculated from the standpipe or piezometer tube, or the borehole casing diameter if the test is carried out during the course of boring operations.

^{***} This is normally the diameter of the borehole since the response zone includes the gravel surround Time lag is taken as the elapsed time corresponding to a value of H/Ho = 0.37. If H/Ho does not reach 0.37, it will be necessary to extrapolate the graph and assess the time.

	riable Hea	d Permea	bility Te	•				SL(F4B)
Contract:	GCTP Phase 3			TEST RE	SPONSE ZO	ONE DETA	ILS:	
Number	18963							
Client:	Galway Co Co		Top (mbgl):					11.00
Engineer	ARUP	(-1 10 -1-)	Bottom (mbg	l):				20.00
Location	BH3/48	(Elev.=40.717)						9.00
Hole No.	BH3/48		*** Diameter					0.1013
Test No.	1			g Water Level			5151515151515151515151	1.76
Date	19/01/2016			of casing / sta				
Elapsed	Depth	Ht/Ho		ing or standpipe	e:		500000000000000000000000000000000000000	0.36
Time	to Water*		above ground					
(mins)	(m)		Falling or Risi	ng Head Test?			Falling]
0.00	0.03	1.00						
0.25	0.74	0.59	1.00 📮					
0.50	1.47	0.17	1					
0.75	1.68	0.05						
1.00	1.74	0.01						
1.50	1.76	0.00	l †					
2.00	1.76	0.00						
		0.00						
		0.00	l ↓					
		0.00						
		0.00						
		0.00	1	7				
		0.00	우					
		0.00	Ht/Ho					
		0.00	=	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \				
		0.00						
		0.00						
		0.00						
		0.00	1 1					
		0.00						
		0.00		7				
		0.00						
		0.00						
		0.00						
		0.00	0.10					
		0.00	0.10	0 0 0	1.00	1 50	2.00	2.50
		0.00	0.0	0 0.50	1.00	1.50	2.00	2.50
		0.00			Time	(min)		
		0.00						
		0.00	dulini		1 1 ()			
		0.00		standpipe/bore			_ ,	0.1013
		0.00		area of BH/Sta	ndpipe		A=	0.00806
		0.00	Shape Factor		, ,		F=	12.49020
		0.00		Ht/Ho = 0.37 (sec)		T=	21
		0.00	Extrapolated `		 \	`		No
		0.00	Coefficient of	Permeability (A	/FT) (m/s	5)	K=	3.14E-05
		0.00						

Depth of water below top of casing/standpipe

^{&#}x27;A' is calculated from the standpipe or piezometer tube, or the borehole casing diameter if the test is carried

out during the course of boring operations.

*** This is normally the diameter of the borehole since the response zone includes the gravel surround

Time lag is taken as the elapsed time corresponding to a value of H/Ho = 0.37. If H/Ho does not reach 0.37, it will be necessary to extrapolate the graph and assess the time.

	riable Hea	d Permea	bility T	est	•				SL(F4B)
Contract:	GCTP Phase 3				TEST RE	SPONSE ZO	ONE DETA	ILS:	
Number	18963								
Client:	Galway Co Co		Top (mbgl)						11.00
Engineer	ARUP	(-1 10 -1-)	Bottom (m						20.00
Location	BH3/48	(Elev.=40.717)							9.00
Hole No.	BH3/48		*** Diamet						0.1013
Test No.	2		Initial Stand					3000000000	1.76
Date	19/01/2016		(m below to						
Elapsed	Depth	Ht/Ho	Height of c			e:		00000000000	0.36
Time	to Water*		above grou						
(mins)	(m)		Falling or R	ising He	ead Test?			Fallin	9
0.00	0.03	1.00							
0.25	1.27	0.28	1.00	-					
0.50	1.59	0.10		A					
0.75	1.71	0.03							
1.00	1.74	0.01		\		$ \cdot \cdot \cdot $			
1.25	1.75	0.01		1					
1.50	1.76	0.00		$\perp \setminus$					
2.00	1.76	0.00		\					
		0.00		\bot					
		0.00							
		0.00							
		0.00							
		0.00	우	T					
		0.00	Ht/Ho						
		0.00	=	1 6					
		0.00							
		0.00			\setminus				
		0.00			\				
		0.00		1					
		0.00							
		0.00							
		0.00							
		0.00							
		0.00							
		0.00	0.10						
		0.00	0.10		0.50	1.00	1 50	2.00	2.50
		0.00		0.00	0.50	1.00	1.50	2.00	2.50
		0.00				Time	(min)		
		0.00							
		0.00	data t		1 1 "	1 1 7 3			0.10:5
		0.00	**Diameter						0.1013
		0.00	** X-section		of BH/Sta	ndpipe		A=	0.00806
		0.00	Shape Facto					F=	12.49020
		0.00	Time to rea			sec)		T=	12
		0.00	Extrapolate			(FT) (:	`		No
		0.00	Coefficient	of Perm	eability (A	/FI) (m/s)	K=	5.46E-05
		0.00							

Depth of water below top of casing/standpipe

^{&#}x27;A' is calculated from the standpipe or piezometer tube, or the borehole casing diameter if the test is carried

out during the course of boring operations.

*** This is normally the diameter of the borehole since the response zone includes the gravel surround

Time lag is taken as the elapsed time corresponding to a value of H/Ho = 0.37. If H/Ho does not reach 0.37, it will be necessary to extrapolate the graph and assess the time.

Var		d Permea	bility Test	•			SL(F4B)
Contract:	GCTP Phase 3			TEST RESPO	NSE ZONE DET	AILS:	
Number	18963		- () (11.00
Client:	Galway Co Co		Top (mbgl):				11.00
Engineer	ARUP	(5) 40 717)	Bottom (mbgl):				20.00
Location	BH3/48	(Elev.=40.717)					9.00
Hole No.	BH3/48		*** Diameter (m)				0.1013
Test No.	3		Initial Standing W		to a No	3000000000	1.76
Date	19/01/2016	111.711	(m below top of		ipe):		0.20
Elapsed	Depth	Ht/Ho	Height of casing				0.36
Time	to Water*		above ground lev				
(mins)	(m)		Falling or Rising H	lead Test?		Fallin	g
0.00	0.03	1.00					
0.25	1.16	0.35	1.00 🖵				
0.50	1.60	0.09	I				
0.75	1.72	0.02					
1.00	1.74	0.01					
1.25	1.75	0.01	I I				
1.50	1.76	0.00					
		0.00					
		0.00					
		0.00		\			
		0.00		\			
		0.00		7			
		0.00	우	7			
		0.00	Ht/Ho				
		0.00	=				
		0.00					
		0.00					
		0.00					
		0.00	1				
		0.00					
		0.00					
		0.00					
		0.00					
		0.00					
		0.00	0.10				
		0.00	0.10	0.50	1.00	1.50	2.00
		0.00	0.00	0.50	1.00	1.50	2.00
		0.00			Time (min)		
		0.00			- •		
		0.00	lule:	1	/ \		
		0.00	**Diameter of sta			└──	0.1013
		0.00	** X-sectional are	a of BH/Standp	ipe	A=	0.00806
		0.00	Shape Factor			F=	12.49020
		0.00	Time to reach Ht/)	T=	14
		0.00	Extrapolated Yes/				No
		0.00	Coefficient of Per	meability (A/FT) (m/s)	K=	4.58E-05
		0.00					

Depth of water below top of casing/standpipe

^{&#}x27;A' is calculated from the standpipe or piezometer tube, or the borehole casing diameter if the test is carried

out during the course of boring operations.

*** This is normally the diameter of the borehole since the response zone includes the gravel surround

Time lag is taken as the elapsed time corresponding to a value of H/Ho = 0.37. If H/Ho does not reach 0.37, it will be necessary to extrapolate the graph and assess the time.

Varia	able Head	Permea	ability Test Report Sheet	IGSL	(F4B)
ontract:	GCTP Phase	3	TEST RESPONSE ZONE DET	AILS:	
lumber	18963		- (1		
lient:	Galway Co Co)	Top (mbgl):		0.6
ingineer	ARUP	/=·	Bottom (mbgl):		7.5
ocation	MW3	(Elev.=15.000			6.8
lole No.	MW3		*** Diameter (m):		0.150
est No.	1		Initial Standing Water Level		5.4
ate	28/04/2016		(m below top of casing / standpipe):		
Elapsed	Depth	Ht/Ho	Height of casing or standpipe :		0.3
Time	to Water*		above ground level (m)		
(mins)	(m)		Falling or Rising Head Test?	Falling	
0.00	0.98	1.00			
0.25	1.06	0.98	1.00		
0.50	1.13	0.97	1.00		
0.75	1.20	0.95			П
1.00	1.24	0.94		++++++	+
1.50	1.25	0.94			\sqcup
2.00	1.27	0.93			
2.50	1.27	0.93			
3.00	1.27	0.93			
3.50	1.28	0.93			
4.00	1.28	0.93		$\downarrow $	
4.50	1.29	0.93		\longrightarrow	
5.00	1.29	0.93		+	
6.00	1.30	0.93	НИНО		
7.00	1.31	0.93	 		
8.00	1.32	0.93			
9.00	1.33	0.92			
10.00	1.33	0.92			
11.00	1.34	0.92			
12.00	1.34	0.92			
	1.34	0.92			
13.00 14.00	1.34	0.92			
15.00	1.34	0.92			
16.00	1.34	0.92			
17.00	1.35	0.92	0.10		Ш
18.00	1.35	0.92	0.00 500.00 1000.001500.002000	002500 0030	. -
19.00	1.35	0.92	0.00 000.00 1000.001000.002000	.502500.0030	,00.00
20.00	1.35	0.92	Time (min)		
25.00	1.36	0.91			
30.00	1.37	0.91			0.1-
35.00	1.38	0.91	**Diameter of standpipe/borehole (m)		0.10
40.00	1.39	0.91	** X-sectional area of BH/Standpipe	A=	0.008
45.00	1.40	0.90	Shape Factor		10.848
60.00	1.43	0.90	Time to reach Ht/Ho = 0.37 (sec)	T=	1498
120.00	1.51	0.88	Extrapolated Yes/No		Y
2500.0	3.75	0.37	Coefficient of Permeability (A/FT) (m/s)	K=	4.96E-
		0.00			

Depth of water below top of casing/standpipe

^{** &#}x27;A' is calculated from the standpipe or piezometer tube, or the borehole casing diameter if the test is carried out during the course of boring operations.

^{***} This is normally the diameter of the borehole since the response zone includes the gravel surround Time lag is taken as the elapsed time corresponding to a value of H/Ho = 0.37. If H/Ho does not reach 0.37, it will be necessary to extrapolate the graph and assess the time.

Plate Bearing Tests

TP3/23

TP3/37

TP3/39

TP3/40

PLATE T	EST REPORT SHEET (F	3.1)		Applied Press	sure/Settlement	Curve	
Reference No. Contract Test No. Location Depth Client Plate Diameter: Test Method Technician Authorised by Date	R71365 GCTP Phase 3 PBT TP3/23 Load E=533040.762, N=728019.8 1.20m bgl Galway County Council 450 mm BS 1377: Part 9: 1990 Test4 AC H. Byrne 19/01/2016			Description of soil un (natural soil, placed f Sandy slightly gravel) Sample Ref No	ill, sub-base)	I G S L	1 N A B NORMER TESTING
			Pressure / S	ettlement			
0.00	10	20	30	40	50	60	70
-1.00 <u>E</u>							
100.2.00							
-1.00							
-4.00							
-5.00	-			-			•
-6.00			Pressu	ire (kN/m2)			
Modulus of subgra	nm settlement intersection = 28 ade reaction = 18 MPa/m applied = 0.64 as per HD 25-26		Equivalent Cl	3R value in accordance with N	IRA HD25-26/10	1.5 %	

	EST REPORT S	SHEET (F3.1)		Арр	lied Pressu	re/Settlem	ent Curve			
Reference No. Contract Test No. Location Depth Client Plate Diameter: Test Method Technician Authorised by Date	1.20m bgl Galway County Co 450	N=728019.859, Elev			(natural	on of soil unde soil, placed fill, ghtly gravelly	sub-base)	lç	I G S L	SO 17005 I V AB ACCOUNTS
				Pressure / S	Settlement					
0.00	10	20	30	40	50	60	70	80	90	100
-0.20 (E)										
Settlement (mm) 0.40 -0.00 -0.00 -0.00 -0.00										
% -0.80							_			
-1.00						•				
-1.20										
-1.40				Press	ure (kN/m2)				_	
Gradient at 1.25 n Modulus of subgra	de reaction = 48 M	lPa/m		Equivalent C	BR value in acco	rdance with NRA	A HD25-26/10		7.9 %	

PLATE T	EST REPORT SHEET (F3.1)		Applied Pres	sure/Settlement Curve)	
Reference No. Contract Test No. Location Depth Client Plate Diameter: Test Method Technician Authorised by Date	R71980 GCTP Phase 3 PBT TP3/37 Load E=521359.173, N=722614.435, Elev=10. 0.45m bgl Galway County Council 450 mm BS 1377: Part 9: 1990 Test4 - Increment AC H. Byrne 18/04/2016				I G S L	IVN AB ACCEPTED ASSESSMENT COMMENT SCOPE (C) 17,1933
		Pressure / Se	ttlement			
0.00 -0.50 -	20 40	60	80	100	120	140
-5.00		Pressur	re (kN/m2)			
Modulus of subgra	nm settlement intersection = 40 ide reaction = 26 MPa/m applied = 0.64 as per HD 25-26/10		R value in accordance with	NRA HD25-26/10	2.7 %	

PLATE T	EST REPORT SHEET (F3.1)	Applied Pressure/Settlement Curve	
Reference No. Contract Test No. Location Depth Client Plate Diameter: Test Method Technician Authorised by Date	R71980 GCTP Phase 3 PBT TP3/37 Reload E=521359.173, N=722614.435, Elev=10.00.45m bgl Galway County Council 450 mm BS 1377: Part 9: 1990 Test4 - Incrementa AC H. Byrne 18/04/2016	GRAVEL with many angular cobbles and occasional boulders of granite	IVN AB ACTORISM ACTORISM GENERAL BY REDY RES TO 1933
		Pressure / Settlement	
0.00 0 -0.20	50	100 150 200 250	300
Settlement (mm)			
-1.00			
-1.20			
-1.40		Pressure (kN/m2)	
Modulus of subgra	nm settlement intersection = 205 ide reaction = 132 MPa/m applied = 0.64 as per HD 25-26/10	Equivalent CBR value in accordance with NRA HD25-26/10 45.5 %	

PLATE T	EST REPORT SHEET (F3.1)		Applied Press	sure/Settlement Curv	'e	
Reference No. Contract Test No. Location Depth Client Plate Diameter: Test Method Technician Authorised by Date	R71981 GCTP Phase 3 PBT TP3/39 Load E=525045.941, N=725382.414, Elev=49. 0.40m bgl Galway County Council 450 mm BS 1377: Part 9: 1990 Test4 - Increment: AC H. Byrne 18/04/2016		Description of soil ur (natural soil, placed the Brown sandy angular granite with many ar Sample Ref No.	I G S L	NAB NAB NOTITION PERSING CHAMES OF TOP SECONDARY	
		Pressure / Se	ettlement			
0.00	20 40	60	80	100	120	140
-0.50 E	-					
1.00 lend						
Settlement (mm) 1.00						
-2.00						
-2.50		-				
-3.00		Pressu	re (kN/m2)			
Modulus of subgra	mm settlement intersection = 49 ade reaction = 31 MPa/m applied = 0.64 as per HD 25-26/10	Equivalent CE	BR value in accordance with N	NRA HD25-26/10	3.8 %	

1 Phase 3 Plase 4 Plase 49.7 Plase 49.				I G S L	IVAB NAB COURTE ISSING GENALED WASCOPE RES TO \$3.33
		Бериі	m bgl		
	Pressure / S	Settlement			
50 100	150	200	250	300	350
	Press	ure (kN/m2)			
	ement intersection = 250 ion = 161 MPa/m	Pressument intersection = 250	Pressure (kN/m2)	50 100 150 200 250 Pressure (kN/m2) ement intersection = 250	Pressure (kN/m2)

PLATE T	EST REPORT SHEET	(F3.1)		Applied Pressure/Settlement Curve							
Reference No. Contract Test No. Location Depth Client Plate Diameter: Test Method Technician Authorised by Date	R71982 GCTP Phase 3 PBT TP3/40 Load E=525397.630, N=72567 0.35m bgl Galway County Council 450 mm BS 1377: Part 9: 1990 Te AC H. Byrne 18/04/2016					I G S L	IVN ABB ACCOUNTS TO SERVE AND TO SERVE AND TO SERVE AND TO SERVE AND TO A 1 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3				
			Pressure /	Settlement							
0.00	20	40	60	80	100	120	140				
-0.50											
(min 1.00											
1.50											
2.00											
-2.50											
-3.00											
-3.50											
-4.00			Press	sure (kN/m2)							
Modulus of subgra	mm settlement intersection = ade reaction = 19 MPa/m applied = 0.64 as per HD 25		Equivalent (CBR value in accordance with	NRA HD25-26/10	1.6 %					

PLATE T	EST REPORT SHEET (F3.1)		Applied Pressure/Settlement Curve						
Reference No. Contract Fest No. Location Depth Client Plate Diameter: Fest Method Fechnician Authorised by	R71982 GCTP Phase 3 PBT TP3/40 Reload E=525397.630, N=725677.100, Elev=59.00.35m bgl Galway County Council 450 mm BS 1377: Part 9: 1990 Test4 - Incrementa AC H. Byrne 18/04/2016		Description of soil under test (natural soil, placed fill, sub-ba Brown slightly clayey very san GRAVEL with occasional cobbl	dy fine to coarse	IGSL Ltd. Ids. Ltd.				
		Pressure	/ Settlement	·					
0.00	50	100	150	200	250				
-0.20 -0.40 -0.60 -0.60 -0.80 -0.80									
8 -0.80									
-1.00									
-1.20					•				
-1.40		Pre	ssure (kN/m2)						

Window Sample Records

WS3/01

WS3/02

WS3/03



REPORT NUMBER

	isl/	VIIIVDO	** 07		. ILU				18	963	
	TRACT N6 Galway City Transport Project - F	Phase 3					PROBE SHEET	NO.	WS3/6 Sheet 1		
	DRDINATES 522,765.73 E 724,237.89 N UND LEVEL (mOD) 48.00						DATE LO				
CLIE							SAMPLI		CK JL		
Depth (m)	Geotechnical Description		Legend	Depth (m)	Elevation	Water Strike	Depth of Sample Run (m)	Recovery (%)	Blowcount	Vane Test (KPa)	Hand Penetrometer (KPa)
1.0	Firm dark brown clayey spongy PEAT with free decaying organic roots Firm grey brown sandy slightly gravelly organic with occasional decaying organic remnants. Sa medium to coarse. Gravel is subangular to subfine to medium of limestone. Final Depth 0.50m			0.35 0.50	47.65 47.50		0.00-0.50	100			
3.0											
5.0 Gene	eral Remarks										
Insta	ıllations										



REPORT NUMBER

18963

CON	TRACT N6 Galway City Transport Project - Phase 3					PROBE SHEET	NO.	WS3/6 Sheet 1		
	DRDINATES 531,268.78 E 728,473.95 N					DATE D		08/04/2	016	
GRO	UND LEVEL (mOD) 9.55					DATE LO	JGGED	08/04/2	.016	
CLIE ENGI	NT Galway County Council NEER ARUP					SAMPLI LOGGE		CK JL		
										ter
Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Depth of Sample Run (m)	Recovery (%)	Blowcount	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0	TOPSOIL: Soft brown sandy organic CLAY with frequent rootlets	\(\frac{1}{2\psi \gamma_{\gamma}} \cdot \frac{1}{2\psi \gamma_{\gamma}} \cdot \frac{1}{2\gamma_{\gamma}} \cdot \frac{1}{2\gamma_{\ga	0.20	9.35						
-	Soft to firm light vellow brown sandy gravelly CLAY.		0.20 0.37	9.35						
-	Sand is fine to medium. Gravel is subangular to subrounded fine to medium of limestone.	\(\frac{\sqrt{1}}{\sqrt{1}}\sqrt{\sqrt{1}}\)								
-	Firm dark brown spongy PEAT		0.60	8.95						
-	Soft to firm light grey and light grey brown silty CLAY	× × ×	0.05	0.00		0.00-1.00	95			
1.0	Soft to firm light grey and light yellow grey sandy silty CLAY. Sand is fine to medium.	×	0.95	8.60		0.00-1.00	90			
_	CLAT. Sand is line to medium.									
		×								
-		×								
-										
2.0	Firm occasional firm to stiff light grey sandy gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular	-XO	1.90	7.65		1.00-2.00	90			
- 2.0	to suborunded fine to coarse of limestone.									
-		×								
-			2.80	6.75		2.00-2.80	100			
-	Final Depth 2.80m		2.00	0.75						
3.0										
-										
-										
-										
-										
4.0										
-										
-										
-										
-										
5.0										
-										
Gene	eral Remarks									

Installations

IGSL WS LOG 18963.GPJ IGSL.GDT 12/5/16



REPORT NUMBER

18963

	321										
CON	ITRACT N6 Galway City Transport Project - P	hase 3					PROBE	NO.	WS3/	03	
	ODDINATEO 500 050 00 5						SHEET		Sheet 1	of 1	
	ORDINATES 528,959.08 E 728,090.10 N DUND LEVEL (mOD) 7.63						DATE DI				
CLIE	,						SAMPLI	ED BY	CK	-	
	INEER ARUP						LOGGE		JL		
Depth (m)	Geotechnical Description		Legend	Depth (m)	Elevation	Water Strike	Depth of Sample Run (m)	Recovery (%)	Blowcount	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0	Soft brown sandy slightly gravelly CLAY with or rootlets. Sand is fine to medium. Gravel is subato subrounded fine to coarse of limestone.	angular /		0.25	7.38						
- -	Firm yellow brown sandy gravelly CLAY. Sand medium. Gravel is subangular to subrounded fi coarse of limestone. Angular COBBLE and BOULDER-sized fragme			0.65	6.98						
1.0	strong grey fine grained limestone Final Depth 1.00m	HILS OI		1.00	6.63		0.00-1.00	80			
2.0											
Gen	eral Remarks		I								

IGSL WS LOG 18963.GPJ IGSL.GDT 12/5/16

Installations



REPORT NUMBER

18963

CONTRACT N6 Galway City Transport Project - Phase 3					PROBE SHEET	NO.	WS3/0		
CO-ORDINATES 531,290.25 E 728,447.79 N GROUND LEVEL (mOD) 9.90					DATE DI		08/04/2 08/04/2	016	
CLIENT Galway County Council ENGINEER ARUP						SAMPLED BY LOGGED BY		CK JL	
Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Depth of Sample Run (m)	Recovery (%)	Blowcount	Vane Test (KPa)	Hand Penetrometer (KPa)
O.0 TOPSOIL: Soft dark brown very sandy organic CLAY with frequent roots and rootlets. Sand is fine to coarse. Soft brown sandy gravelly organic CLAY. Sand is fine to medium. Gravel is subangular fine to coarse of limestone. Firm dark brown spongy to fibrous PEAT		0.15 0.40	9.75 9.50						
Soft to firm grey to grey blue sandy gravelly organic CLAY. Sand is fine to coarse. Gravel is subangular to suborunded fine to coarse of limestone. Soft light grey to light grey brown sandy silty CLAY.		1.10 1.30	8.80 8.60		0.00-1.00	70			
Sand is fine to medium. (Medium dense) Grey silty fine to medium SAND Soft to firm grey to light grey brown sandy silty CLAY. Sand is fine to medium.	× · · · · · · · · · · · · · · · · · · ·	1.80 1.90	8.10 8.00		1.00-2.00	67			
Firm light grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of limestone.		2.80	7.10	,	2.00-3.00	15			
- 4.0 Final Depth 4.00m		4.00	5.90		3.00-4.00	95			
General Remarks									

Installations

IGSL WS LOG 18963.GPJ IGSL.GDT 12/5/16





WS3/03





Geophysical Survey Report

MGX File Ref: 6031f-005.doc

N6 Galway City Transport Plan County Galway

Geophysical Survey

Report Status: Final MGX Project Number:6031 MGX File Ref: 6031f-005.doc 3rd July 2016

Confidential Report To:

IGSL Unit FM7 Business Park M7 Business Park Naas Co. Kildare

Report submitted by : Minerex Geophysics Limited

Unit F4, Maynooth Business Campus

Maynooth, Co. Kildare

Ireland

Tel.: 01-6510030 Fax.: 01-6510033 Email: info@mgx.ie Issued by:

Ruth Jackson (Senior Geophysicist)

Hartmut Krahn (Senior Geophysicist)



Subsurface Geophysical Investigations

EXECUTIVE SUMMARY

- 1. Minerex Geophysics Ltd. (MGX) carried out a geophysical survey consisting of 2D-Resistivity and seismic refraction (p-wave) for the ground investigation for the Galway N6 GCTP.
- 2. The main objectives of the survey were to determine ground conditions, estimate the depth to rock and overburden thickness and to check for karst and other possible features that may create a concern during construction.
- 3. The survey was carried out at certain areas within the scheme that were given by the consulting engineers.
- 4. The geophysical surveys carried out show that the subsurface bedrock geology consists of Granite and Limestone.
- 5. The results of direct ground investigations which were on-going at the time of the geophysics survey, are drawn on the plans and show a good fit overall with the geophysics.
- 6. High resistivities and seismic velocities within the Granite section indicate the presence of bedrock close to the surface.
- 7. This Granite would require breaking or blasting and trial breaking of rock is recommended in proposed deep cut areas.
- 8. High resistivities within the Limestone area indicate a clean Limestone, often occurring quite close to the surface. This type of limestone is liable to karstification.
- 9. Zones of lower resistivity within the clean Limestone point towards a weathered or karstified Limestone. Rotary core holes could be drilled at these locations to test for the degree of weathering/karstification.
- 10. Recommendations for targeted trial pits with test breaking and coreholes have been made, based on the geophysics models. These locations may be investigated at a later ground investigation phase.

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List of Tables and Plans:

Title Title	Pages	Document
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Table 1: Geophysical Survey Locations and Acquisition Parameters	2 x A4	6031f-Tab1.xls
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Table 4: Summary of Results and Interpretation in Granite Area	In text	In text
Table 5: Summary of Results and Interpretation in Limestone Area	In text	In text
(Resistivity only)		
Table 6: Summary of Results and Interpretation in Limestone Area	In text	In text
(Resistivity and Seismic Refraction)		
Table 7: Locations of recommended Rotary Core holes	In text	In text
Plan 1a: Survey Locations and Models for GP3/01	1 x A1	6031f_Plans.dwg
Plan 1b: Survey Locations and Models for GP3/02 & GP3/04	1 x A1	6031f_Plans.dwg
Plan 1c: Survey Locations and Models for GP3/03	1 x A1	6031f_Plans.dwg
Plan 1d: Survey Locations and Models for GP3/05	1 x A1	6031f_Plans.dwg
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Plan 1g: Survey Locations and Models for GP3/08	1 x A1	6031f_Plans.dwg
Plan 1h: Survey Locations and Models for GP3/09 & GP3/10	1 x A1	6031f_Plans.dwg
Plan 1i: Survey Locations and Models for GP3/12,GP3/18,GP3/13	1 x A1	6031f_Plans.dwg
Plan 1j: Survey Locations and Models for GP3/14	1 x A1	6031f_Plans.dwg
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Plan 1m: Survey Locations and Models for GP3/23,GP3/24,GP3/25	1 x A1	6031f_Plans.dwg
Plan 1n: Survey Locations and Models for GP3/19	1 x A1	6031f_Plans.dwg
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Plan 2a: Survey Locations and Interpretation for GP3/01	1 x A1	6031f_Plans.dwg
Plan 2b: Survey Locations and Interpretation for GP3/02 & GP3/04	1 x A1	6031f_Plans.dwg
Plan 2c: Survey Locations and Interpretation for GP3/03	1 x A1	6031f_Plans.dwg
Plan 2d: Survey Locations and Interpretation for GP3/05	1 x A1	6031f_Plans.dwg
Plan 2e: Survey Locations and Interpretation for GP3/06	1 x A1	6031f_Plans.dwg
Plan 2f: Survey Locations and Interpretation for GP3/07	1 x A1	6031f_Plans.dwg
Plan 2g: Survey Locations and Interpretation for GP3/08	1 x A1	6031f_Plans.dwg

Minerex Geophysics Limited Report Reference: 6031f-005.doc

Plan 2h: Survey Locations and Interpretation for GP3/09 & GP3/10	1 x A1	6031f_Plans.dwg
Plan 2i: Survey Locations and Interpretation for GP3/12,GP3/18,GP3/13	1 x A1	6031f_Plans.dwg
Plan 2j: Survey Locations and Interpretation for GP3/14	1 x A1	6031f_Plans.dwg
Plan 2k: Survey Locations and Interpretation for GP3/15,GP16,GP3/17	1 x A1	6031f_Plans.dwg
Plan 2I: Survey Locations and Interpretation for GP3/17	1 x A1	6031f_Plans.dwg
Plan 2m: Survey Locations and Interpretation for GP3/23,GP3/24,GP3/25	1 x A1	6031f_Plans.dwg
Plan 2n: Survey Locations and Interpretation for GP3/19	1 x A1	6031f_Plans.dwg
Plan 2o Survey Locations and Interpretation for GP3/20	1 x A1	6031f_Plans.dwg
Plan 2p: Survey Locations and Interpretation for GP3/21	1 x A1	6031f_Plans.dwg

1. INTRODUCTION

1.1 Background

Minerex Geophysics Ltd. (MGX) carried out a geophysical survey for the N6 Galway City Transport Plan. The survey consisted of 2D-Resistivity and seismic refraction (p-wave) measurements.

The survey employed various geophysical methods that complement each other and improve the interpretation. The role of geophysics as a non-destructive fast method is to allow later targeted direct investigations. Those results can be used to improve the initial results and interpretation.

The survey was done at locations selected by the consulting engineers. This report was reviewed after the results from direct ground investigation results were available. Recommendations for targeted direct ground investigation are made in this report. These may be carried out at a future ground investigation stage.

1.2 Objectives

The main objectives of the geophysical survey were:

- To determine the ground conditions under the site
- To determine the depth to rock and overburden thickness
- To estimate the strength/stiffness/compaction of overburden materials and the quality of rock
- To determine the type of overburden and rock
- To detect lateral changes within the geological layers
- To detect possible karstified zones and fracture zones within the rock

1.3 Site Description

The site is located around Galway city, from Bearna in the west to Coolagh, Briarhill in the east.

The geophysical profiles were located at specific chainage locations along the proposed road alignment and the survey was carried out as close as possible to the proposed centre line.

The survey locations are tabulated in Table 1 and shown on maps in the upper frames of the plans. The route crosses mainly over private farmland with one survey area on paved ground.

A weekly programme of works was used to ensure access was arranged in advance of MGX carrying out the geophysical survey. A number of locations within the survey area were overgrown and it was not possible to carry out the geophysics at the time. These locations were returned to at a later date when clearance had been carried out by the client. At some locations the survey lines were meandered through the vegetation after agreeing the path on site with the engineers.

1.4 Geology

The Geological Survey of Ireland bedrock geological map (www.gsi.ie) indicates that the survey area is underlain by both Carboniferous Limestones (Visean Limestone) and Caledonian Granitic rocks (mainly the Errisbeg Townland Granite).

The overburden is predominantly Made Ground and Till derived from either the Limestone or Granite.

Table 2 contains a summary of the geology and survey locations of the individual survey areas.

1.5 Report

This report includes the results and interpretation of the geophysical survey. Maps, figures and tables are included to illustrate the results of the survey. More detailed descriptions of geophysical methods and measurements can be found in GSEG (2002), Milsom (1989) and Reynolds (1997).

The client provided maps of the site and the digital version was used as the background map in this report. Elevations were surveyed on site and are used in the vertical sections.

The interpretative nature and the non-invasive survey methods must be taken into account when considering the results of this survey and Minerex Geophysics Limited, while using appropriate practice to execute, interpret and present the data, give no guarantees in relation to the existing subsurface.

2. GEOPHYSICAL SURVEY

2.1 Methodology

The methodology consisted of using 2D-Resistivity and Seismic Refraction as outlined in the tender documents.

The survey locations are indicated in the top frames of Plans 1a - 1p. The profiles, locations, chainage and parameters are tabulated in Tab. 1.

All geophysical surveys are acquired, processed and reported in accordance with British Standards BS 5930:1999 +A2:2010 'Code of Practice for Site Investigations'.

2.2 2D-Resistivity

The 2D-Resistivity profiles were as continuous as possible along the chainage and 3m or 5m electrode spacing was used. The standard spacing of 5m was used to achieve the maximum depth along the majority of profiles. The exception to this was GP 3/1 and GP3/4 where the maximum cuts were 3.8 and 2.9m respectively and therefore 3m spaced electrodes allowed for more detail in the shallow subsurface.

In concrete and hard standing areas small holes (12mm) were drilled to place the electrodes in them and saline water was added to make a good electrical connection.

The readings were taken with a Tigre Resistivity Meter, Imager Cables, stainless steel electrodes, laptop and ImagerPro acquisition software.

During 2D-Resistivity surveying data is acquired in the form of linear profiles using a suite of metal electrodes. A current is injected into the ground via a pair of electrodes while a potential difference is measured across a second pair of electrodes. This allows for the recording of the apparent resistivity in a two-dimensional arrangement below the profile. The data is inverted after the survey to obtain a model of subsurface resistivities. The generated model resistivity values and their spatial distribution can then be related to typical values for different geological materials.

While the achieved depth may be viewed as greater than required for the proposed project it does not result in a loss of detail or accuracy in the shallow subsurface. It may however provide additional useful information such as detecting areas of possible karstification which may have implications for subsidence or other construction issues.

The penetration depth of a resistivity profile increases towards the centre where it reaches an approx. value of 1/6th of the layout length.

2D-Resistivity has proven zones of anomalous rock/karstified rock with lateral extents of 5 m and more.

2.3 Seismic Refraction

The seismic survey consisted of p-wave seismic refraction profiling at the locations shown on Plans 1a – 1p.

Each of the profiles consisted of 24 geophones with 3 m spacing, resulting in lengths of 69m per profile. Profiles were acquired continuously along chainage to allow for concatenation during the processing stage. The recording equipment consisted of a 24 Channel GEOMETRICS ES-3000 engineering seismograph with 4.5 Hz vertical geophones. The seismic energy source consisted of a hammer and plate. A zero delay trigger was used to start the recording. At least 7 shot points per p-wave profile were used.

In the seismic refraction survey method a p-wave is generated by a source at the surface resulting in energy travelling through surface layers directly and along boundaries between layers of differing seismic wave velocities. Processing of the seismic data allows geological layer thicknesses and boundaries to be established.

Seismic Refraction generally determines the depth to horizontal or near horizontal layers where the compaction/strength/rock quality changes with an accuracy of 10 - 20% of depth to that layer. Where low velocity layers or shadow zones are present (e.g. below solid ground surface) or where layers dip with more than 20 degrees angle the accuracy becomes much less.

The seismic refraction profiles with 69 m individual length have a reasonable penetration depth of around 10m. An internationally accepted maximum depth estimate for a seismic refraction layout is 1/6 of the layout length. The depth penetration varies according to the velocity structure of the subsurface.

2.4 Site Work

The data acquisition was carried out between the 26th of January and 15th of April 2016, which included a period of time away from the site, to allow for overgrown areas to be cleared and access possible for geophysical surveying. The weather conditions were variable throughout the acquisition period. Health and safety standards were adhered to at all times. While working on roadways the area was clearly highlighted by the use of warning signs and cones and a traffic management system was in place.

The locations and elevations were surveyed with a TRIMBLE RTK-GPS to accuracy < 0.02m.

3. RESULTS AND INTERPRETATION

The interpretation of geophysical data was carried out utilising the known response of geophysical measurements, typical physical parameters for subsurface features that may underlay the site, and the experience of the authors.

The interpretation is based on the methods available and the type of bedrock in each area. In some areas only 2D-Resistivity was carried out, so the interpretation is made solely by resistivity. In other areas seismic refraction was done at the same location as the 2D-Resistivity and the interpretation is based on both methods. Table 3 shows the areas along the survey area and the method of interpretation used.

The bedrock geological map of Ireland (www.gsi.ie) shows the granite/limestone boundary occurring at approx. CH8890. This chainage agrees with the survey (Plan 2d) where a sudden change in elevation is present in Area GP 3/5. The interpretation at the start of this area is made for the granite area and the interpretation for the rest of the area follows the limestone area.

Table 3: Interpretation Areas

Interpretation Areas	Chainage (CH)
Granite Bedrock with 2D-Resistivity and Seismic Refraction Survey	5315 – 8325
	Side Road 0 - 600
Limestone bedrock with 2D- Resistivity Survey only	8750 – 10060
	10550 — 11110
	12220 - 12575
Limestone Bedrock with 2D-Resistivity and Seismic Refraction Survey	All other areas
	Limestone bedrock with 2D- Resistivity Survey only

Ground investigation results were available after the survey and the abbreviated borehole logs are indicated on the sections. The rock was generally divided into Limestone/Granite and Weathered Limestone/Granite based on the driller description. Where no description was made in the logs, it was based on the RQD value of more or less than 50%. This can be done only to a certain extent as the rock is very variable and RQD values and fracture index often changes rapidly with depth.

In general, there is a good fit between the boreholes and the geophysical data. In some boreholes a difference in rock level with the geophysical interpretation is evident, those are discussed further below.

3.1 2D-Resistivity Models

The 2D-Resistivity data was positioned and inverted with the RES2DINV inversion package. Overlapping and roll-along profiles were concatenated for a joint inversion. The programme uses a smoothness constrained least-squares inversion method to produce a 2D model of the subsurface model resistivities from the recorded apparent resistivity values. Three variations of the least squares method are available and for this project the Jacobian Matrix was recalculated for the first three iterations, then a Quasi-Newton approximation was used for subsequent iterations. Each dataset was inverted using seven iterations resulting in a typical RMS error of < 3.0%. The resulting models were colour contoured with the same resistivity scale for all profiles and they are displayed as cross sections (Plans 1a - 1p).

Resistivities are characteristic for certain overburden material types. If there is a high content of clay minerals (which are electrically conductive) then the overburden resistivity will be lower than as if there is a high content of clastic grains like sand or gravel. The purer the clay and the lower the sand/gravel content the lower the resistivity. The water content in the overburden also influences the resistivities but generally the clay content has a larger effect.

The resistivities cover a range typical for materials from clay rich overburden (low resistivities) to fresh strong unweathered bedrock (high resistivities). The ranges have been taken into the consideration for the interpretation.

Within bedrock types like clean limestone and granite high resistivities indicate a fresh strong unweathered rock. As the weathering in the rock increases the resistivity gets lower because of weathering products, remineralisation of rock and infill of cracks, faults and voids with clay and water. Weathering within rock is typically indicated by lower resistivity values in the cross sections.

In limestone areas karstified rock is defined in this report as a formerly intact clean limestone rock, liable to karstification, that has been partially dissolved by water over long geological time scales and where the cavities and voids have either remained empty (filled by air) or became filled by overburden sediment (clay, silt, sand), weathering product of the broken rock itself or water. This process would lead to a reduction of the resistivity of the overall rock and therefore karstified rock has a lower resistivity than intact clean limestone rock.

3.2 Seismic Refraction Models

The seismic refraction data was positioned and processed with the SEISIMAGER software package to give a layered model of the subsurface. The numbers of layers has been determined by analysing the seismic traces and 2 layers were used for the granite area and 3-4 layers were used for the limestone area. All seismic profiles were subject to a standardised processing sequence which consisted of a topographic

correction which was based on integrated elevation data, first break picking, tomographic inversion, travel-time computation via ray-tracing and velocity modelling. Residual deviations of typically 0.4 to 1.9 msec RMS have been obtained for each profile. Following each processing stage QC procedures were adhered to. The resulting layer boundaries are shown as thick lines overlaid on the 2D-Resistivity cross sections (Plans 1a – 1p). The average seismic velocities obtained within the layers are annotated on the sections as bold black numbers.

The p-wave seismic velocity is closely linked to the density of subsurface materials and to parameters like compaction, stiffness, strength and rock quality. The higher the density of the subsurface materials the higher the seismic velocity. Similarly for the other parameters it is generally valid that a more compacted, stiffer and stronger material will have a higher seismic velocity. For rock the seismic velocity is higher when the rock is stronger, less weathered and has a higher quality. If the rock is more weathered broken fractured or fissured then the seismic velocity will be reduced compared to that of intact fresh rock.

Because of the above relation the seismic refraction method and seismic velocities are suitable to investigate ground where the layers get denser, more compacted and stronger with depth. A disadvantage is that some different materials have the same or similar seismic velocity: A very stiff or very dense highly consolidated overburden and a weathered rock can have the same seismic velocity range.

3.3 Interpretation of Granite Area with 2D-Resistivity and Seismic Refraction

Table 4 summarises the interpretation for this area. The stiffness/compaction and the rock strength/quality have been estimated from the seismic velocity. The estimation of the excavatability for the bedrock has been made according to the caterpillar chart published in Reynolds (1997). The geotechnical assessment for rippability will have to take factors like rock type and jointing into account and the estimation in this report is solely based on the seismic velocities.

Interpreted cross sections are shown in Plans 2a - 2c (lower sections). The interpretation has been made from all available information. For overburden layers and the top of the rock the seismic refraction data has been used as seismic refraction is the best method to delineate layer boundaries. The resistivity models have been used to delineate different types of rock. Resistivity data is better suited to show rock types and features within the rock while seismic refraction velocities are indicating the change of compaction/stiffness/rock quality with depth.

Table 4: Summary of Results and Interpretation in Granite Area

Layer	General Seismic Velocity Range (m/sec)	General Resistivity Range (Ohmm)	Compaction/ Strength/ Rock Quality	Interpretation	Estimated Excavation Method
G1 G2a	200 - 400 4100 - 7500	AII < 640	Soft/Loose Fair to Good Rock	Topsoil/Overburden Strong Granite with some Weathered Zones	Diggable Breaking & Blasting
G2b	4100 - 7500	> 640	Fair to Good Rock	Strong Granite	Breaking & Blasting

Layer G1 is generally thin (1m) and comprises topsoil, made ground and overburden. The seismic velocity range of 200 - 400 m/s indicates that the geological material in this layer would be mainly soft or loose in terms of stiffness and compaction.

The depth to top of rock (Layer G2a and G2b) with a seismic velocity range of 4100 - 7500 m/s varies between 1 and 3m bgl. under the survey profiles. This layer requires breaking/blasting for removal. Layer G2a with high velocities (4100 - 7500 m/s) but lower resistivities (<640 Ohmm) occurs at a small number of locations. The lower resistivities would indicate that the granite rock is partially weathered.

3.4 Interpretation of Limestone Area with 2D-Resistivity Method only

Table 5 summarises the interpretation for the resistivities in the limestone area. Interpreted cross sections are shown in Plans 2d, 2e, 2g & 2h (lower sections).

Resistivities are used to indicate the bedrock type and how clean the limestone is. Resistivity values < 120 Ohmm, where present near the surface indicate a clay or silt overburden and where they occur at depth a clay filled karstified limestone (Layer A). Layer B with a medium resistivity range (120 – 640 Ohmm) has been interpreted as a more gravel rich overburden or an infilled (silt, sand, weathering products and moisture) or karstified limestone.

Resistivity values greater than 640 Ohmm (Layer C) have been interpreted as either a sand/gravel overburden or a clean limestone that is hardly weathered or broken.

2D-Resistivity data allows for interpretation of different types of overburden and rock types and features within the rock, but it is not possible to distinguish between overburden and rock where they have similar velocities. This distinction is done from the seismic refraction which was not carried out in this area.

Table 5: Summary of Results and Interpretation in Limestone Area (Resistivity only)

Layer	General Resistivity Range (Ohmm)	Interpretation
А	< 120	Clay or Silt Overburden, or Clay Filled Limestone
В	120 - 640	Gravelly Clay Overburden, or Infilled Limestone
С	> 640	Sand or Gravel Overburden, or Fresh Limestone

3.5 Interpretation of Limestone Area with 2D-Resistivity and Seismic Refraction

Table 6 summarises the interpretation for this area. The stiffness/compaction and the rock strength/quality have been estimated from the seismic velocity. The estimation of the excavatability for the bedrock has been made according to the caterpillar chart published in Reynolds (1997). The geotechnical assessment for rippability will have to take factors like rock type and jointing into account and the estimation in this report is solely based on the seismic velocities.

Interpreted cross sections are shown in Plans 2f, 2j & 2i - 2p (lower sections). The interpretation has been made from all available information. For overburden layers and the top of the rock the seismic refraction data has been used as seismic refraction is the best method to delineate layer boundaries. The resistivity models have been used to delineate different types of overburden and rock. Resistivity data is better suited to show overburden and rock types and features within the rock while seismic refraction velocities are indicating the change of compaction/stiffness/rock quality with depth.

Table 6: Summary of Results and Interpretation in Limestone Area (Resistivity and Seismic Refraction)

Layer	General Seismic Velocity Range (m/sec)	General Resistivity Range (Ohmm)	Stiffness/ Compaction or Rock Strength/ Quality	Interpretation	Estimated Excavation Method
1	200 - 360	Any	Soft or Loose	Topsoil/Fill/Made Ground	Diggable
2a	900 - 1200	< 120	Firm to Stiff or Medium Dense	Clay or Silt Overburden	Diggable
2b	900 - 1200	120 - 640	Firm to Stiff or Medium Dense	Gravelly Clay Overburden	Diggable
2c	900 – 1200	> 640	Firm to Stiff or Medium Dense	Sand or Gravel Overburden	Diggable
За	2000 – 2400	< 120	Poor to fair rock or Very stiff to hard or Very dense	Clay Filled Weathered Limestone or Clay or Silt Overburden	Diggable/rippable to marginal rippable
3b	2000 – 2400	120 - 640	Poor to fair rock or Very stiff to hard or Very dense	Infilled Weathered Limestone or Gravelly Clay Overburden	Diggable/rippable to marginal rippable
Зс	2000 - 2400	> 640	Poor to fair rock or Very stiff to hard or Very dense	Weathered Limestone or Sand or Gravel Overburden	Diggable/rippable to marginal rippable
4a	4000 - 5000	< 120	Good to very good rock	Clay Filled Strong Limestone	Breaking & Blasting
4b 4c	4000 - 5000 4000 - 5000	120 – 640 > 640	Good to very good rock Good to very good rock	Infilled Strong Limestone Fresh Strong Limestone	Breaking & Blasting Breaking & Blasting

Seismic layer 1, a relatively thin layer with seismic velocities of 200 - 340 m/s, has been interpreted as a layer of overburden, mainly comprised of made ground, topsoil and soil with a soft/loose stiffness/compaction.

Seismic layer 2 was modelled with a velocity range of 900 - 1200 m/s, which indicates overburden material with firm to stiff or medium dense strength/compaction. The resistivity ranges indicate varying amounts of clay, sand or gravel within the overburden. This layer may also include some highly weathered limestone at the base of the layer.

Seismic layer 3, with velocities of 2000 – 2400 m/s indicates predominantly Limestone bedrock with varying degrees of weathering or a very stiff to hard/very dense overburden. Within this layer, where the lower resistivity ranges occur at depth, the interpretation points towards that of a weathered/karstified Limestone. Occurring closer to the surface, the layer is more likely overburden with varying degrees of clay, silt, sand and gravel.

Strong Limestone is indicated by seismic velocities between 4000 – 5000 m/s of Layer 4. Again the varying resistivity ranges within this Limestone layer indicate varying degrees of weathering/karstification.

A division of seismic layers 2-4 into the subdivisions by resistivity (A-C) is made, and the interpretation by resistivity is the same as for chapter 3.4.

4. CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are made:

- The geophysical surveys carried out show that the subsurface geology consists of various overburden material overlying granite and limestone bedrock. Recommendations for targeted ground investigation locations were made during the geophysical survey. These are included in this report for a future phase of ground investigation.
- Direct ground investigation comprising of cable percussive boreholes, rotary boreholes and trial pits
 was carried out by IGSL Ltd. The locations are shown on the maps, in the upper frames of plans.
 The abbreviated logs of the cable percussive and rotary core holes have been drawn on the
 sections (lower frames). There is generally a good fit between the boreholes and the geophysical
 data.
- It is possible to divide the survey area along the length of the chainage based on this subsurface geology. The Caledonian Granitic rocks are located from CH0 to approx. CH8890. East from here the geology consists of Carboniferous Limestones.

Granite

- Within the Granite section (Plans a-c), high resistivities and high seismic velocities indicate granite bedrock close to the surface. The overburden has an average thickness of 1 m.
- Small zones of lower resistivities in the rock indicate that the Granite is slightly weathered at these
 locations. On the side road at CH 250 (Plans c), this zone of weathered rock extends to a depth of
 approx. 18m bgl and might also indicate a fault. A targeted rotary core hole is recommended at this
 location (CH250).
- High seismic velocities in the granite rock indicate that the rock requires breaking or blasting for removal.
- The direct ground investigation results generally indicate that the granite is shallow and unweathered. Some boreholes near the survey line (BH3/17, BH3/18 and BH3/20) indicate the strong unweathered granite deeper than the seismic data. This could indicate irregular weathering of granite (spheroidal or woolsack weathering), where the overall rock unit is good quality rock though at a small scale weathered granite and unweathered granite occur close together. Other boreholes in the granite area show a good fit of the rock head with the seismic interpretation.
- Trial breaking of granite rock is recommended in the proposed deep cut areas CH7700 8200 and sideroad CH50 – 350. Trial breaking of rock in trial pits with a large surface area will give the best indication of the excavatability.

Limestone

- Within the Limestone section high resistivities indicate a clean Limestone, which occurs shallowest
 under the topographical rises along the scheme. This good to very good Limestone would require
 breaking and blasting during construction of cuts.
- The bedrock resistivities in the limestone section are generally high which indicates a clean limestone that is liable to karstification (but does not have to be karstified).
- Lower resistivity values within the clean high resistivity limestone point towards a weathered or karstified Limestone. The existence of karstified rock could lead to subsidence and therefore its location is of particular relevance in areas of proposed cut and fill in the construction plan.
- The limestone area starts at approx. CH8890, from here on to the eastern end of the scheme there
 is a risk of the occurrence of karst.
- The first karst feature appears inside the rock at CH8930 and has a width of approx. 40m and a depth of 20m. This feature could be drilled by a targeted corehole if there is an impact of the future design, e.g. if foundations for a bridge are proposed at this chainage.
- At area GP 3/5 the resistivities indicate overburden or infilled limestone. Borehole BH 3/53R places
 the depth to rock at approx. 5m bgl. In this area no seismic refraction was done, and the depth to
 rock cannot be determined from the resistivity data alone.
- The largest zone of weathered and karstified limestone occurs CH13650 14150. It is located in a topographical depression likely caused by erosion of the lesser quality rock.
- A zone of thick overburden and deep rock occurs at CH13050 13140 where the resistivity profile
 did not reach good quality limestone to at least 15m depth. A longer 2D-Resistivity profile is
 recommended at this location.
- The survey at the abandoned Coolagh quarry was done to check for weathered and karstified rock in relation to the hydrogeological conditions between the quarry and the proposed road.
- In some areas there are possible contradictions between the resistivity and seismic data (e.g. CH11900 11950 in area GP 3/9). The resistivities are quite high (> 1000 Ohmm) and the seismic velocities medium (2300 m/s). Resistivities can indicate a limestone rock while seismic velocities indicate poor to fair weathered rock or very dense sand and gravel overburden. The models were reviewed and it is not possible to seismically model a strong limestone at shallow depth as might be proposed by the resistivity data. Targeted boreholes can resolve these locations more, especially such locations like at CH11970 where the construction changes from proposed cut to fill or bridge.

• In order to test for weathered and karstified limestone targeted rotary core holes could be drilled and have been recommended at the following locations shown in Table 7.

Table 7: Locations of recommended Rotary Core Holes

Table 7. Locations of recommended Rotary Core Holes						
Chainage	Plan					
8930	Plan 2d					
10760	Plan 2g					
12020	Plan 2h					
12370	Plan 2h					
13775	Plan 2i					
200m along GP3/19	Plan 2n					
480m along GP3/19	Plan 2n					
320m along GP3/20	Plan 2o					
200m along GP3/21	Plan 2p					

5. REFERENCES

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- 2. **GSI, 2004.** Geology of Galway Bay. Geological Survey of Ireland 2004.
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Table 1: Geophysical Survey Locations and Acquisition Parameters

		2D-Resi	stivity Survey		
Site	Profile	Length (m)	Combined Length (m)	Electrode Spacing	Start Chainage
GP3/1	R4	189		3	5309
GP3/1		96		3	
GP3/1		42	327	3	
GP3/2	R1	200	200	5	7565
GP3/2	R3	315		5	7750
GP3/2		75	390	5	
GP3/3	R2	315		5	16
GP3/3		160		5	
GP3/3		120	595	5	
GP3/4	R5	153	153	3	8203
GP3/5	R13	315		5	8759
GP3/5		160		5	
GP3/5		60	535	5	
GP3/6	R6	315		5	9491
GP3/6		55	370	5	
GP3/6	R22	295	295	5	9790
GP3/7	R21	285	285	5	10160
GP3/7					
GP3/8	R7	315		5	10550
GP3/8		160		5	
GP3/8		115	590	5	
GP3/9	R25	265	265	5	11855
GP3/10	R16	315		5	12222
GP3/10		45	360	5	
GP3/12	R8	85	85	5	13052
GP3/13	R10	315		5	13457
GP3/13		150	465	5	
GP3/14	R11	315		5	13957
GP3/14		55	370	5	
GP3/15	R14	205	205	5	15499
GP3/16	R15	105	105	5	15724
GP3/17	R12	315		5	15874
GP3/17		160		5	
GP3/17		160		5	
GP3/17		65	700	5	
GP3/18	R9	120	120	5	13198
GP3/19	R23	315		5	OFF Mainline

Table 1: Geophysical Survey Locations and Acquisition Parameters

GP3/19		160		5	
GP3/19		50	525	5	
GP3/20	R24	315		5	OFF Mainline
GP3/20		95	410	5	
GP3/21	R17	315		5	Across Mainline
GP3/21		80	395	5	
GP3/23	R20	115	115	5	Across Mainline
GP3/24	R19	170	170	5	10958
GP3/25	R18	290	290	5	10897
	SUM	8320			
		Seismic Refra	action Survey		
Site	Profile Name	Length (m)	Spacing (m)	No. Geophones	Start Chainage
GP3/1	S5	321	3	108	5309
GP3/2	S1	171	3	58	7565
GP3/2	S3	213	3	72	7750
GP3/2	S4	174	3	58	7948
GP3/3	S2	591	3	198	16
GP3/4	S6	141	3	48	8206
GP3/7	S21	285	3	96	10154
GP3/9	S31	258	3	87	11854
GP3/12	S7	84	3	29	13052
GP3/13	S9	285	3	96	13457
GP3/13	S10	177	3	59	13742
GP3/14	S11	357	3	120	13957
GP3/15	S15	213	3	72	15499
GP3/16	S16	105	3	36	15724
GP3/17	S12	285	3	96	15874
GP3/17	S13	216	3	72	16162
GP3/17	S14	195	3	65	16361
GP3/18	S8	120	3	41	13198
GP3/19	S30	501	3	168	OFF Mainline
GP3/20	S32	411	3	138	OFF Mainline
GP3/21	S17	402	3	135	Across Mainline
GP3/23	S33	69	3	24	Across Mainline
GP3/24	S19	162	3	55	10960
GP3/25	S18	285	3	96	10898
	SUM	6021			

Table 2: Structure Locations and Geological Background

Geophysical Survey Area	Geophysical Method	Proposed Cut Depth/Design Feature	Soil	Subsoils	Soft Ground	Bedrock	Outcrop (Rock < 2m bgl)	Fractures/Faults	Karst Features
G.P 3/1	2D-Resistivity 3m & Seismic Refraction 3m	Maximum cut depth 3.8m	Shallow soils derived from non- calcareous rock or gravels	Bedrock outcrop and subcrop	No	Errisbeg Townland Granite - Megacrystic pink/grey monzogranite	Yes	No	No
G.P 3/2	2D-Resistivity 5m & Seismic Refraction 3m	Maximum cut depth 14.6m at approx. Ch. 7900	Shallow soils derived frommainly non-calcareous parent materials	Bedrock outcrop and subcrop	No	Errisbeg Townland Granite - Megacrystic pink/grey monzogranite	Yes	No	No
G.P 3/3	2D-Resistivity 5m & Seismic Refraction 3m	Maximum cut depth 12m at approx. Ch. 145	Shallow soils derived from mainly non-calcareous parent materials	Till derived chiefly from grainite	No	Errisbeg Townland Granite - Megacrystic pink/grey monzogranite	Yes	No	No
G.P 3/4	2D-Resistivity 3m & Seismic Refraction 3m	Maximum cut depth of 2.9m at approx. Ch. 8+270	Shallow soils derived from mainly non-calcareous parent materials	Till derived chiefly from grainite	No	Errisbeg Townland Granite - Megacrystic pink/grey monzogranite & Murvey Granite - non-porphyritic syenogranite; pink	No	No	No
G.P 3/5	2D-Resistivity 5m	Bridge structure, 30m depth required due to bedrock formation change (granite to limestone)	Made Ground, Soils derived from mainly calcareous and non calcareous parent materials	Made ground, Till derived from granites and karstified bedrock outcrop and subcrop	No	Partially Murvey Granite - non-porphyritic syenogranite; pink and moves into Visean Limestones- Undifferentiated limestome	No	No	No
G.P 3/6	2D-Resistivity 5m	Bridge structure, 30m depth required due to limestone bedrock and karst potential	Soils derived from mainly calcareous parent materials	Till derived from limestones and Karstified bedrock outcrop or subcrop	Soft Compressible Ground	Visean Limestones- Undifferentiated limestome	Yes	No	No

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Table 2: Structure Locations and Geological Background

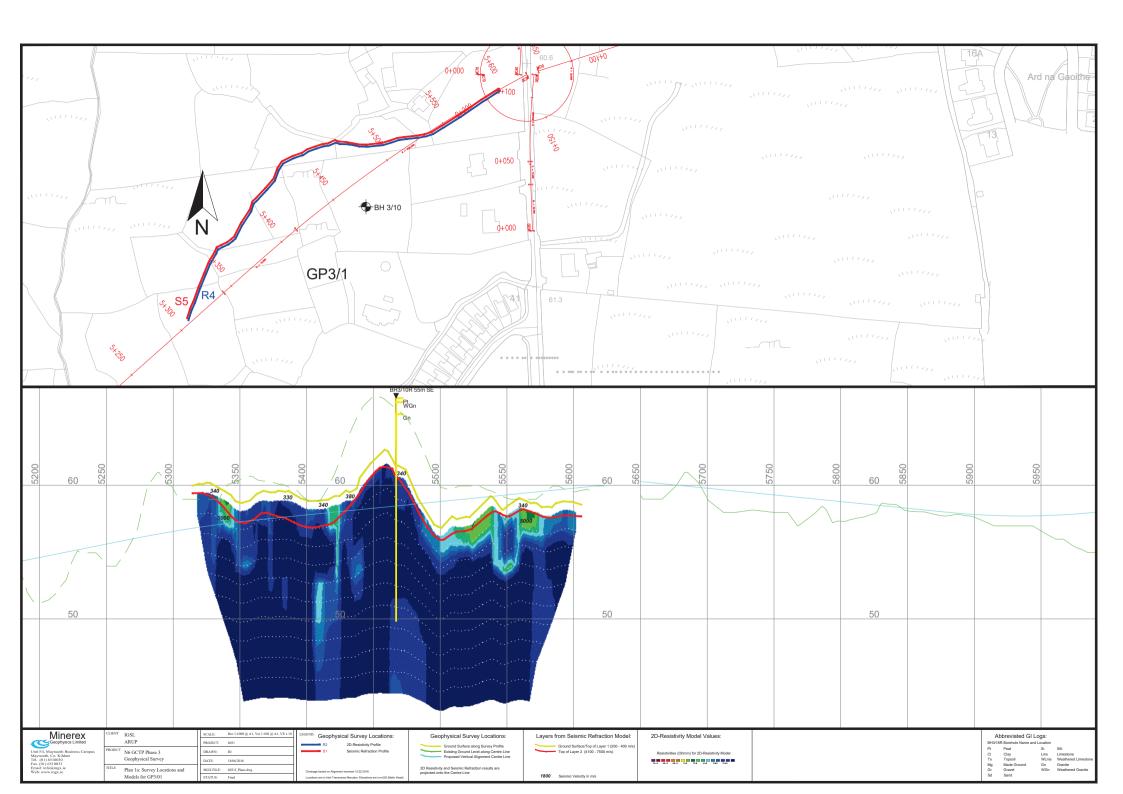
Geophysical Survey Area	Geophysical Method	Proposed Cut Depth/Design Feature	Soil	Subsoils	Soft Ground	Bedrock	Outcrop (Rock < 2m bgl)	Fractures/Faults	Karst Features
G.P 3/7	2D-Resistivity 5m & Seismic Refraction 3m	Viaduct structure, 30m depth required due to limestone bedrock and karst potential	Soils derived from mainly calcareous parent materials	Till derived from limestones and Karstified bedrok outcrop or subcrop	No	Visean Limestones- Undifferentiated limestome	Yes	No	No
G.P 3/8	2D-Resistivity 5m	Lackagh Tunnel (21m below surface) 30m depth required	Soils derived from mainly calcareous parent materials	Till derived from limestones and Karstified bedrok outcrop or subcrop	No	Visean Limestones- Undifferentiated limestome	Yes	No	No
G.P 3/9	2D-Resistivity 5m & Seismic Refraction 3m	Maximum cut depth 13.4m, 30m depth required due to limestone bedrock and karst potential	Soils derived from mainly calcareous parent materials	Till derived from limestones and Karstified bedrok outcrop or subcrop	No	Visean Limestones- Undifferentiated limestome	Yes	No	No
G.P 3/10	2D-Resistivity 5m	Embankment, 30m depth required due to limestone bedrock and karst potential	Soils derived from mainly calcareous parent materials	Till derived from limestones and Karstified bedrok outcrop or subcrop	Cut Peat	Visean Limestones- Undifferentiated limestome	Yes	No	No
G.P 3/12	2D-Resistivity 5m & Seismic Refraction 3m	Maximum cut depth 7.7m, 30m depth required due to limestone bedrock and karst potential	Soils derived from mainly calcareous parent materials	Till derived from limestones and Karstified bedrok outcrop or subcrop	No	Visean Limestones- Undifferentiated limestome	No	No	No
G.P 3/13	2D-Resistivity 5m & Seismic Refraction 3m	Maximum cut depth 7.3m, 30m depth required due to limestone bedrock and karst potential	Soils derived from mainly calcareous parent materials	Till derived from limestones and Karstified bedrok outcrop or subcrop	No	Visean Limestones- Undifferentiated limestome	Yes	No	No

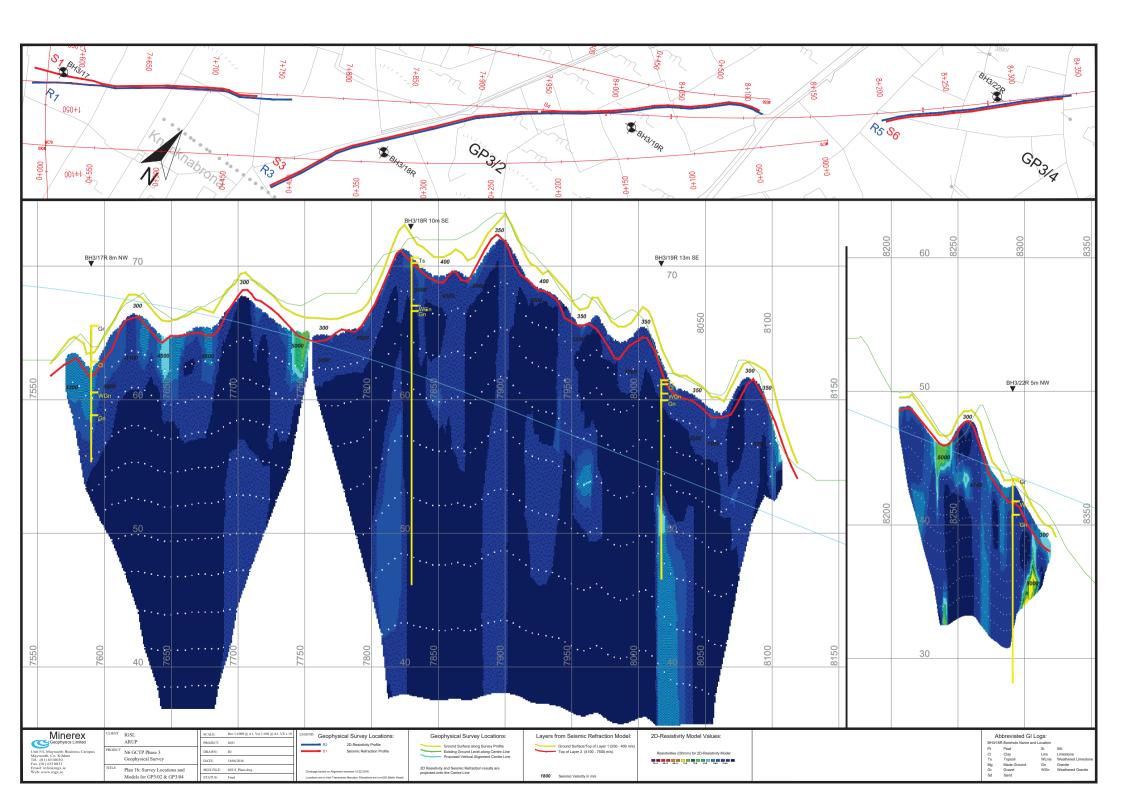
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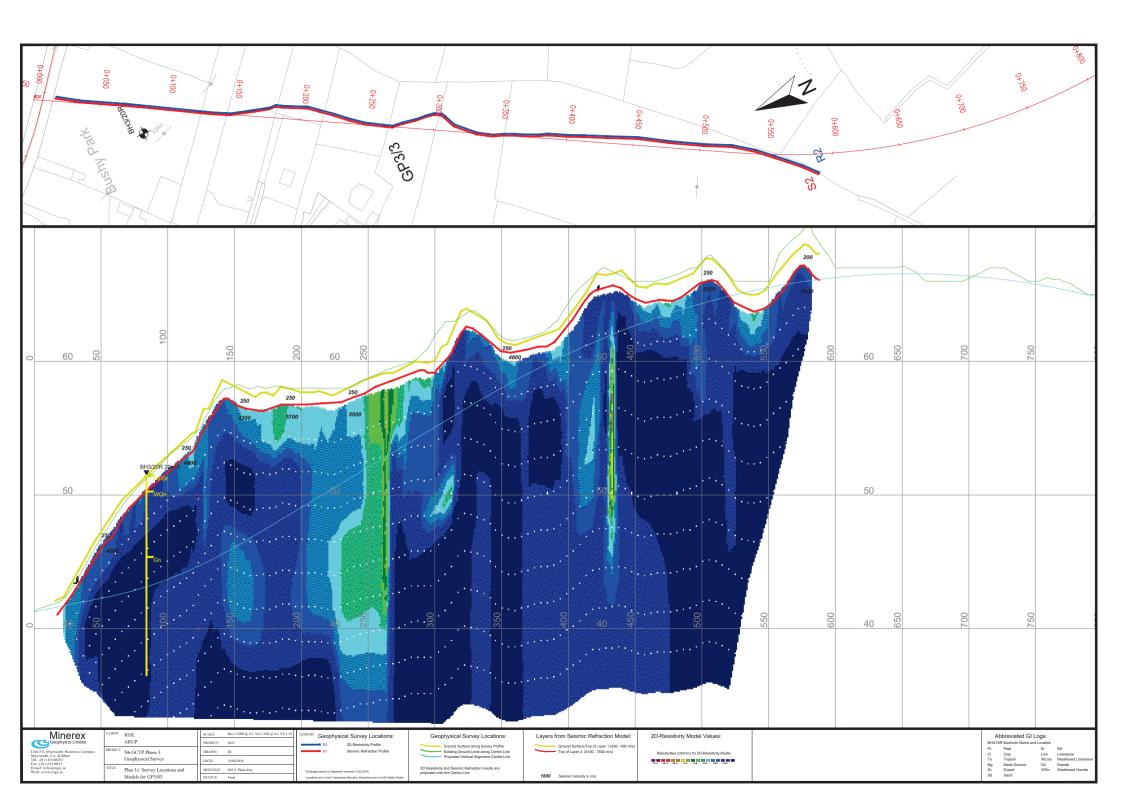
Table 2: Structure Locations and Geological Background

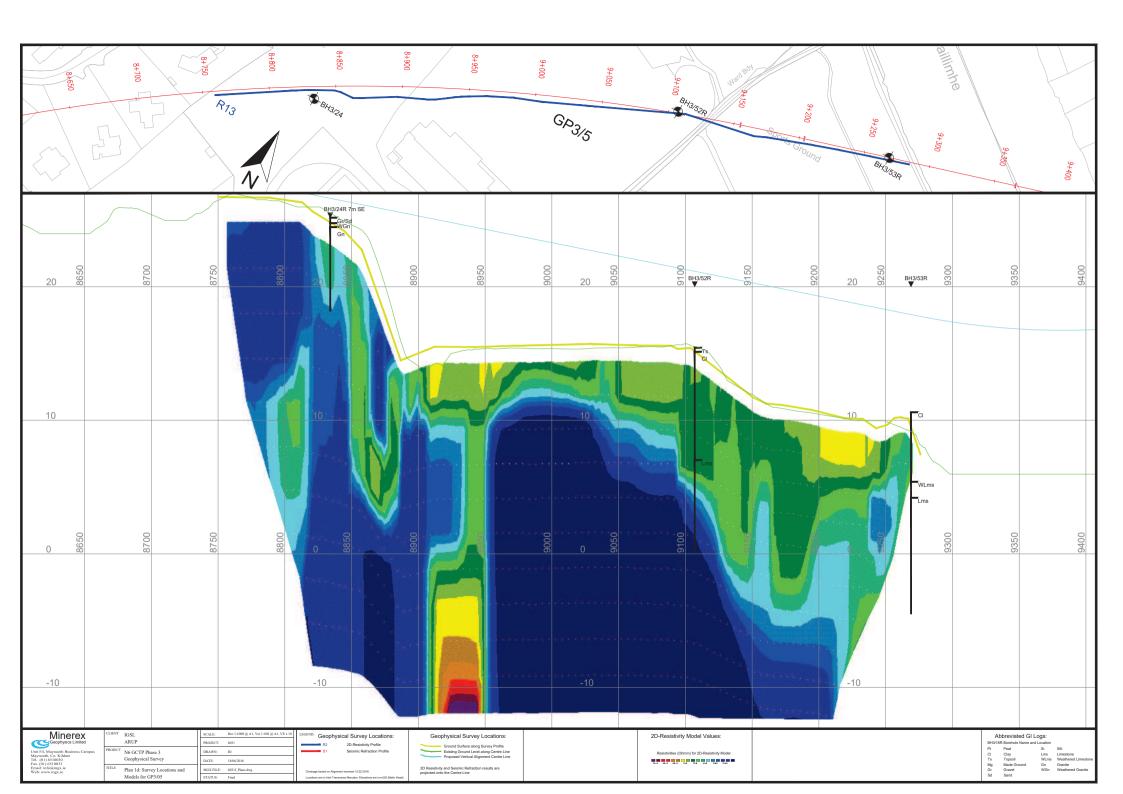
Geophysical Survey Area	Geophysical Method	Proposed Cut Depth/Design Feature	Soil	Subsoils	Soft Ground	Bedrock	Outcrop (Rock < 2m bgl)	Fractures/Faults	Karst Features
G.P 3/14	2D-Resistivity 5m & Seismic Refraction 3m	Maximum cut depth 12.3m, 30m depth required due to limestone bedrock and karst potential	Soils derived from mainly calcareous parent materials	Till derived from limestones and Karstified bedrok outcrop or subcrop	No	Visean Limestones- Undifferentiated limestome	Yes	No	No
G.P 3/15	2D-Resistivity 5m & Seismic Refraction 3m	Maximum cut depth 7.0m, 30m depth required due to limestone bedrock and karst potential	Soils derived from mainly calcareous parent materials	Till derived from limestones	No	Visean Limestones- Undifferentiated limestome	Yes	No	No
G.P 3/16	2D-Resistivity 5m & Seismic Refraction 3m	Maximum cut depth 7.0m, 30m depth required due to limestone bedrock and karst potential	Soils derived from mainly calcareous parent materials	Till derived from limestones	No	Visean Limestones- Undifferentiated limestome	Yes	No	No
G.P 3/17	2D-Resistivity 5m & Seismic Refraction 3m	Maximum cut depth 7.0m, 30m depth required due to limestone bedrock and karst potential	Soils derived from mainly calcareous parent materials	Till derived from limestones	No	Visean Limestones- Undifferentiated limestome	Yes	No	No
G.P 3/18	2D-Resistivity 5m & Seismic Refraction 3m	Maximum cut depth 12.1m, 30m depth required due to limestone bedrock and karst potential	Soils derived from mainly calcareous parent materials	Till derived from limestones and Karstified bedrok outcrop or subcrop	No	Visean Limestones- Undifferentiated limestome	No	No	No

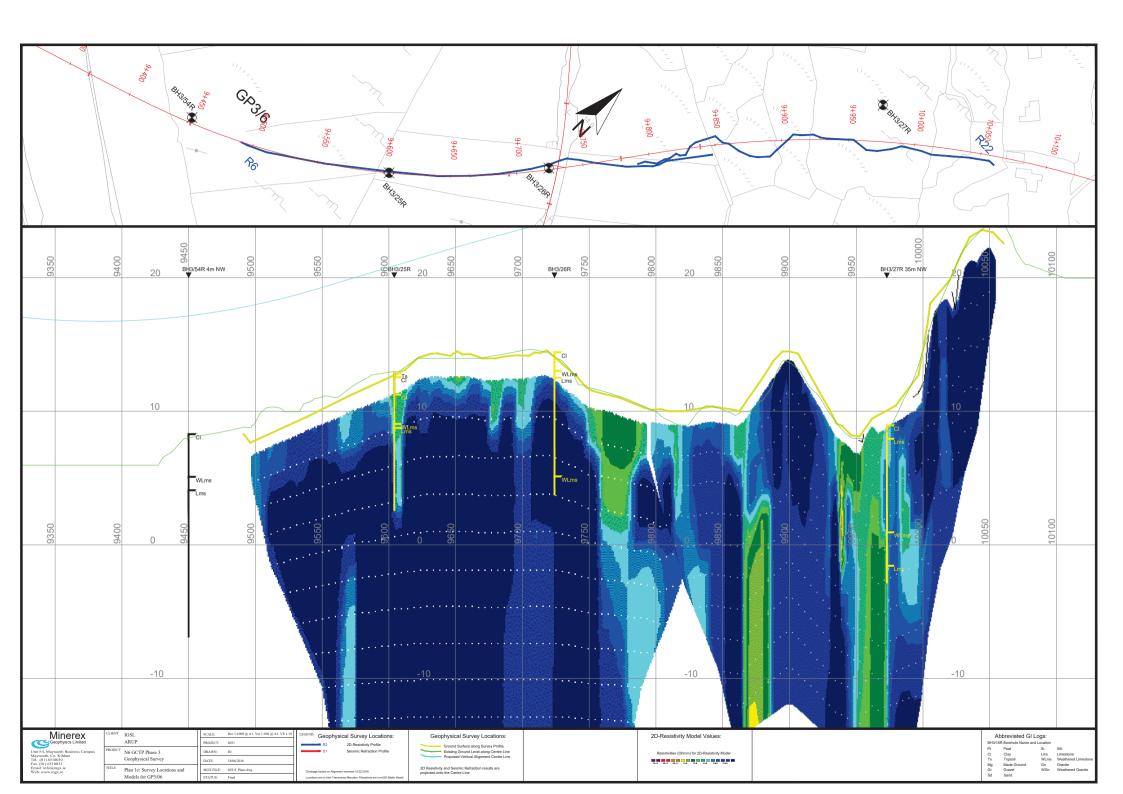
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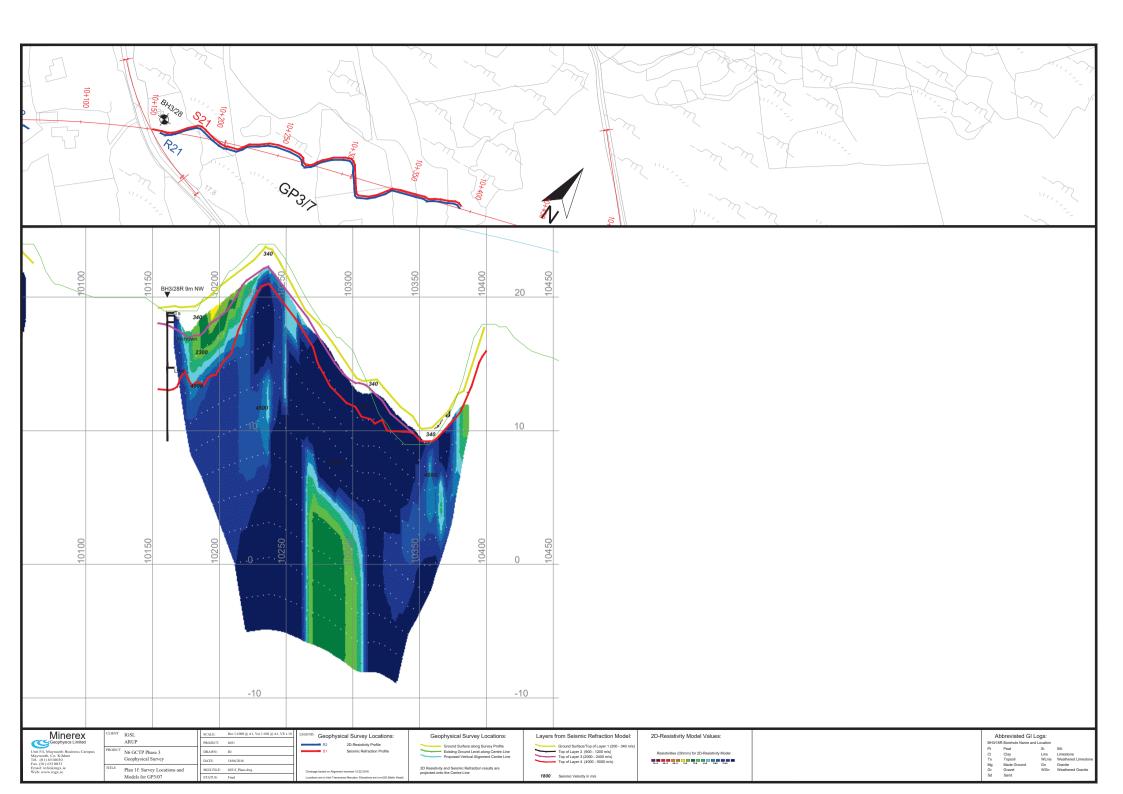


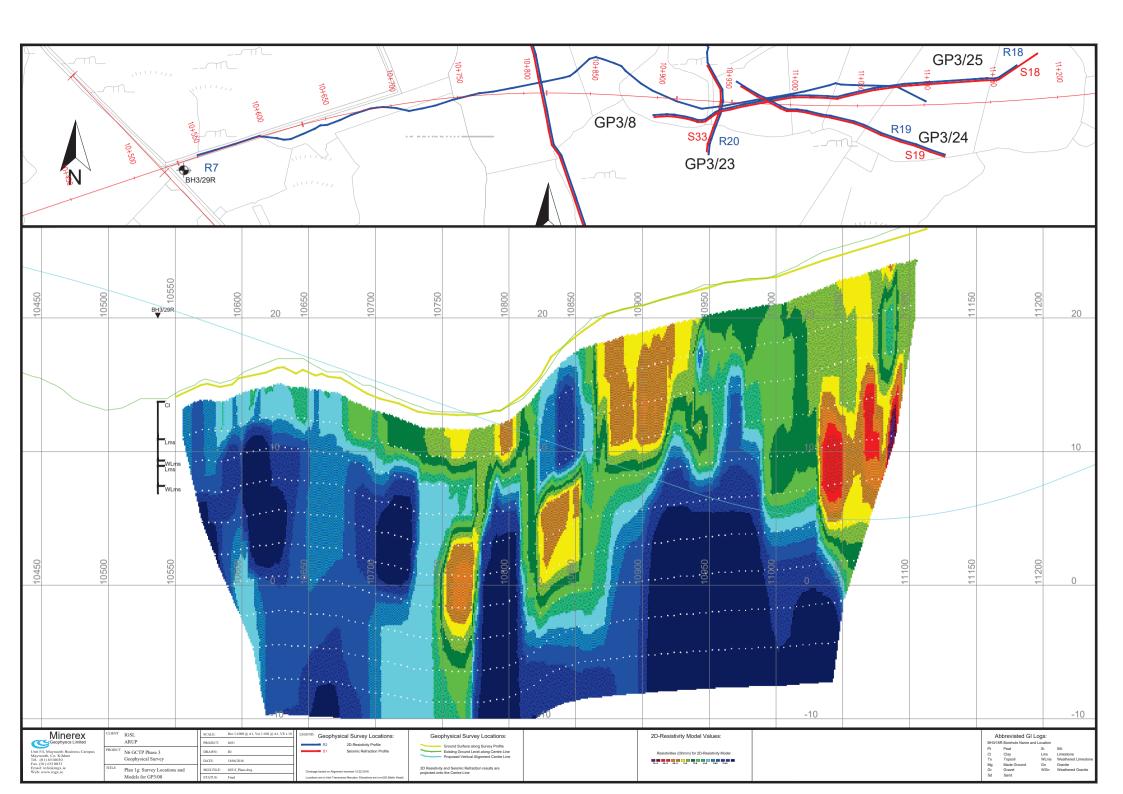


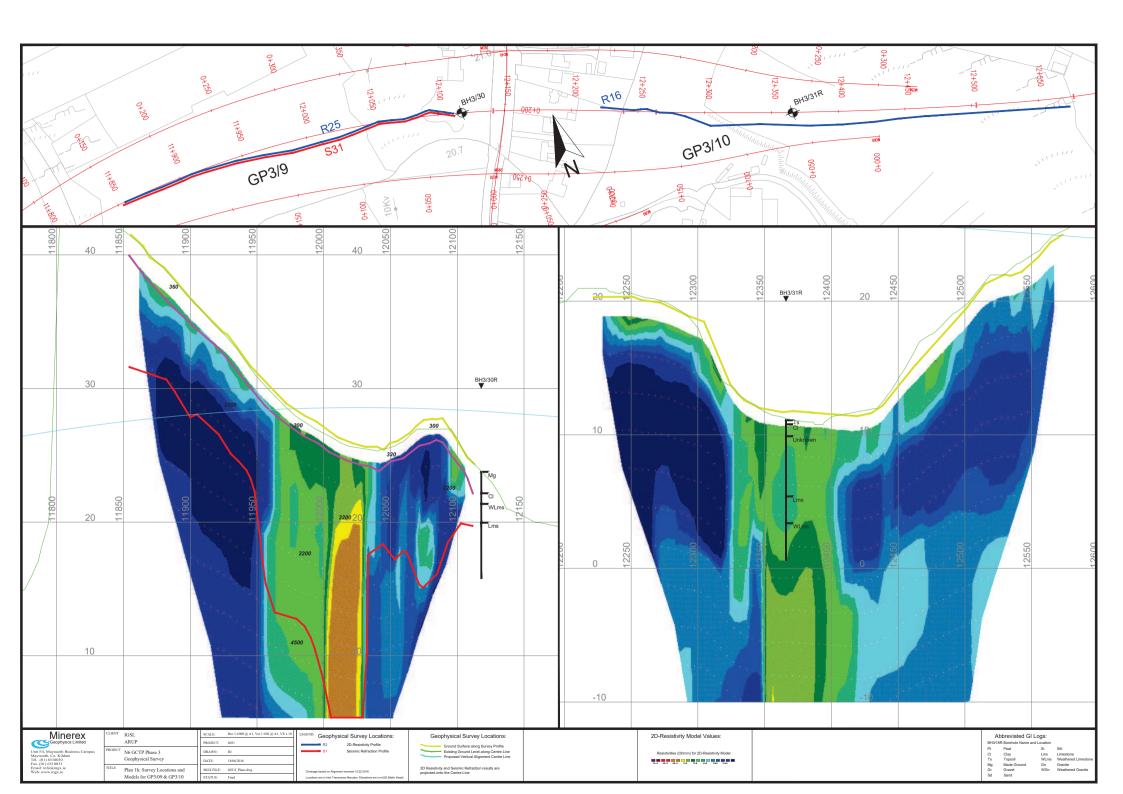


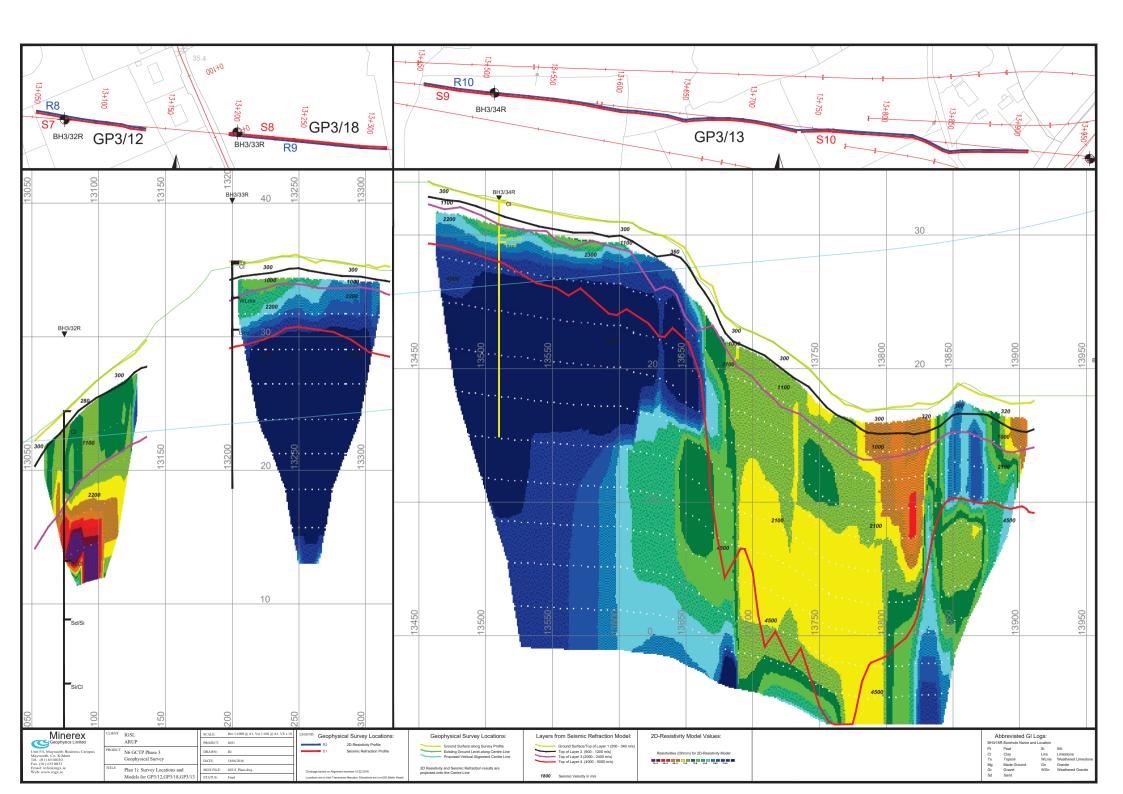


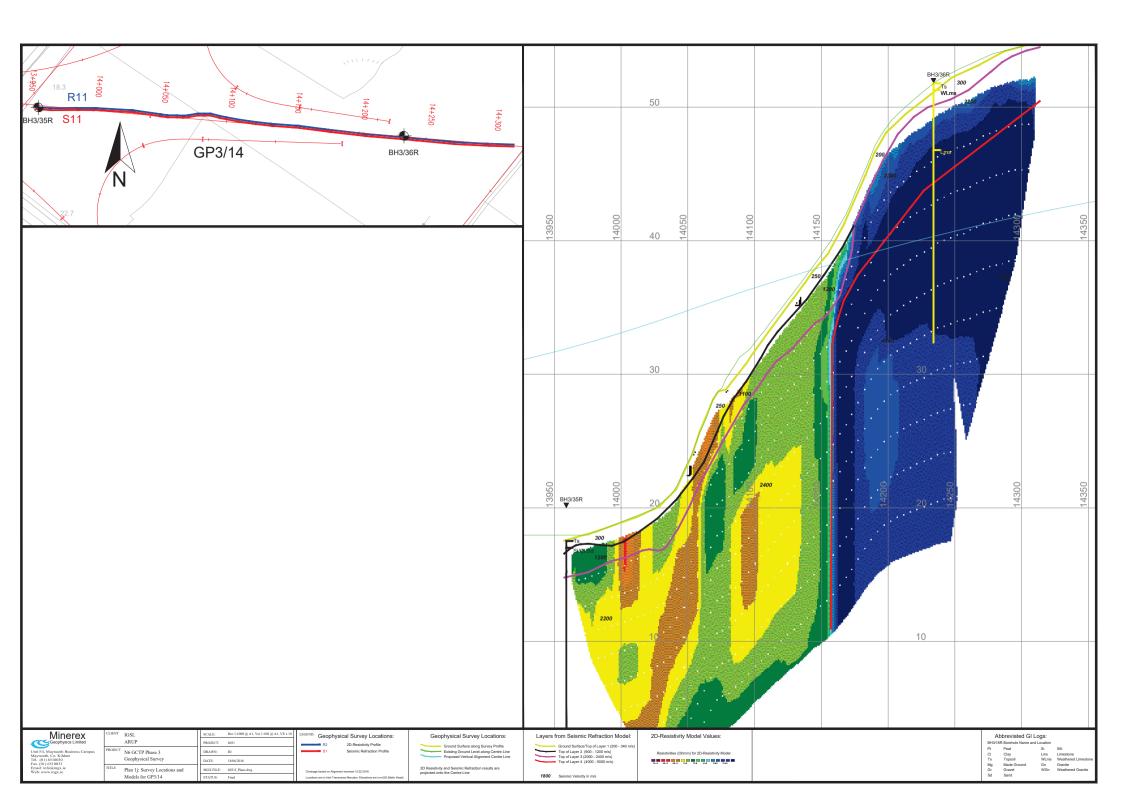


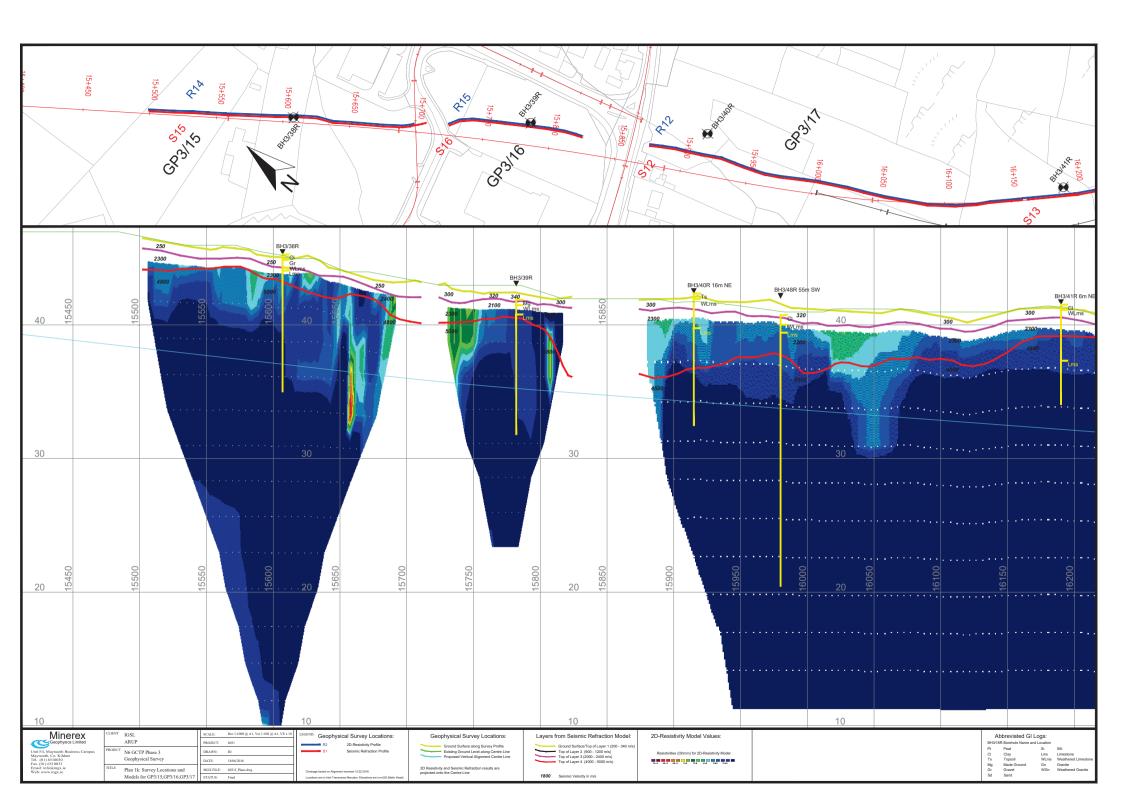


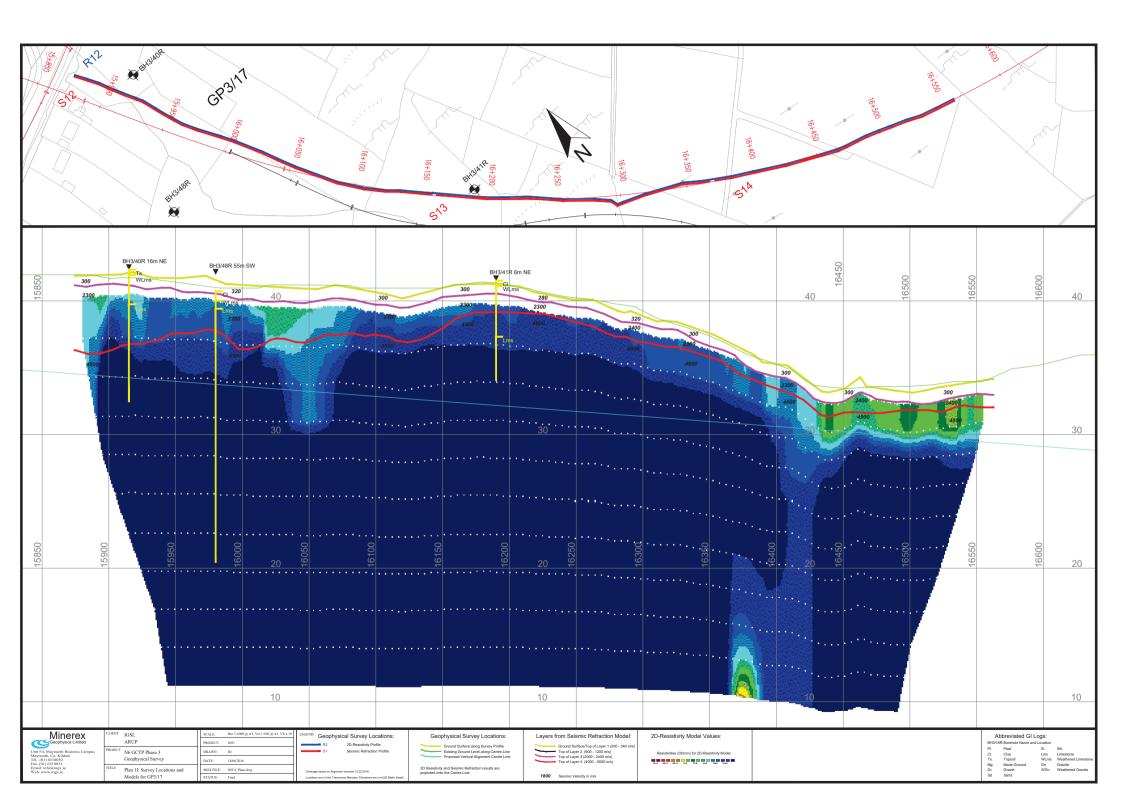


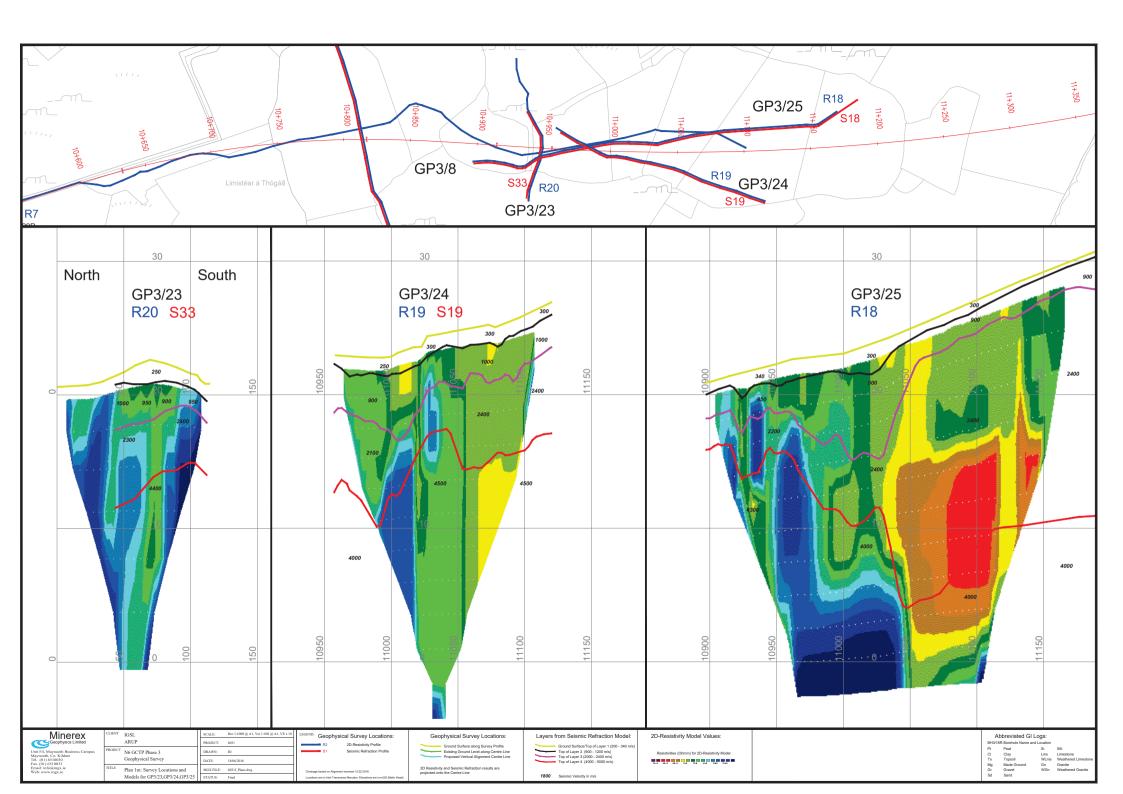


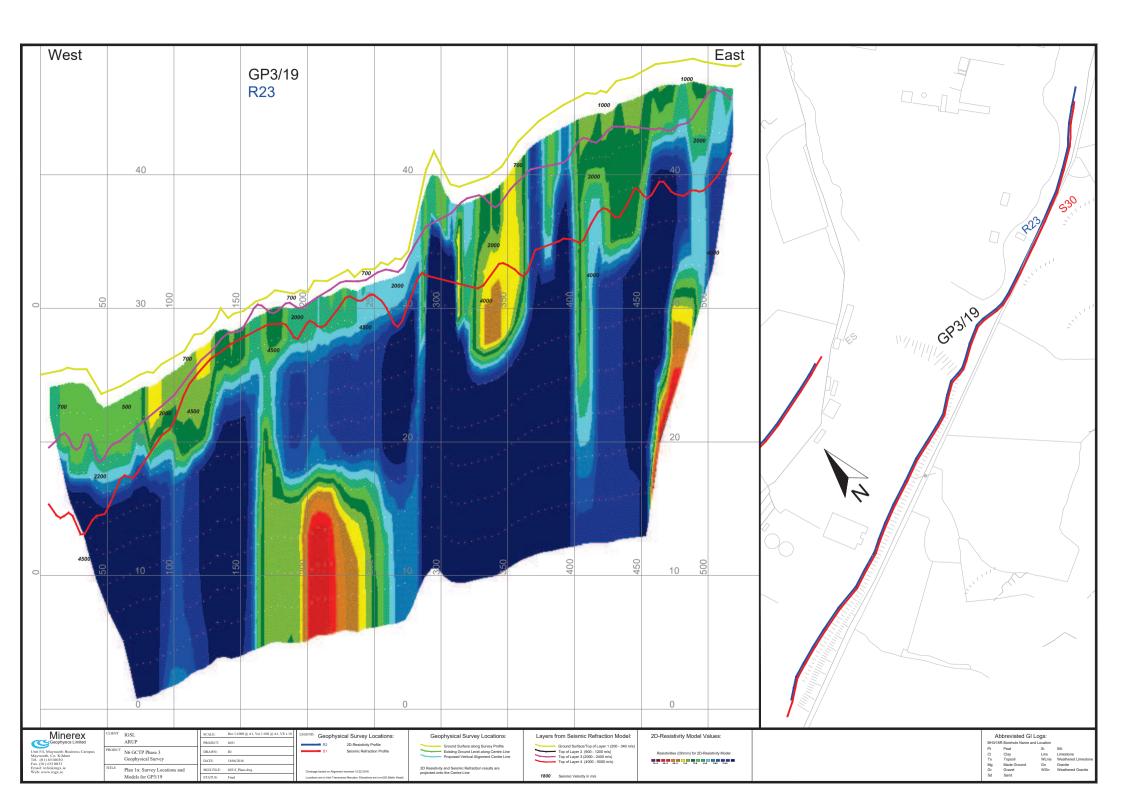


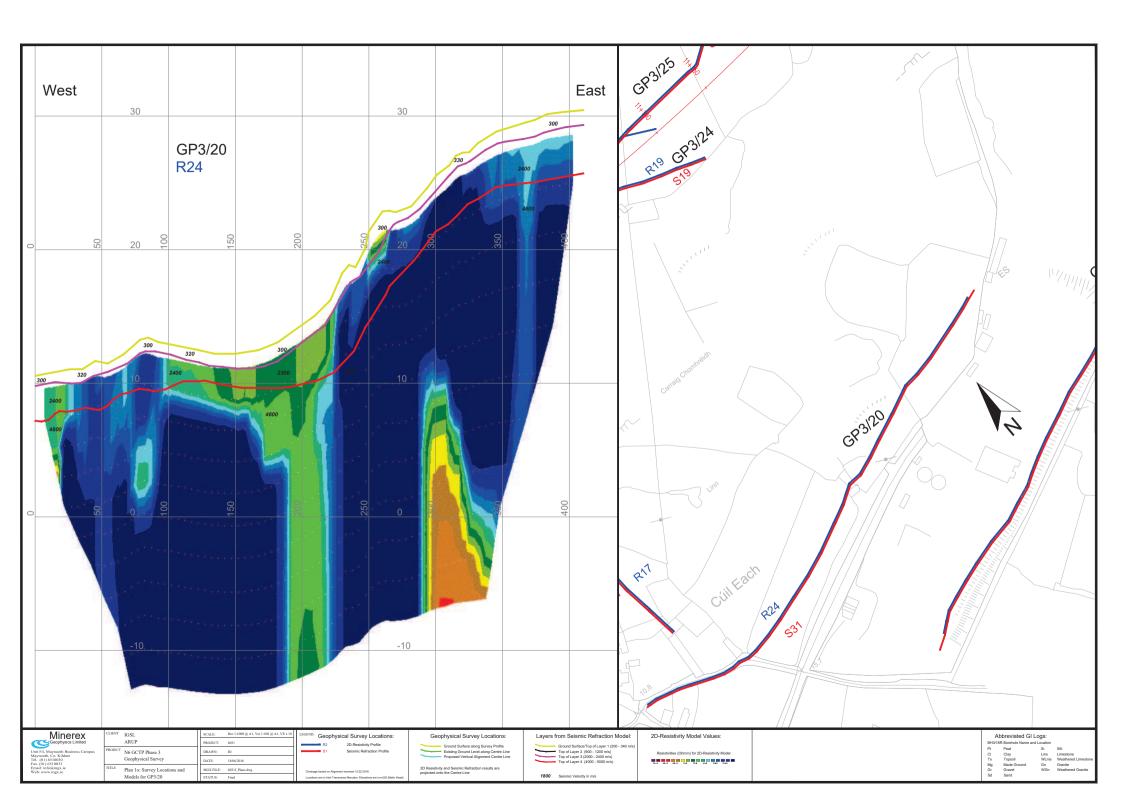


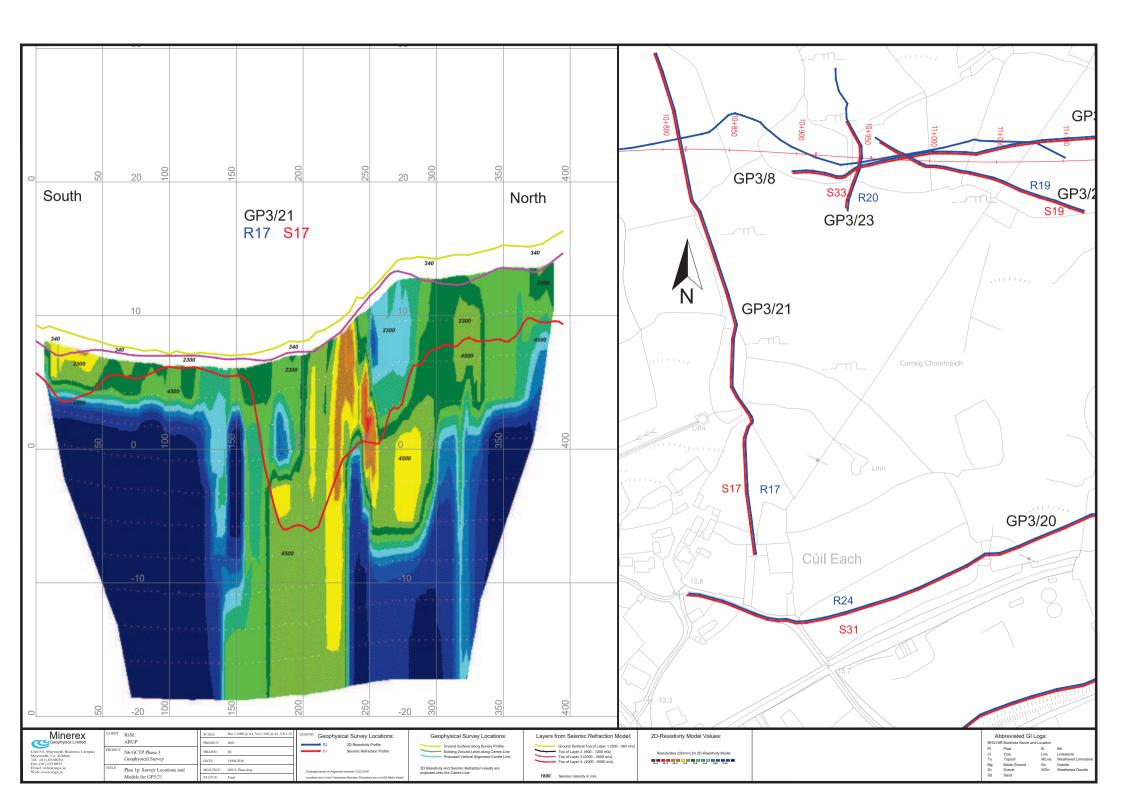


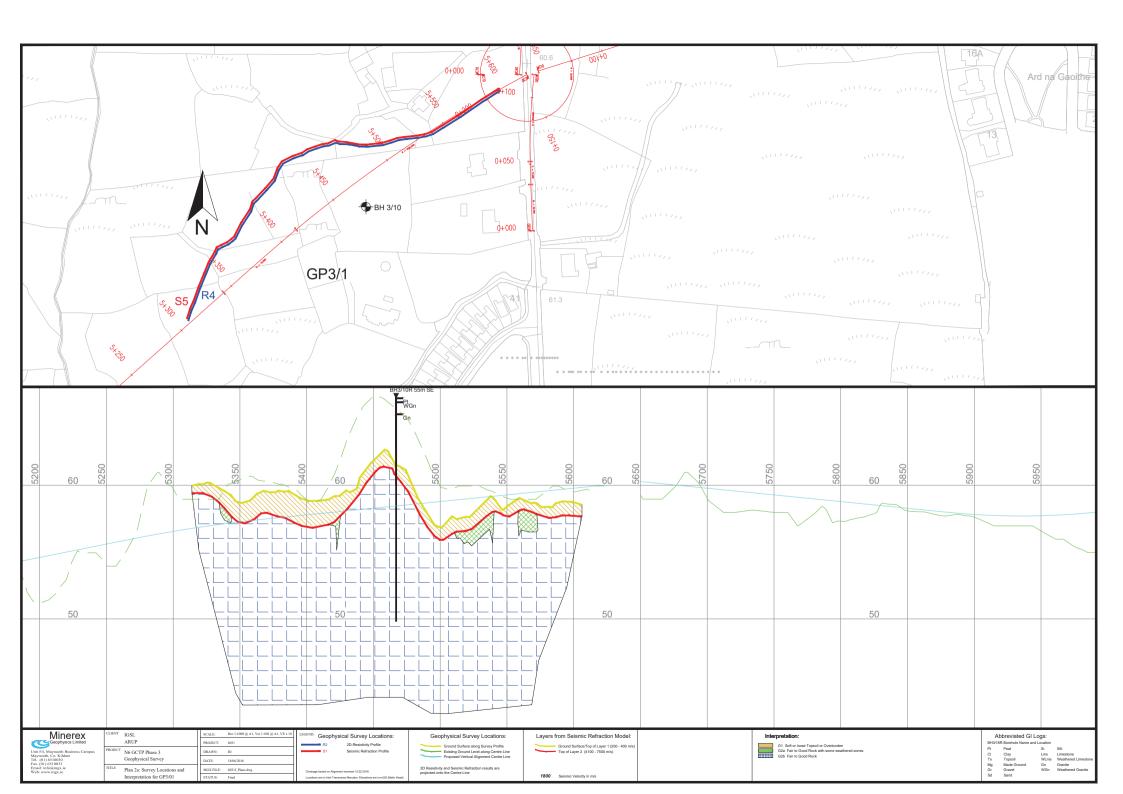


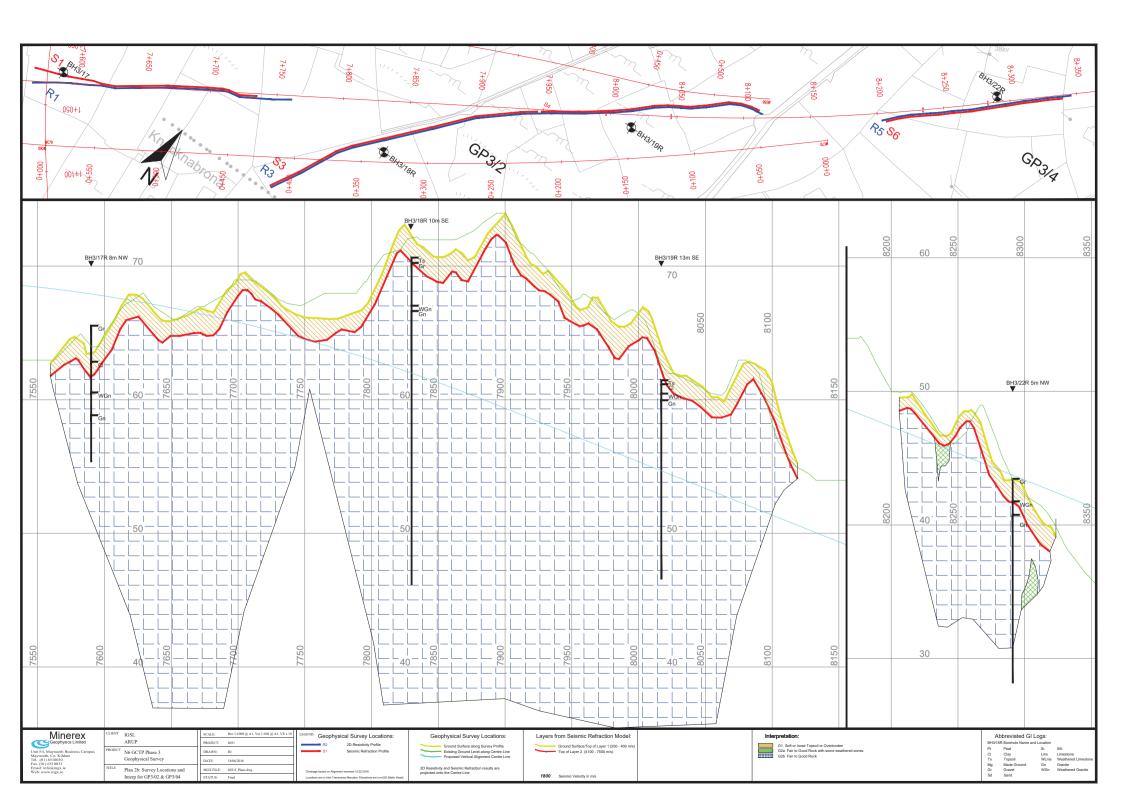


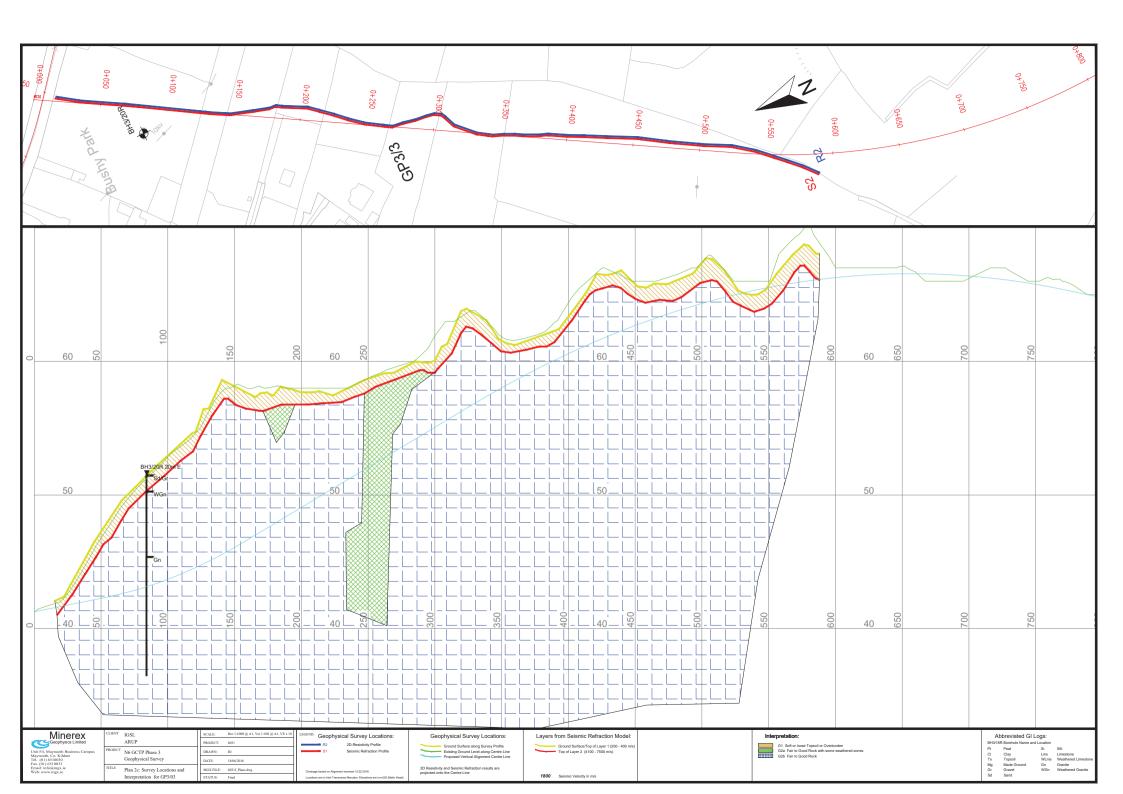


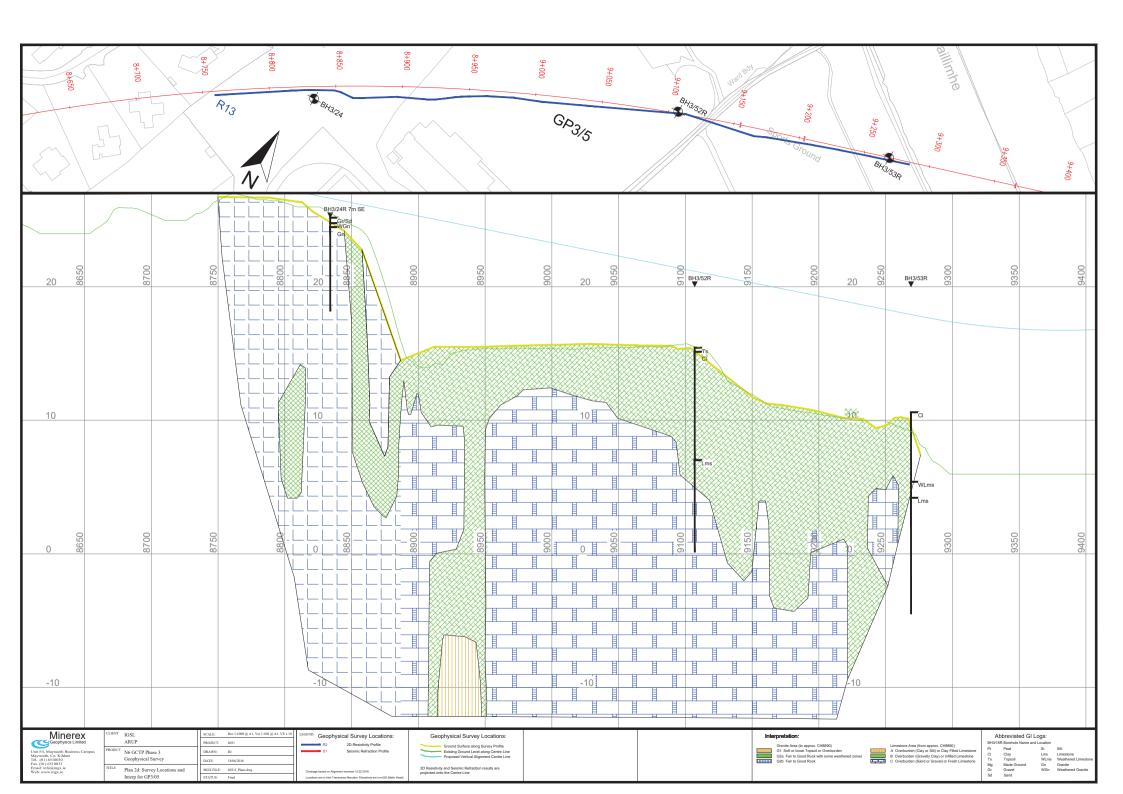


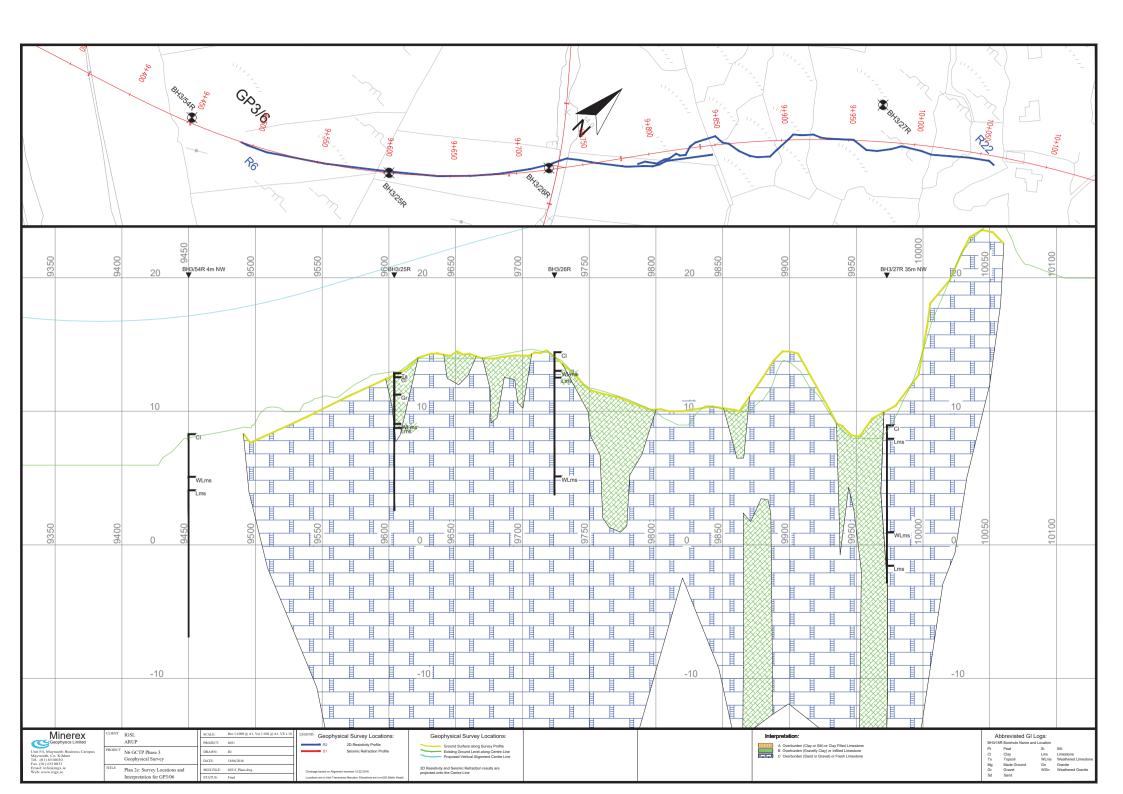


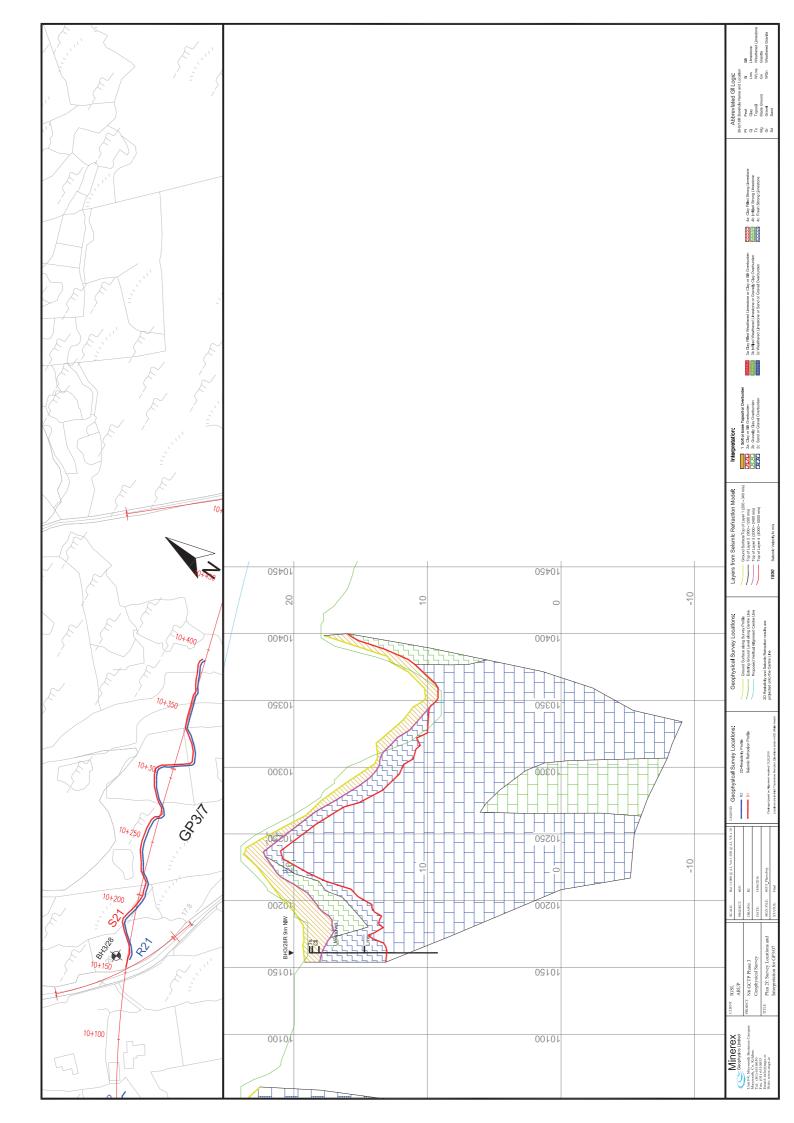


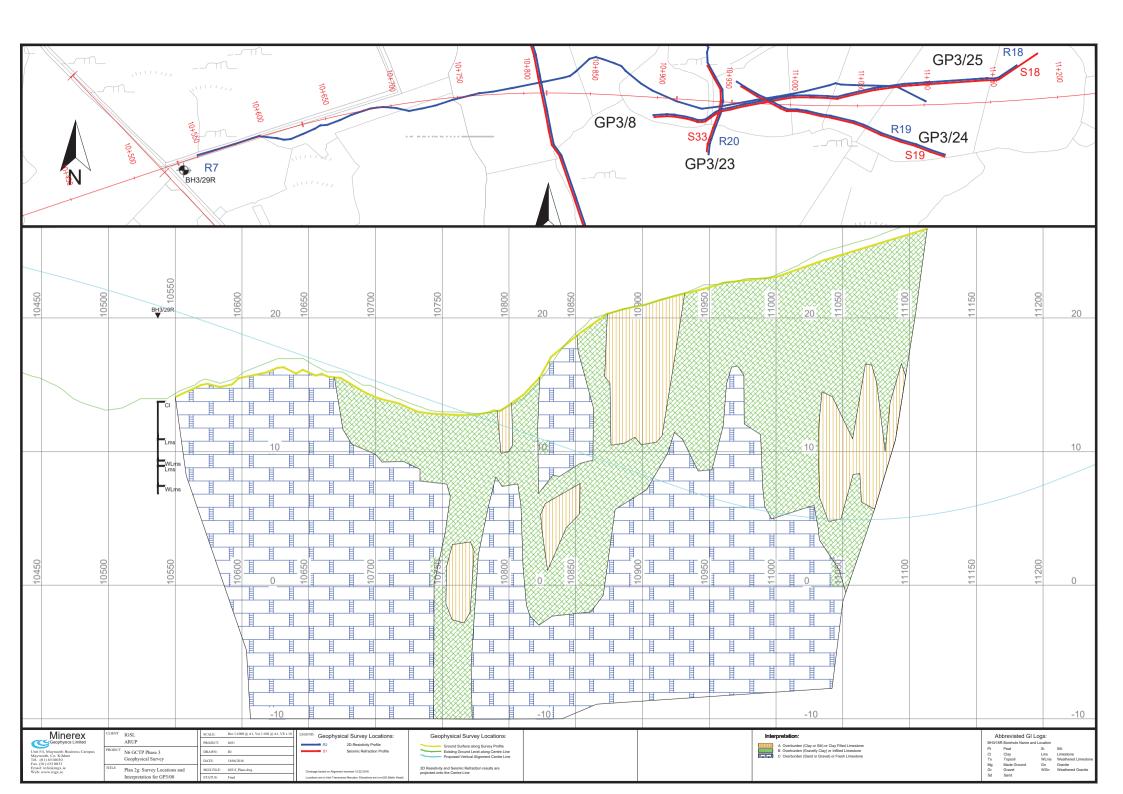


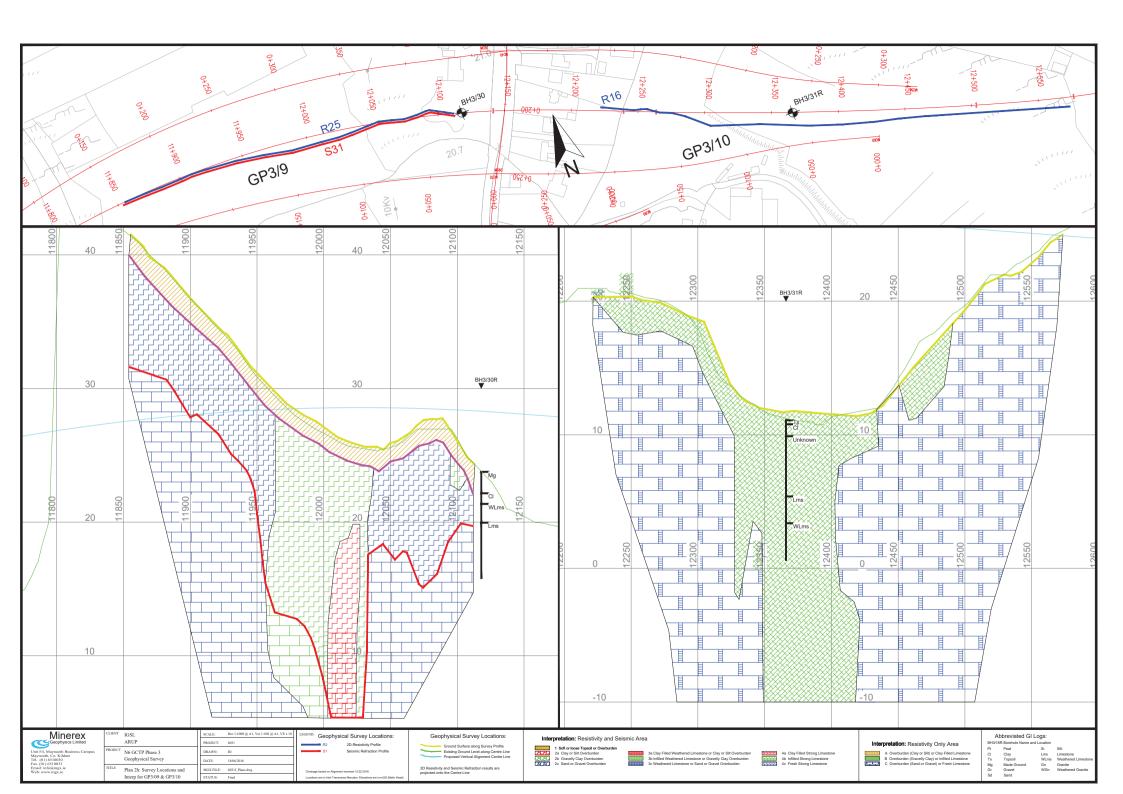


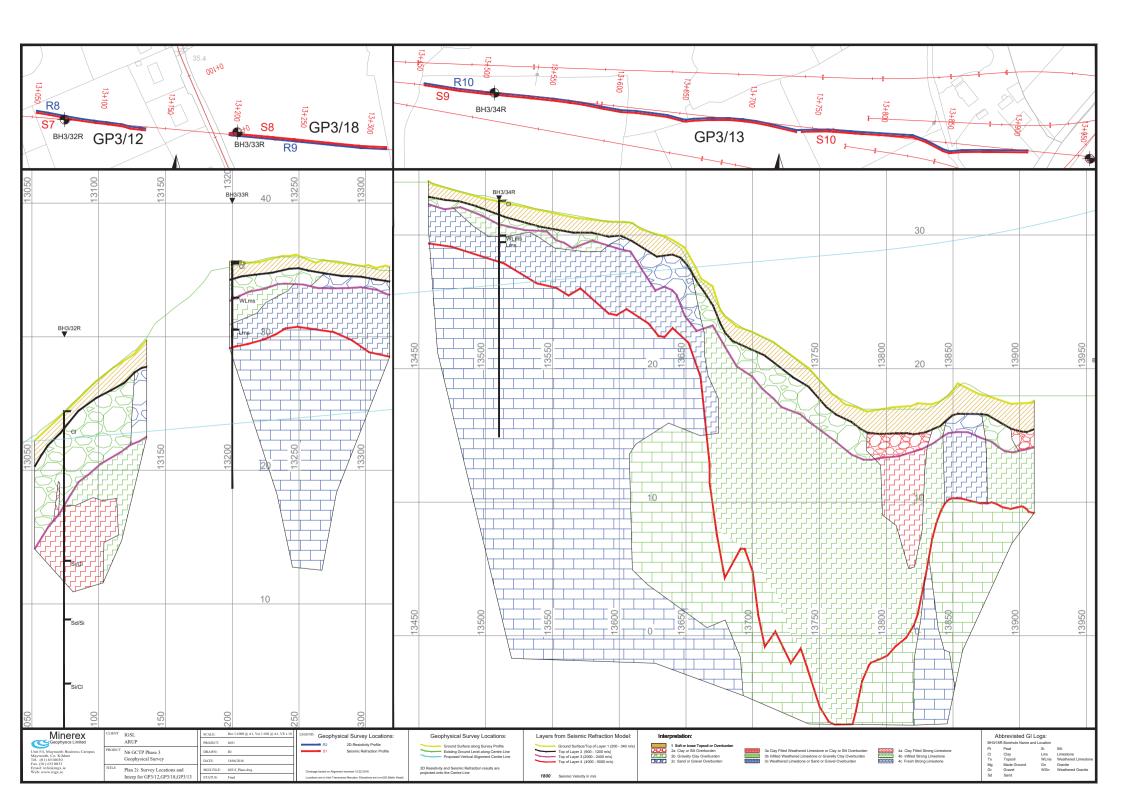


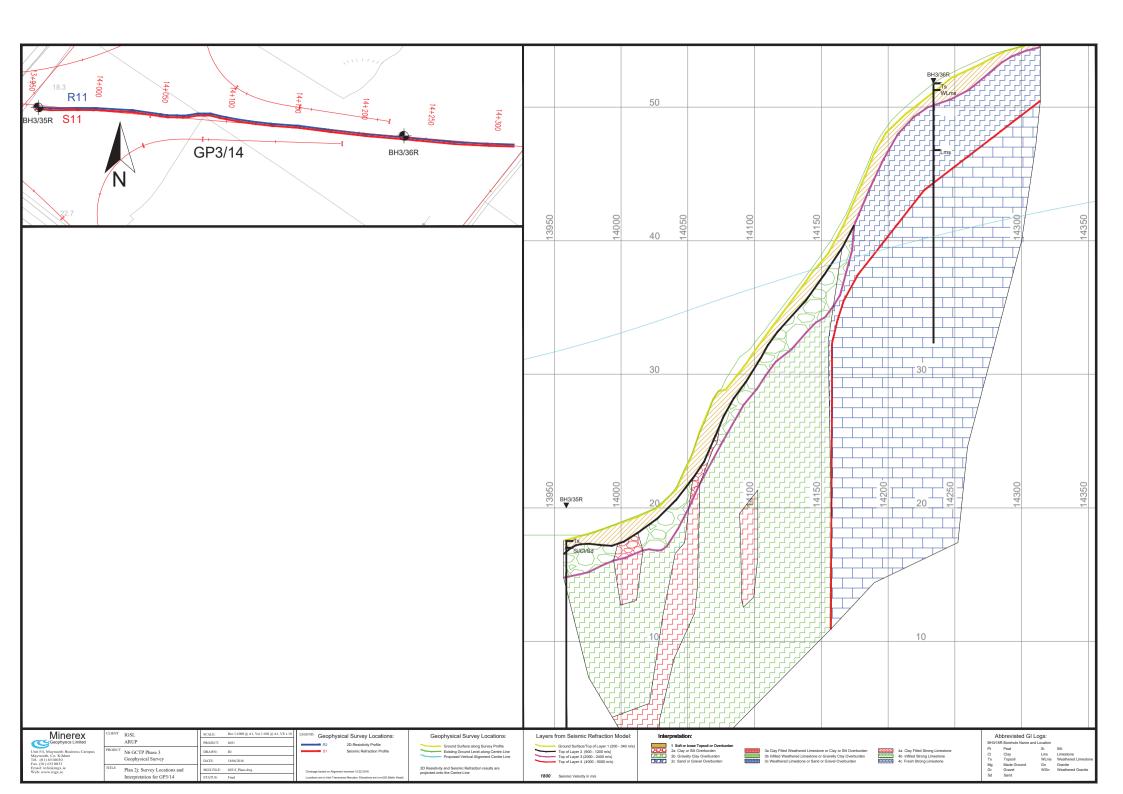


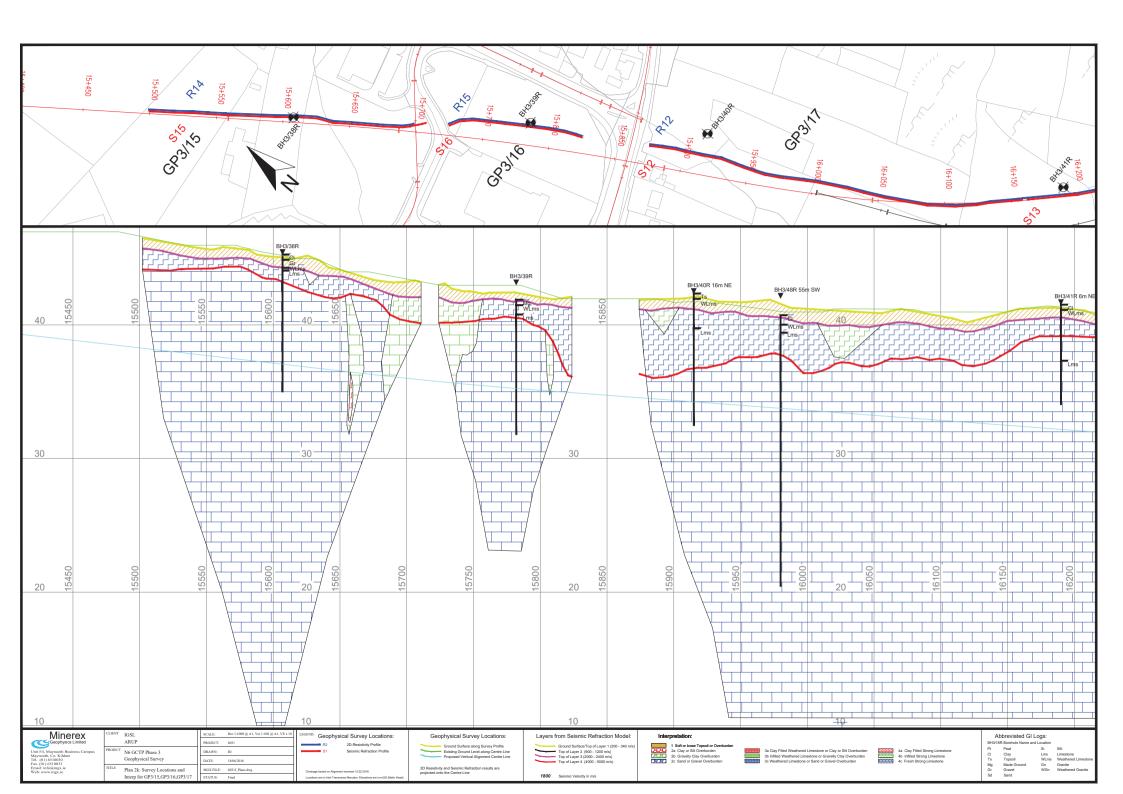


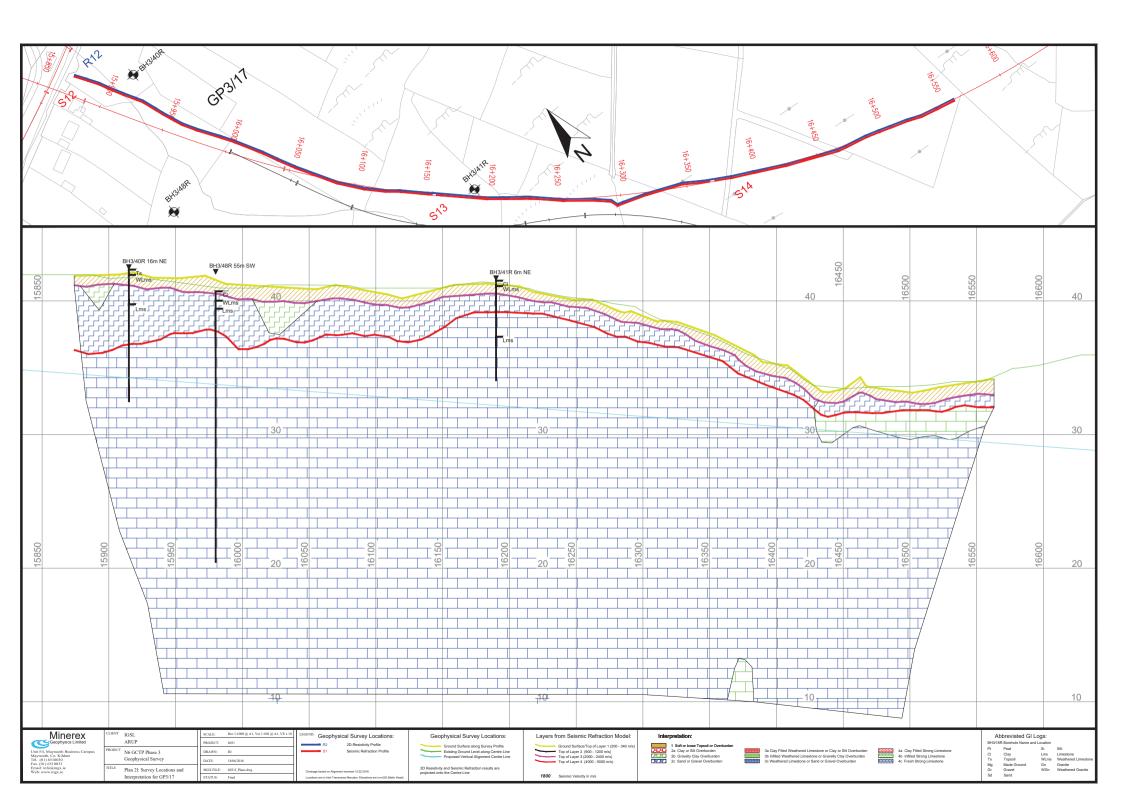


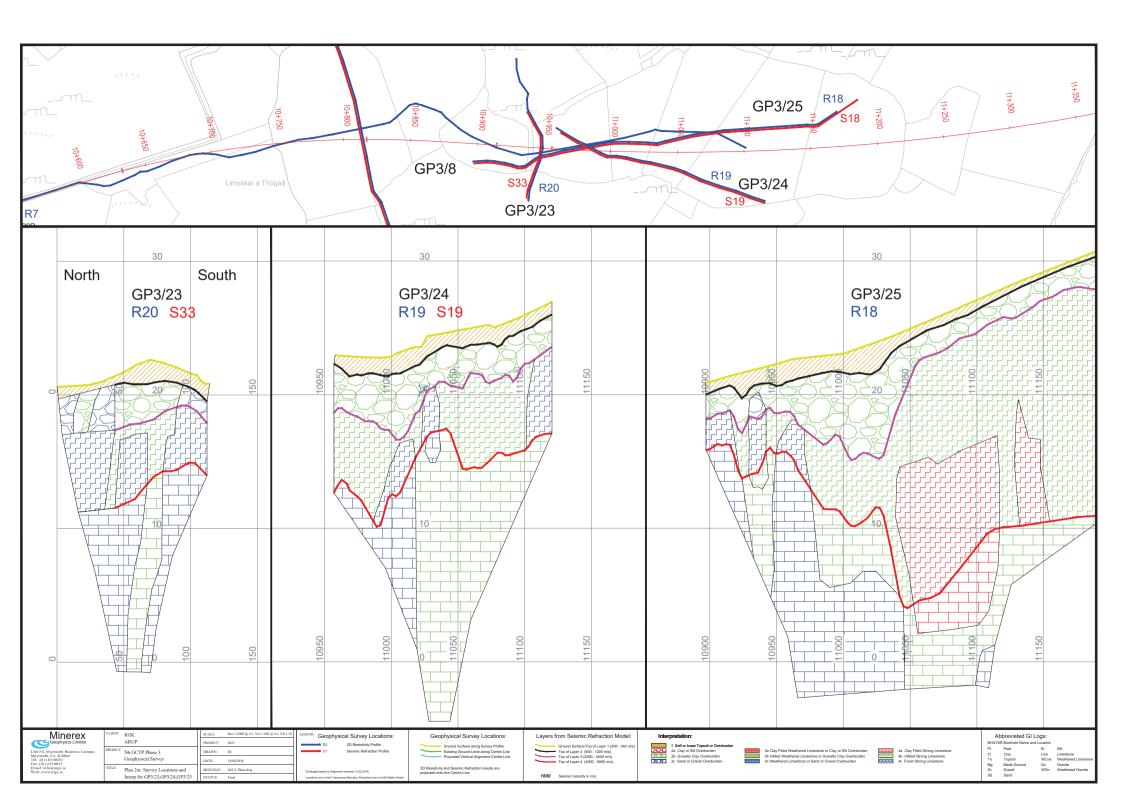


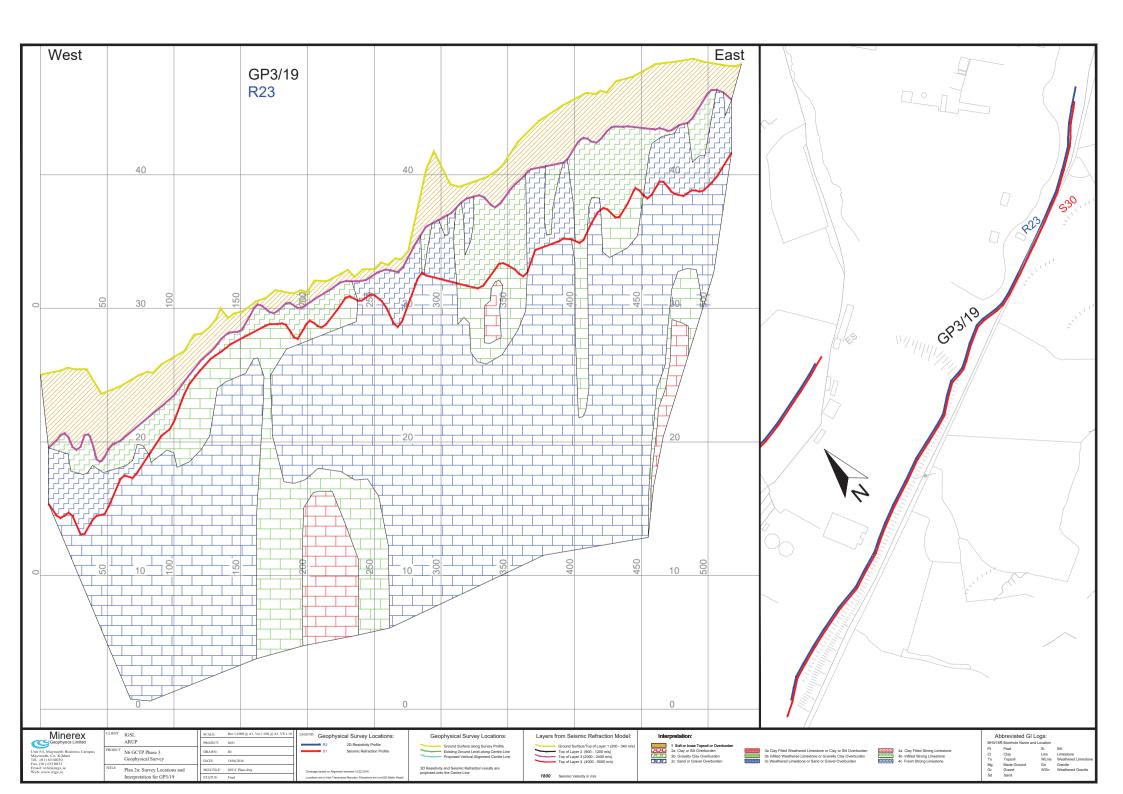


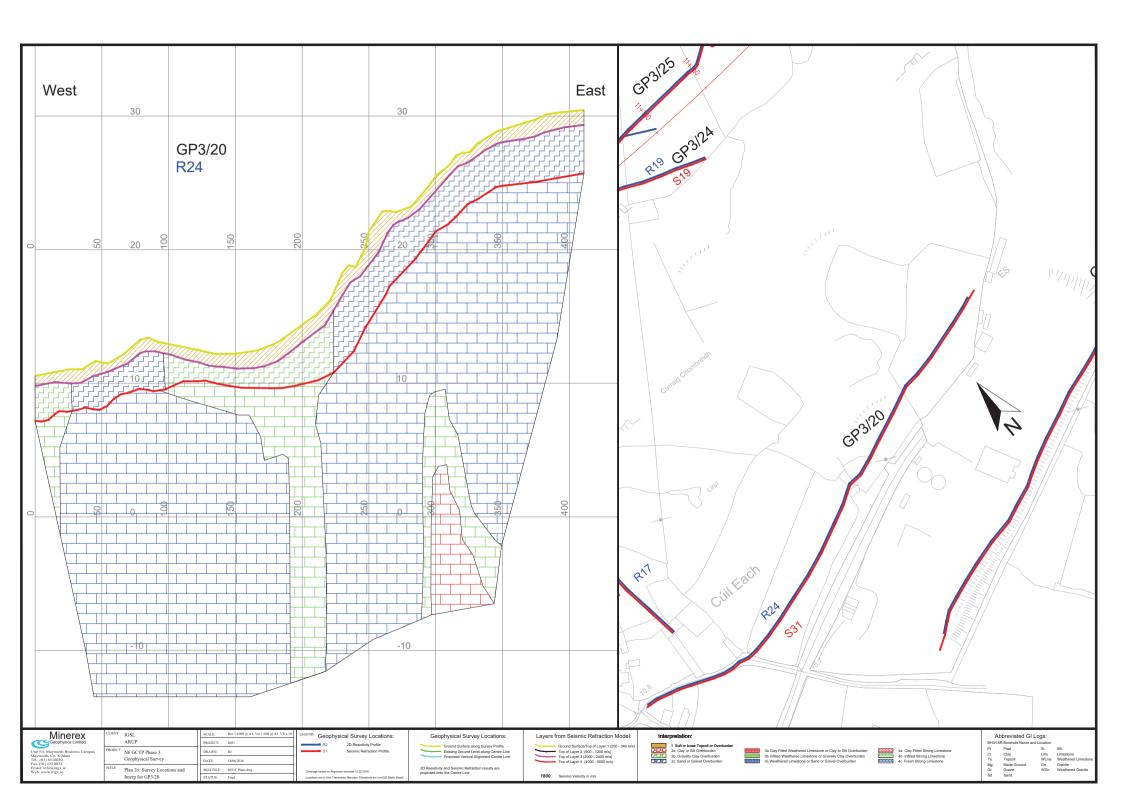


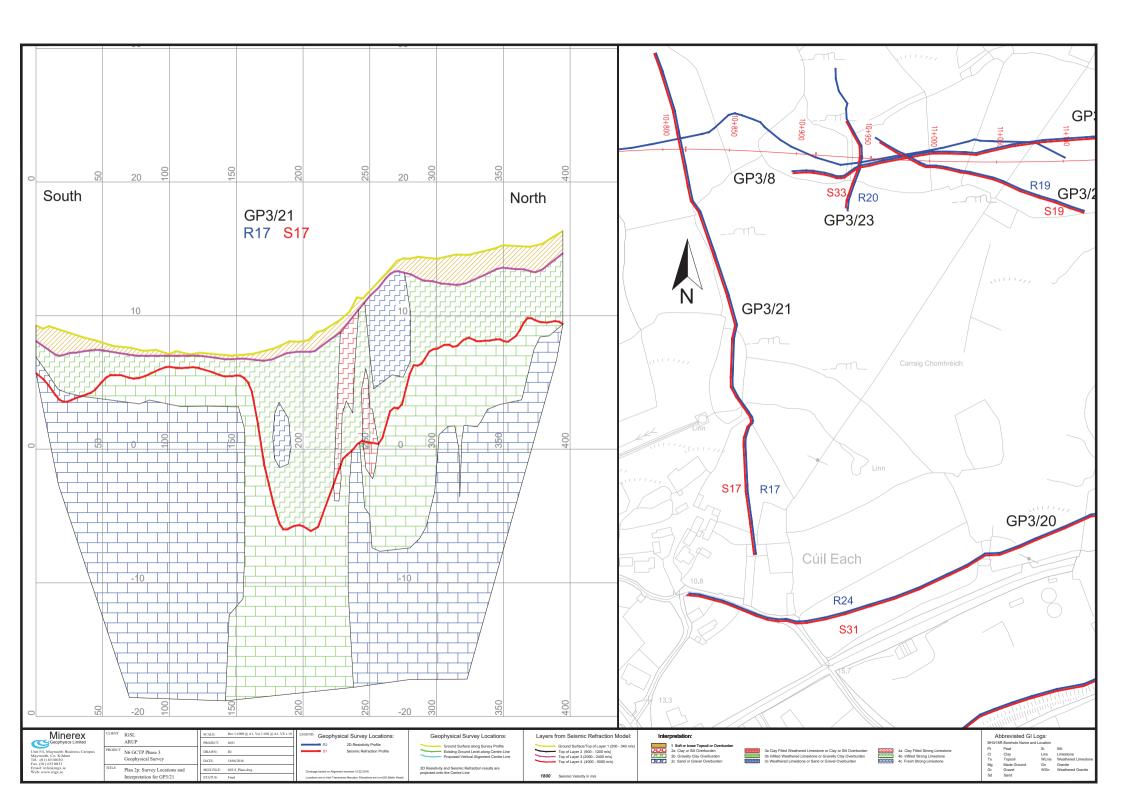












Appendix 12

Groundwater Measurements

Water Readings

Project Name GCTP Phase 3
Project No. 18963
Engineer ARUP



Borehole No.						Da	ite				
	11/03/2016	16/03/2016	21/03/2016	14-15/04/2016	25/05/2016	13-14/06/2016	18-19/07/2016	18-19/08/2016	29/09/2016	09/11/2016	
Borehole No.						m bgl	m OD				
BH3/04R	0.46		0.52	0.47	0.59	0.58	0.48	0.54	0.50	0.12	
BH3/06R	0.87			0.95	1.14	1.22	1.10	1.14	1.08	0.96	
BH3/08R	1.52			0.66	2.02	2.19	1.8	2.2	2.2	1.69	
BH3/10R				3.14	2.43	2.63	2.35	2.59	2.44	1.85	
BH3/11R	0.97		1.28	1.11	1.40	1.41	1.15	1.38	1.3	1.14	
BH3/13R				1.71	5.38	5.80	1.99	4.66		1.53	
BH3/16R				3.92	3.94	4.02	3.94	3.99	3.78	3.21	
BH3/17R			2.61	2.47	2.79	2.87	2.65	2.85	2.84	2.83	
BH3/18R			2.61	1.53	no access	2.55	2.3	2.58	2.48	2.3	
BH3/20R				3.02	3.50	3.8	3.16	3.65	3.55	3.15	
BH3/21 [CP]				1.32	1.55	dry	1.27	dry	dry	1.35	
BH3/23R			3.47	4.31	4.55	4.61	4	4.52	4.3	4.10	
BH3/24R			2.52	2.39	3.40	3.24	3.25	4.19	4.1	3.06	
BH3/27R				2.69	2.97	3.2	2.9			2.71	
BH3/29R				6.19	no access	dry	dry	dry	dry	4.50	
BH3/31R				1.53	no access	1.63	1.3	no access	no access	no access	
BH3/32R				dry (14,0)	dry (14.0)	dry	dry	14.19	dry	dry	
BH3/34R				7.52	7.78	8.04	6.66	12.88	8.50	7.70	
BH3/35R				8.91	9.10	9.61	9.14	9.49	9.20	8.37	<u> </u>
BH3/36R		18.98		18.52	18.07	17.96	17.90	17.93	17.90	17.78	ļ
BH3/38R	2.26	2.35		2.58	2.66	2.69	2.28	2.72	2.60	1.44	ļ
BH3/40R	2.66	2.95		2.96	no access	3.04	2.65	3.00	3.05	2.46	
BH3/41R	3.16	3.67		3.78	no access	4.01	3.43	no access	no access	3.20	
BH3/42R		2.72		2.97	2.72	3.15	2.53	2.85	2.80	2.66	
BH3/46R			12.78	12.71	12.75	13.00	12.74	13.01	13.00	12.49	
BH3/47R				10.05	10.16	10.19	10.00	dry	dry	10.02	
BH3/48R	1.41	1.45		1.55	no access	1.46	1.40	1.48	1.50	1.40	
						1				1	

NOTES

Appendix 13

Geotechnical Laboratory Testing

Lab Schedule 1

045 846176

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2*, 4.3, 4.4 & 5.3



Report No. R70242 Contract No. 18963

Contract Name: GCTP Phase 3-Contract 1

Customer GCC

Samples Received: 01-02-16 Date Tested: Various

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425μm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
TP3/01	AA37828	0.0	A16/0310	В	645				•				Dark brown/black sandy gravelly very fibrous PEAT
TP3/01	AA37829	1.0	A16/0311	В	12								Grey/brown clayey/silty, very sandy, GRAVEL
TP3/03	AA44474	0.5	A16/0312	D	54								Dark brown/black silty, very sandy, GRAVEL
TP3/03	AA44479	0.5	A16/0313	D	42	63	NP	NP	28	WS	4.4		Dark brown/black silty, very sandy, GRAVEL
TP3/03	AA44480	0.5	A16/0314	В	25								Dark brown/black silty, very sandy, GRAVEL
TP3/03	AA44481	1	A16/0315	D	80								Dark brown/black sandy gravelly SILT/CLAY
TP3/03	AA44482	1.6	A16/0316	D	26								Dark brown silty, very sandy, GRAVEL with occasional cobbles
TP3/03	AA44483	1.6	A16/0317	D	23	59	NP	NP	17	WS	4.4		Dark brown silty, very sandy, GRAVEL with occasional cobbles
TP3/03	AA44484	1.6	A16/0318	В	18								Dark brown silty, very sandy, GRAVEL with occasional cobbles
TP3/05	AA44473	0.5	A16/0319	D	892								Dark brown fibrous PEAT
TP3/05	AA44474	0.5	A16/0320	D	970								Dark brown/black fibrous PEAT
TP3/05	AA44475	0.5	A16/0321	В	912								Dark brown/black very fibrous PEAT
TP3/05	AA44476	1	A16/0322	D	30								Dark brown/grey clayey/silty, very sandy, GRAVEL
TP3/05	AA44477	1	A16/0323	В	30								Dark brown/grey clayey/silty, very sandy, GRAVEL
TP3/06	AA35350	0.5	A16/0324	D	855								Dark brown/black fibrous PEAT
Notes:	Preparation:	WS - Wet sie	ved	·-	Sample Type:	B - bulk distu	rbed	Remarks:		-			

Liquid Limit

U - Undisturbed

AR - As received NP - Non plastic

4.3 Cone Penetrometer definitive method

Clause: 4.4 Cone Penetrometer one point method NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014

Opinions and interpretations are outside the scope of accreditation.

Approved by

The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory

Persons authorized to approve reports

H Byrne (Quality Manager)

A Bejane

15-02-16

Date

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045 846176

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2*, 4.3, 4.4 & 5.3



Report No. R70244 Contract No. 18963 Contract Name: GCTP Phase 3-Contract 1

Customer Galway Co.Co.

Samples Received: 01-02-16 Date Tested: Various

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample	Moisture	Liquid	Plastic	Plasticity	%	Preparation	Liquid Limit	Classification	Description
	'			Туре	Content %	Limit %	Limit %	Index	<425μm	'	Clause	(BS5930)	'
TP3/06	AA37803	0.5	A16/0324	В	787								Dark brown/black PEAT
TP3/06	AA37804	1.1	A16/0325	D	22								Dark brown/black clayey/silty, sandy, GRAVEL with some cobbles
TP3/06	AA37805	1.1	A16/0326	В	21								Dark brown/black clayey/silty, sandy, GRAVEL with some cobbles
TP3/07	AA37806	0.2	A16/0327	D	31	42	NP	NP	40	WS	4.4		Brown silty, very gravelly, SAND with some cobbles
TP3/07	AA37807	0.2	A16/0328	В	27								Brown silty, very gravelly, SAND with some cobbles
TP3/08	AA37818	0.5	A16/0329	D	19								Dark brown clayey/silty, very sandy, GRAVEL with some cobbles
TP3/08	AA37819	0.5	A16/0330	В	12								Dark brown clayey/silty, very sandy, GRAVEL with some cobbles
TP3/08	AA37820	1.2	A16/0331	D	13								Light brown/grey clayey/silty, very sandy, GRAVEL
TP3/08	AA37821	1.2	A16/0332	В	12								Light brown/grey clayey/silty, very sandy, GRAVEL
TP3/11	AA37814	0.25	A16/0333	В	26								Dark brown clayey/silty, very sandy, GRAVEL with many cobbles
TP3/12	AA44457	0.1	A16/0334	В	90								Dark brown/black sandy gravelly organic SILT/CLAY
TP3/13	AA44458	0.1	A16/0335	D	246								Dark brown/black fibrous PEAT
TP3/13	AA44459	0.1	A16/0336	В	39								Dark brown/black slightly sandy, gravelly, SILT/CLAY with many cobbles
TP3/13	AA44460	0.5	A16/0337	D	25	27	NP	NP	59	WS	4.4		Light brown/grey sandy, slightly gravelly, SILT
TP3/13	AA44461	0.5	A16/0338	В	23								Light brown/grey sandy, slightly gravelly, SILT
Notes:	Preparation:	WS - Wet sie	eved		Sample Type:	B - bulk distu	rbed	Remarks:					

AR - As received

NP - Non plastic

Liquid Limit 4.3 Cone Penetrometer definitive method

Clause:

4.4 Cone Penetrometer one point method

U - Undisturbed

NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014

Opinions and interpretations are outside the scope of accreditation.

The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory

Persons authorized to approve reports

H Byrne (Quality Manager)

Approved by Page Date 15-02-16 1 of 1

045 846176

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2*, 4.3, 4.4 & 5.3



Report No. R70245 Contract No.

18963

Contract Name:

GCTP Phase 3-Contract 1

Galway Co. Co. Customer

Samples Received: 01-02-16 Date Tested:

Various

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425μm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
TP3/15	AA44485	0.1	A16/0340	D	210	247	NP	NP	46	WS	4.4		Dark brown/black PEAT
TP3/15	AA44486	0.1	A16/0341	В	140								Dark brown/black slightly gravelly PEAT
TP3/16	AA37816	0.2	A16/0342	D	44								Dark brown slightly clayey/silty, sandy, GRAVEL
TP3/16	AA37817	0.2	A16/0496	В	15								Dark brown slightly clayey/silty, sandy, GRAVEL
TP3/17	AA44487	0.5	A16/0509	D	17								Orange/brown clayey/silty, sandy, GRAVEL with some cobbles
TP3/17	AA44488	0.5	A16/0343	В	14								Orange/brown clayey/silty, sandy, GRAVEL with some cobbles
TP3/17	AA44489	0.5	A16/0344	В	18								Orange/brown clayey/silty, sandy, GRAVEL with some cobbles
TP3/18	AA37825	0.15	A16/0345	В	36								Dark brown/black sandy gravelly SILT/CLAY
TP3/18	AA37826	1	A16/0346	В	10								Brown clayey/silty, sandy, GRAVEL
TP3/18	AA37827	2	A16/0347	В	6.2								Light brown slightly clayey/silty, sandy, GRAVEL with some cobbles
TP3/19	AA44490	0.5	A16/0348	D	11								Dark brown/black clayey/silty, very sandy, GRAVEL with some cobbles
TP3/19	AA44491	0.5	A16/0349	В	15								Dark brown/black clayey/silty, very sandy, GRAVEL with some cobbles
TP3/19	AA44492	0.5	A16/0350	В	14								Dark brown/black clayey/silty, very sandy, GRAVEL with some cobbles
TP3/20	AA37822	0.15	A16/0351	В	169								Dark brown/black very fibrous PEAT
TP3/20	AA37823	1	A16/0352	В	170								Dark brown/black very fibrous PEAT
Notes:	tes: Preparation: WS - Wet sieved Sample Type: B - bulk distr						bed	Remarks:					

U - Undisturbed

AR - As received NP - Non plastic

H Byrne (Quality Manager)

NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014

Liquid Limit 4.3 Cone Penetrometer definitive method Opinions and interpretations are outside the scope of accreditation.

Approved by

Clause: 4.4 Cone Penetrometer one point method

The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory

Persons authorized to approve reports

Date 15-02-16

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045 846176

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2*, 4.3, 4.4 & 5.3



Report No. R70246 Contract No.

Contract Name:

GCTP Phase 3-Contract 1

Customer GCC

Samples Received: 01-02-16

Date Tested:

10-02-16

18963

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample	Moisture	Liquid	Plastic	Plasticity	%	Preparation	Liguid Limit	Classification	Description
D11/11	Campio No.	Bopar (m)	Lab. Hor	Туре	Content %	Limit %	Limit %	Index	<425μm		Clause	(BS5930)	Becompacin
TP3/20	AA37824	1.0	A16/0353	В	11				•				Dark brown/grey very sandy GRAVEL
TP3/20	AA37824	1.0	A16/0354	Е	11								Dark brown/grey very sandy GRAVEL
TP3/21	AA44493	0.2	A16/0355	D	15								Dark brown/black clayey/silty, sandy, GRAVEL with some cobbles
TP3/21	AA44494	0.15	A16/0356	В	17								Dark brown/black clayey/silty, sandy, GRAVEL with some cobbles
TP3/21	AA44495	0.15	A16/0357	В	19								Dark brown/black clayey/silty, sandy, GRAVEL with some cobbles
TP3/22	AA39946	0.15	A16/0358	D	25	34	NP	NP	75	WS	4.4		Brown sandy, slightly gravelly, SILT
TP3/22	AA33947	0.15	A16/0359	В	24								Brown sandy, slightly gravelly, SILT
TP3/23	AA39940	0.5	A16/0360	D	17	29	NP	NP	77	WS	4.4		Light brown slightly sandy, slightly gravelly, SILT
TP3/23	AA33941	0.5	A16/0361	В	17								Light brown slightly sandy, slightly gravelly, SILT
TP3/23	AA33942	1.1	A16/0362	D	12	21	NP	NP	65	WS	4.4		Light brown slightly sandy, gravelly, SILT with some cobbles
TP3/23	AA33943	1.1	A16/0363	В	11								Light brown slightly sandy, gravelly, SILT with some cobbles
TP3/23	AA33944	2	A16/0364	D	6.6	19	NP	NP	54	WS	4.4		Light brown slightly sandy, gravelly, SILT with some cobbles
TP3/23	AA33945	2	A16/0365	В	7.9								Light brown slightly sandy, gravelly, SILT with some cobbles
TP3/25	AA33934	0.15	A16/0366	D	34	59	NP	NP	34	WS	4.4		Brown silty, very sandy, GRAVEL
TP3/25	AA33935	0.15	A16/0367	В	16								Brown silty, very sandy, GRAVEL
Notes:	Preparation:	WS - Wet sie	ved		Sample Type:	B - bulk distu	rbed	Remarks:					

AR - As received NP - Non plastic

U - Undisturbed

H Byrne (Quality Manager)

Liquid Limit 4.3 Cone Penetrometer definitive method NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014 Opinions and interpretations are outside the scope of accreditation.

Approved by

Clause: 4.4 Cone Penetrometer one point method

The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory

Persons authorized to approve reports

15-02-16

Date

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R70246.PID.xls Tmp: Pl.II Rev 02/10

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2*, 4.3, 4.4 & 5.3



Report No. R70247 Contract No.

18963

Contract Name:

GCTP Phase 3-Contract 1

Customer Galway Co.Co.

Samples Received:

01-02-16

Date Tested:

Various

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425μm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
TP3/25	AA33936	1.0	A16/0368	D	7.7	24	NP	NP	38	WS	4.4		Light brown/grey very sandy very gravelly SILT
TP3/25	AA33937	1.0	A16/0369	В	8.1								Light brown/grey very sandy very gravelly SILT
TP3/25	AA33938	2.0	A16/0370	D	7.9								Light brown/grey slightly sandy, gravelly, SILT/CLAY with some cobbles
TP3/25	AA33939	2.0	A16/0371	В	7.7								Light brown/grey slightly sandy, gravelly, SILT/CLAY with some cobbles
TP3/27	AA44451	0.5	A16/0372	D	15	34	NP	NP	64	WS	4.4		Brown slightly sandy, gravelly, SILT
TP3/27	AA44452	0.5	A16/0373	В	17								Brown slightly sandy, gravelly, SILT
TP3/27	AA44453	1.0	A16/0374	D	6.7	18	NP	NP	66	WS	4.4		Grey/brown slightly sandy, slightly gravelly, SILT
TP3/27	AA44454	1.0	A16/0375	В	9.2								Grey/brown slightly sandy, slightly gravelly, SILT
TP3/27	AA44455	2.0	A16/0376	D	6.4	18	NP	NP	73	WS	4.4		Light brown slightly sandy, slightly gravelly, SILT
TP3/27	AA44456	2.0	A16/0377	В	9.3								Light brown slightly sandy, slightly gravelly, SILT
TP3/28	AA37830	0.5	A16/0378	D	14	22	NP	NP	51	WS	4.4		Light brown slightly sandy, gravelly, SILT with some cobbles
TP3/28	AA37831	0.5	A16/0379	В	11								Light brown slightly sandy, gravelly, SILT with some cobbles
TP3/28	AA37832	1.0	A16/0380	D	13	22	NP	NP	64	WS	4.4		Light brown slightly sandy, slightly gravelly, SILT
TP3/28	AA37833	1.0	A16/0381	В	12								Light brown slightly sandy, slightly gravelly, SILT
TP3/28	AA37834	2.0	A16/0382	D	10	21	NP	NP	69	WS	4.4		Light brown slightly sandy, slightly gravelly, SILT
Notes:	Preparation:	WS - Wet sie	ved	-	Sample Type:	B - bulk distu	rbed	Remarks:		•			•

AR - As received

U - Undisturbed

H Byrne (Quality Manager)

NP - Non plastic

NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014

Liquid Limit 4.3 Cone Penetrometer definitive method Opinions and interpretations are outside the scope of accreditation.

Approved by

Clause: 4.4 Cone Penetrometer one point method

The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory

Persons authorized to approve reports

Date 15-02-16

Page

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045 846176

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2*, 4.3, 4.4 & 5.3



Report No. R70248 Contract No.

18963 Contract Name:

GCTP Phase 3-Contract 1

Customer GCC

Samples Received: 01-02-16

Date Tested:

Various

							•						
BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample	Moisture	Liquid	Plastic	Plasticity	%	Preparation	Liquid Limit	Classification (BS5930)	Description
				Туре	Content %	Limit %	Limit %	Index	<425μm		Clause	(100000)	
TP3/28	AA37835	2.0	A16/0383	В	9.5								Light brown slightly sandy, gravelly, SILT/CLAY
TP3/28	AA37836	3.0	A16/0384	D	9.4	20	NP	NP	63	WS	4.4		Light brown slightly sandy, gravelly, SILT
TP3/28	AA37837	3.0	A16/0385	В	8.5								Light brown slightly sandy, gravelly, SILT
TP3/29	AA37808	0.5	A16/0386	D	316								Dark brown/black fibrous PEAT
TP3/29	AA37809	0.5	A16/0387	В	199								Dark brown/black fibrous PEAT
TP3/29	AA37810	1	A16/0388	D	45	38	23	15	49	WS	4.4	СІ	Brown clayey/silty, sandy, GRAVEL with many cobbles
TP3/29	AA37811	1	A16/0389	В	27								Brown clayey/silty, sandy, GRAVEL with many cobbles
TP3/29	AA37812	1.6	A16/0390	D	29	55	NP	NP	46	WS	4.4		Dark brown/grey clayey/silty, very sandy, GRAVEL with some cobbles
TP3/29	AA37813	1.6	A16/0391	В	27								Dark brown/grey clayey/silty, very sandy, GRAVEL with some cobbles
TP3/33	AA35349	0	A16/0392	В	72								Black gravelly sandy organic SILT/CLAY
TP3/34	AA44464	0.5	A16/0393	D	653								Dark brown/black PEAT
TP3/34	AA44465	0.5	A16/0394	D	531								Dark brown/black PEAT
TP3/34	AA44466	0.5	A16/0395	В	493								Dark brown/black PEAT
TP3/34	AA44467	1	A16/0396	D	25	35	NP	NP	78	WS	4.4		Grey/brown slightly sandy, slightly gravelly, SILT
TP3/34	AA44468	1	A16/0397	В	23								Grey/brown slightly sandy, slightly gravelly, SILT
Notes:	Preparation:	WS - Wet sie	ved		Sample Type:	B - bulk distu	rbed	Remarks:					

AR - As received

U - Undisturbed

NP - Non plastic

H Byrne (Quality Manager)

Liquid Limit 4.3 Cone Penetrometer definitive method NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014 Opinions and interpretations are outside the scope of accreditation.

Clause: 4.4 Cone Penetrometer one point method The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory

Persons authorized to approve reports

Approved by

15-02-16

Date

1 of 1

Page

045 846176

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2*, 4.3, 4.4 & 5.3



Report No. R70249 Contract No. 18963 Contract Name: GCTP Phase 3-Contract 1

Customer GCC

Samples Received: 01-02-16 Date Tested: Various

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425μm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
TP3/34	AA44469	2.0	A16/0398	D	15	33	NP	NP	24	WS	4.4		Grey clayey/silty, sandy, GRAVEL
TP3/34	AA44470	2.0	A16/0399	В	11								Grey clayey/silty, sandy, GRAVEL
TP3/34	AA44471	1.0	A16/0400	CBR	25								Dark brown very sandy very gravelly SILT/CLAY with root hairs
TP3/34	AA44472	1.0	A16/0401	CBR	25								Dark brown very sandy very gravelly SILT/CLAY with root hairs
TP3/35	AA44462	0.5	A16/0402	D	612								Dark brown/black PEAT
TP3/35	AA44463	0.5	A16/0403	В	643								Drk brown/black fibrous PEAT
0	0	0	0	0	0								0
TP3/14	AA37815	0.2	A16/0339	В	22								Dark brown/black clayey/silty, sandy, GRAVEL with many cobbles
			·			·	·					·	
						_						_	
Notes:	Preparation:	B - bulk distu	rbed	Remarks:		-			_				

WS - Wet sieved Notes: Preparation:

AR - As received

NP - Non plastic

IGSL Ltd Materials Laboratory

Liquid Limit 4.3 Cone Penetrometer definitive method

4.4 Cone Penetrometer one point method

Clause:

Persons authorized to approve reports

H Byrne (Quality Manager)

U - Undisturbed

NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014

Opinions and interpretations are outside the scope of accreditation.

The results relate to the specimens tested. Any remaining material will be retained for one month.

Approved by Page Date 15-02-16 1 of 1

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R70450			
size	passing			Contract:	GCTP Pha	se 3 - Co	ontact 1			
75	100	COBBLES		TP:	TP03/01					
63	100	OODDELO		Sample No.	AA37824	Lab. Sa	ample No.	A16/0311		
50	96			Sample Type:	В					
37.5	89			Depth (m)	1.00	Custom	ner: Galway Co.C	0.		
28	85			Date Received	01-02-16		esting started	09-02-16		
20	77			Description:	Grey/brow	n clayey/s	silty, very sandy, G	RAVEL		
14	69	GRAVEL								
10	64	OTTAL		Remarks						
6.3	58						0.15	0.3 0.425 0.6	35	7.5 37.5 93 93
5	55		100	_			0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 14 20	37 930 930
3.35	49									
2	42		90							
1.18	36		© 80	1						
0.6	29		<u>ိ</u> စ္ခ် 70	†						
0.425	27	SAND	Percentage passing (%) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	+ + + + + + + + + + + + + + + + + + + +						
0.3	23		<u>\delta} 50</u>	1						
0.15	17		betu 40	 						
0.063	15		<u> </u>	 						
			20							
			10							
		SILT/CLAY	0							
			_	0001 0.0	01	0.01	0.1	1	10	100
				CLA	Y	SILT	Sieve size (mm)	SAND	GRAVEL	
		1001 11	-1 BA - 1 - 1	ala Labas C			Approved by:		Date:	Page no:
		IGSL Lt	d Wateri	als Laborate	ory		A Byen	-	17-02-16	1 of 1
						Persons a	authorised to approve re	port: J Barrett (De	p. Quality Manager) H Byr	rne (Quality Manag

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R70496			
size	passing		1	Contract:	GCTP Pha	ise 3 - Co	ontact 1			
75	100	COBBLES	1	TP:	TP03/03					
63	100		1	Sample No.	AA	Lab. Sa	ample No.	A16/0314		
50	94		1	Sample Type:	В					
37.5	81		1	Depth (m)	0.50	Custom	er: Galway Co.C	0.		
28	72		1	Date Received	01-02-16		esting started	04-02-16		
20	65		1	Description:	Dark brow	n/black sil	ty, very sandy, GR	AVEL		
14	59	GRAVEL	1							
10	55	0.0	1	Remarks						
6.3	50						0.15	0.3 1.425 0.6 1.18	35	ιĊ
5	47		100				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 10 20	7027
3.35	43		100							
2	38		90							
1.18	33		<u></u> 80							
0.6	26		<u>်</u> 70	+ + + + + + + + + + + + + + + + + + + +						
0.425	23	SAND	iss 60	+ + + + + + + + + + + + + + + + + + + +						
0.3	20		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.15	16		bett 40							
0.063	13		e 30						1	
			ور 20							
		SILT/CLAY	10							
			0		04		2.4		40	4.00
			0.	0001 0.0		0.01	0.1	1	10	100
				CLA	/	SILT	Sieve size (mm)	SAND	GRAVEL	
	l	1001.11	al N/I = 4 = 1	iala Labassi			Approved by:		Date:	Page no:
		IGSL Lt	a water	ials Laborato	ory 		A Bejon	_	18-02-16	1 of 1
						Persons a	authorised to approve rep	oort: J Barrett (De	p. Quality Manager) H Byr	ne (Quality Manager

Determination of Particle Size Distribution





	1								<u> </u>	
particle	%			Contract No:	18963	•	. R70449			
size	passing			Contract:		se 3 - Conta	act 1			
75	100	COBBLES		TP:	TP03/03					
63	96			Sample No.	AA44484	Lab. Samp	ole No.	A16/0318		
50	83			Sample Type:	В					
37.5	72			Depth (m)	1.60	Customer:	Galway Co.C	co.		
28	66			Date Received	01-02-16	Date Testi	-	05-02-16		
20	59			Description:	Dark brown	n silty, very s	sandy, GRAVEL	with occasiona	ıl cobbles	
14	52	GRAVEL								
10	48	0.0.0.		Remarks						
6.3	44						55	8 8	22	τ.
5	41		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 20 20 20	37.0 530.7
3.35	36		100							
2	32		90							
1.18	27		<u> </u>							
0.6	21		§ 70	+						
0.425	19	SAND	ils 60							
0.3	14		0 50							
0.15	7		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.063	6		Cen							
			20							
		SILT/CLAY	10	+ + + + + + + + + + + + + + + + + + + +						
		0.21702711	0				 			
			0.	0001 0.0	31	0.01	0.1	1	10	100
				CLA	,	SILT S	ieve size (mm)	SAND	GRAVEL	
		1001 14	d Mata:	iala Labarrata			Approved by:		Date:	Page no:
		IGSL Lt	a water	ials Laborato	гу		A Byen		17-02-16	1 of 1
						Persons author	orised to approve re	port: J Barrett (De	p. Quality Manager) H Byr	ne (Quality Mana

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report N	lo. R70586		!	
size	passing			Contract:	GCTP Pha	se 3 - Cor	ntact 1			
75	100	COBBLES		TP:	TP03/05					
63	100	OODDELO		Sample No.	AA	Lab. Sar	nple No.	A16/0485		
50	79			Sample Type:	В					
37.5	75			Depth (m)	1.00	Custome	r: Galway Co.	Co.		
28	64			Date Received	01-02-16		sting started	05-02-16	i	
20	57			Description:	Dark brow	n/grey clay	ey/silty, very sai	ndy, GRAVEL		
14	53	GRAVEL								
10	49	OTTAL		Remarks	Sample size did not meet the	requirements of BS1377				
6.3	44						63	3 25 3 18	35	ιĊ
5	42		100				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 14 20	37.0 530.7 530.0
3.35	34		100							
2	29		90							
1.18	24		© 80	† 						
0.6	18		© 70	+ + + + + + + + + + + + + + + + + + + +						 /
0.425	15	SAND	Percentage passing (%) 80 20 40 30 40 30	 						
0.3	12		8 50	 						
0.15	9) tag	<u> </u>						
0.063	7		acer 30							
			20							
		SILT/CLAY	10							
			0	0001 0.0	n01	0.01	0.1	1	10	100
			0.0	CLA			Sieve size (mm		GRAVEL	100
		IGSL I to	d Materi	als Laborate	orv		Approved b	y:	Date:	Page no:
					-· J		# Byen	~	23-02-16	1 of 1
						Persons au	thorised to approve	report: J Barrett (De	p. Quality Manager) H By	rne (Quality Manag

Determination of Particle Size Distribution



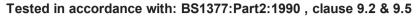
(note: Sedimentation stage not accredited)



Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

particle	%			Contract No:	18963	Report	No. R70372							
size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1							
75	100	COBBLES		TP:	TP3/06									
63	89	OODDELO		Sample No.		Lab. Sa	ample No.	A16/0325						
50	89			Sample Type:	В									
37.5	83			Depth (m)	1.10	Custom	er: Galway Co.Co).						
28	79			Date Received	01-02-16	Date To	esting started	04-02-16						
20	75			Description:	Dark brown	n/black cla	ayey/silty, sandy, G	RAVEL with so	me cobbles					
14	71	GRAVEL												
10	62	GNAVEL		Remarks	Sample size did not meet the r	requirements of BS1377								
6.3	46						5 53	8 22	ري .	rύ				
5	40		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 14 20	3 2 3 3 4 3 4 3 4 3 4 4 4 4 4 4 4 4 4 4				
3.35	29			100										
2	22		90											
1.18	18		80											
0.6	13	SAND	≥ 70	+										
0.425	12		SAND	SAND	SAND	SAND	Percentage passing (%) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0							
0.3	11				6 50									
0.15	9		eget 40											
0.063	7		cen											
			20											
		SILT/CLAY	10											
			0	+ + + + + + + + + + + + + + + + + + + +			 		1 111111111					
			0.0	0.00		0.01	0.1	1	10	100				
				CLAY	•	SILT	Sieve size (mm)	SAND	GRAVEL					
			d Mater	ala Labarata	163.7		Approved by:		Date:	Page no:				
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Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report N	No. R70587		_							
size	passing			Contract:	GCTP Phas	se 3 - Co	ntact 1									
75	100	COBBLES		TP:	TP03/07											
63	93	OODDELO		Sample No.	AA	Lab. Sa	mple No.	A16/0328								
50	87			Sample Type:	В											
37.5	84			Depth (m)	0.20	Custome	er: Galway Co.C	0.								
28	82			Date Received	01-02-16		sting started	05-02-16								
20	79			Description:	Brown silty,	very grav	velly, SAND with so	ome cobbles								
14	77	GRAVEL														
10	75	OIVWLL		Remarks												
6.3	72		<u> </u>					5 53	8 22 2	ري	ιĊ					
5	71		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	37. 50. 53.						
3.35	66		100 -							ППИП						
2	59		90 -													
1.18	52	SAND	80 -													
0.6	41		SAND	SAND	S 70 -											
0.425	35				SAND	SAND	SAND	SAND	. 88 iii -							
0.3	30												<u>a</u> 50 -			
0.15	21		Percentage passing (%) 70 - 20 - 20 - 20 - 20 - 20 - 20 - 20 -													
0.063	15		90 -													
								1								
			20 -													
		SILT/CLAY	10 -													
			0 -	!						 						
			0.0	0.0		0.01	0.1	1	10	100						
				CLAY	/	SILT	Sieve size (mm)	SAND	GRAVEL							
	l	1001.11	al Matau'	ا ا ماه ا ماه			Approved by:		Date:	Page no:						
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						Persons au	uthorised to approve rep	oort: J Barrett (De	p. Quality Manager) H Byr	ne (Quality Manage						

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report No.														
size	passing		Ī	Contract:	GCTP Pha	se 3 - Conta	ct 1													
75	100	COBBLES		TP:	TP03/8															
63	88	0000000		Sample No.	AA37819	Lab. Samp	le No.	A16/0330												
50	76			Sample Type:	В															
37.5	74			Depth (m)	0.50	Customer:	Galway Co.0	Co.												
28	65			Date Received	01-02-16	Date Testir		05-02-16												
20	58			Description: Dark brown clayey/silty, very sandy, GRAVEL with some cobbles																
14	50	GRAVEL																		
10	45	OTTALL		Remarks	Sample size did not meet the	requirements of BS1377														
6.3	38						53	25	3 35	rċ.										
5	35								400				0.063	0.3 0.425 0.6 1.18	2 3 3 3 5 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	37. 530. 530.				
3.35	32		100																	
2	26		90																	
1.18	22		<u>©</u> 80																	
0.6	17		Percentage passing (%) 30	+ + + + + + + + + + + + + + + + + + + +						/ 										
0.425	15	SAND	SAND	SAND	SAND	SAND	SAND	SAND	SAND	SAND	SAND	SAND	.ig 60							
0.3	13												<u>ω</u> 50							-
0.15	10		gestr 40																	
0.063	6		90 190 190 190 190																	
			ى 20																	
			10																	
		SILT/CLAY																		
			0.	0001 0.0	001	0.01	0.1	1	10	100										
				CLA	Y	SILT Si	eve size (mm)	SAND	GRAVEL											
		1001 14	-1 NA - 1 :	!ala ala			Approved by		Date:	Page no:										
		IGSL Lt	a Mater	ials Laborato	ory		A Rejer	-	18-02-16	1 of 1										
						Persons autho	rised to approve re	eport: J Barrett (De	p. Quality Manager) H Byr	ne (Quality Manag										

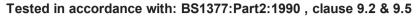
Determination of Particle Size Distribution





									<u> </u>										
particle	%			Contract No:	18963	Report No.													
size	passing	ļ		Contract:	GCTP Pha	se 3 - Conta	ct 1												
75	100	COBBLES		TP:	TP03/08														
63	100	0055220		Sample No.	AA37821	Lab. Samp	le No.	A16/0332											
50	100			Sample Type:	В														
37.5	84			Depth (m)	1.20	Customer:	Galway Co.C	Co.											
28	77			Date Received	01-02-16	Date Testir	-	05-02-16											
20	68			Description:	Light brown	n/grey clayey	/silty, very sand	dy, GRAVEL											
14	65	GRAVEL																	
10	60	OIVWEE		Remarks	Sample size did not meet the	requirements of BS1377													
6.3	54							53	25	. 35	75								
5	51						400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	28 330.78 530.78					
3.35	45			100															
2	39		90							#####									
1.18	35		© 80	+ + + + + + + + + + + + + + + + + + + +					1 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	 									
0.6	30	SAND	SAND	SAND	SAND	§ 70	+ + + + + + + + + + + + + + + + + + + +						++++++						
0.425	27					SAND	SAND	SAND	SAND	SAND	SAND	iss 60	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						
0.3	25						<u>a</u> 50												
0.15	21) tage																
0.063	14		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00																
			20																
		SILT/CLAY	10	1															
			0	0001 0.0	101	0.01	0.1	1	10	100									
			0.0							100									
				CLA	ſ	SILT Si	eve size (mm)	SAND	GRAVEL										
							Approved by		Date:	Page no:									
		IGSL Lt	d Materi	als Laborate	ory		Me	Syene	15-02-16	1 of 1									
						Persons autho	rised to approve re	port: J Barrett (De	p. Quality Manager) H By	rne (Quality Manager									

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R70588																		
size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1																		
75	83	COBBLES		TP:	TP03/11																				
63	70	COBBLES		Sample No.	AA37814	Lab. Sa	ample No.	A16/0333																	
50	65			Sample Type:	В																				
37.5	60			Depth (m)	0.25	Custon	ner: Galway Co.Co																		
28	58			Date Received	01-02-16	Date To	esting started	05-02-16																	
20	55			Description:	Dark brown	n clayey/s	silty, very sandy, GR	AVEL with ma	any cobbles																
14	52	GRAVEL																							
10	50			Remarks	Sample size did not meet the re	equirements of BS1377	,																		
6.3	47											63	25	35	rċ.										
5	45								100				0.063	0.425 0.6 0.6	2 3.35 6.3 10 20 20	37. 93. 93.									
3.35	41		100																						
2	36		90																						
1.18	31	SAND	<u>\$</u>																						
0.6	25		SAND	SAND	SAND	SAND	SAND	<u>©</u> 70	+ + + + + + + + + + + + + + + + + + + +																
0.425	22							SAND	SAND	SAND	SAND	SAND	SAND	SAND	SAND	SAND	SAND	iss 60	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						
0.3	19								ed 50	 															
0.15	13		ob tage																						
0.063	9		Percentage passing (%) 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0																						
			ص ع 20																						
		SILT/CLAY	10																						
			0	1004	04	0.04	0.4	4	40	400															
			0.0	0.0		0.01	0.1	1	10	100															
				CLA	,	SILT	Sieve size (mm)	SAND	GRAVEL																
	<u>I</u>	1001 : 1					Approved by:		Date:	Page no:															
		IGSL Lt	d Materi	als Laborato	ory		A Byone	_	23-02-16	1 of 1															
						Persons a	authorised to approve repo	ort: J Barrett (De	p. Quality Manager) H Byr	ne (Quality Manage															

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Penort N	lo. R70661								
size	passing			Contract:	GCTP Phas	•									
75	89			TP:	TP03/13	30 0 - 001	itaot i								
63	79	COBBLES		Sample No.	AA44459	Lab. San	nnle No	A16/0336							
50	60			Sample Type:	В	Las. Gan	ipio i to:	711070000							
37.5	55			Depth (m)	0.10	Custome	r: Galway Co.0	Co.							
28	50			Date Received	02-02-16		sting started	09-02-16							
20	47			Description:			-		with many cobbles						
14	43	00 A) /FI		•											
10	43	GRAVEL		Remarks	Sample size did not meet the r	equirements of BS1377									
6.3	41						5 3	8 57	22	22					
5	40								0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 14 20	23. 23. 53. 53.			
3.35	39					39	100								
2	36		90												
1.18	36		<u> </u>	+ + + + + + + + + + + + + + + + + + + +											
0.6	33		§ 70	+ + + + + + + + + + + + + + + + + + + +											
0.425	32	SAND	SAND	SAND	SAND	SAND		Percentage passing (%) 80 00 00 00 00 00 00 00 00 00 00 00 00							
0.3	31							<u>8</u> 50							
0.15	28) tage												
0.063	26		arcen 30												
			ص 30 20												
		SILT/CLAY	10												
			0.0	0001 0.0	01	0.01	0.1	1	10	100					
				CLA			Sieve size (mm)	SAND	GRAVEL						
							Approved by	<u> </u>	Date:	Page no:					
		IGSL Lt	d Materi	als Laborate	ory		A Byen		29-02-16	1 of 1					
						Persons au	thorised to approve re	eport: J Barrett (De	p. Quality Manager) H By	rne (Quality Mana					

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



particle	%			Contract No:	18963	Report No	. R70400			
size	passing			Contract:	GCTP Phas	se 3 - Conta	act 1			
75	100	COBBLES		TP:	TP03/13					
63	100			Sample No.	AA44461	Lab. Samp	ple No.	A16/0338		
50	100			Sample Type:	В					
37.5	100			Depth (m)	0.50	Customer:	Galway Co.C	0.		
28	100			Date Received	01-02-16		ing started	05-02-16		
20	94			Description:	Light brown	n/grey sandy	v, slightly gravelly	, SILT		
14	94	GRAVEL								
10	93	OTTAL		Remarks						
6.3	90						63	3 25	35	5.
5	88		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	37.5 50 63
3.35	84		100							
2	79		90							
1.18	74		80							
0.6	67		§ 70	+ + + + + + + + + + + + + + + + + + + +						
0.425	63	SAND	Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.3	58		<u>8</u> 50							
0.15	49) tage							
0.063	37		acen 30							
0.036	33									
0.026	29		20							
0.017	25	SILT/CLAY	10							
0.010	21		0	 		1111				
0.007	19		0.0	0.0		0.01	0.1	1	10	100
0.005	16			CLAY	/	SILT S	ieve size (mm)	SAND	GRAVEL	
0.002	12								D .	To.
		IGSL Ltd	d Materi	ials Laborato	orv		Approved by:		Date:	Page no:
					<i>y</i>		A Byen	-	16-02-16	1 of 1

Determination of Particle Size Distribution





	ī	ī								
particle	%			Contract No:	18963	•	o. R70497			
size	passing			Contract:	GCTP Phas	se 3 - Conta	act 1			
75	90	COBBLES		TP:	TP03/14					
63	70			Sample No.	AA37815	Lab. Sam	ple No.	A16/0339		
50	57			Sample Type:	В					
37.5	50			Depth (m)	0.20	Customer	: Galway Co.C	0.		
28	44			Date Received	01-02-16		ing started	04-02-16		
20	41			Description:	Dark brown	n/black claye	ey/silty, sandy, G	RAVEL with m	any cobbles	
14	40	GRAVEL								
10	38	OIVWEE		Remarks						
6.3	36						53	8 22 2		5.
5	35		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 20 20 20	37.0 53.0 53.0
3.35	31		100							
2	26		90							
1.18	21		80	+ + + + + + + + + + + + + + + + + + + +						
0.6	17		8 70	+						
0.425	15	SAND	Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.3	13		<u>a</u> 50							
0.15	11) 1436 40							
0.063	8		30 accen	1						
				1						
			20	1						
		SILT/CLAY	10							
			0		04	0.04	0.4		40	400
			0.	0001 0.0		0.01	0.1	1	10	100
				CLA	r	SILT S	lieve size (mm)	SAND	GRAVEL	
	l			iala I abazata			Approved by:		Date:	Page no:
		IGSL LT	a water	ials Laborato	гу		A Byen	_	18-02-16	1 of 1
						Persons auth	•		o. Quality Manager) H Byr	ne (Quality Mana

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report No	p. R70498		<u></u>	
size	passing			Contract:		se 3 - Cont				
75	100	0000155		TP:	TP03/16					
63	100	COBBLES		Sample No.	AA37817	Lab. Sam	ple No.	A16/0496		
50	89			Sample Type:	В		'			
37.5	74			Depth (m)	0.20	Customer	: Galway Co.	Co.		
28	62			Date Received	01-02-16		ing started	09-02-16		
20	52			Description:	Dark browr		yey/silty, sandy	, GRAVEL		
14	45	GRAVEL		·						
10	38	GRAVEL		Remarks	Sample size did not meet the re	requirements of BS1377				
6.3	30						5 33	8 8	22	2
5	26						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	93.7.8 93.3.7.8
3.35	22		100							
2	16		90							
1.18	12		<u> </u>	+ + + + + + + + + + + + + + + + + + + +						
0.6	8		§ 70	+						
0.425	7	SAND	sins 60							/
0.3	6		8 50							
0.15	4		eget 40							
0.063	2		<u>ā</u>							
			20							
		SILT/CLAY	10							
			0	1004	04	0.04	0.4		10	400
			0.0	0.0		0.01	0.1	1	10	100
				CLA	1	SILT S	lieve size (mm) SAND	GRAVEL	
							Approved by	<i>y</i> :	Date:	Page no:
		IGSL Lt	d Materi	als Laborate	ory		A Byen	~	18-02-16	1 of 1
						Persons auth	norised to approve	eport: J Barrett (De	p. Quality Manager) H By	rne (Quality Manage

Determination of Particle Size Distribution





	6.1			0 1 111	40000		D=00= :			
particle	%			Contract No:	18963	•	D. R70374			
size	passing			Contract:		se 3 - Conta	act 1			
75	100	COBBLES		TP:	TP03/17					
63	93			Sample No.	AA44488	Lab. Sam	ple No.	A16/0343		
50	79			Sample Type:	В					
37.5	69			Depth (m)	0.50	Customer:	: Galway Co.C	0.		
28	58			Date Received	01-02-16		ing started	04-02-16		
20	50			Description:	Orange/bro	own clayey/s	silty, sandy, GRA	VEL with some	e cobbles	
14	45	GRAVEL								
10	41	0.000		Remarks						
6.3	36						53	\$ 25		ıč
5	34		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 20 20	37.0 530.7
3.35	27		100							
2	22		90							
1.18	17		<u> </u>	+ + + + + + + + + + + + + + + + + + + +						
0.6	12		§ 70	+ + + + + + + + + + + + + + + + + + + +						
0.425	11	SAND	iligi 60							
0.3	10		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.15	8		tage 40							
0.063	6		cent							
			20						1	
		SILT/CLAY	10					+++++++++++++++++++++++++++++++++++++++		
		OIL 1/OLA1	0							
			0.	0001 0.0	001	0.01	0.1	1	10	100
				CLA	Y	SILT S	ieve size (mm)	SAND	GRAVEL	
		1001 14		iala Labanat			Approved by:		Date:	Page no:
		IGSL Lt	a water	ials Laborat	ory		AFE	your	15-02-16	1 of 1
						Persons auth			p. Quality Manager) H Byr	ne (Quality Mana

Determination of Particle Size Distribution





particle	%			Contract	No:	18963	Report	No.	R70375		-	
size	passing		1	Contract	:	GCTP Pha	ase 3 - C	ontac	xt 1			
75	100	COBBLES		TP:		TP03/18						
63	100	OODDELO		Sample I	No.	AA37826	Lab. S	ample	e No.	A16/0346		
50	98			Sample ⁻	Туре:	В						
37.5	89			Depth (m	n)	1.00	Custon	ner:	Galway Co.0	Co.		
28	80			Date Red	ceived	01-02-16	Date T	estin	g started	04-02-16	5	
20	70			Descripti	on:	Brown cla	yey/silty,	sandy	, GRAVEL			
14	61	GRAVEL										
10	53	GIVAVLL		Remarks	;							
6.3	43								5 53	8	ιΩ	υ,
5	38								0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 14 20	28 37.5 50 63 63
3.35	30			00								
2	24			90 + + +								
1.18	18		(9)	80 +							 	/
0.6	12		%) b	70 + + +							 	
0.425	11	SAND	ssin	60 + + +							 	
0.3	9		Percentage passing (%)	50				\perp				
0.15	8		ıtage	40								
0.063	7		rcen	30								
				20								
		SILT/CLAY		10								
				0.0001	0.00)1	0.01		0.1	1	10	100
				0.0001	CLAY		SILT	Sie	ve size (mm)	SAND	GRAVEL	100
					02.17		0.27	0.0			3.522	
		1001 11	.1.84 . 4			_			Approved by	·	Date:	Page no:
		IGSL Lt	a Mate	erials La	porato	ry			Ale	Syme	15-02-16	1 of 1
							Persons	authori	ised to approve re	eport: J Barrett (D	ep. Quality Manager) H By	yrne (Quality Manage

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report No	o. R70376			
size	passing			Contract:	GCTP Phas					
75	100	COBBLES		TP:	TP03/18					
63	94	COBBLES		Sample No.	AA37827	Lab. Sam	iple No.	A16/0347		
50	78			Sample Type:	В					
37.5	70			Depth (m)	2.00	Customer	r: Galway Co.C	o.		
28	63			Date Received	01-02-16		ting started	04-02-16		
20	49			Description:	Light brown	n slightly cla	ayey/silty, sandy,	GRAVEL with	some cobbles	
14	44	GRAVEL								
10	39	OIVWLL		Remarks						
6.3	34						63	3 25 3 18	35	rċ.
5	31		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 14 20	37. 530. 533.
3.35	23		100							ППППППППППППППППППППППППППППППППППППППП
2	17		90							
1.18	13		© 80	† 						
0.6	10		°) 70	+ + + + + + + + + + + + + + + + + + + +						
0.425	9	SAND	Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00					- 	 	/
0.3	7		<u>α</u> 50							
0.15	5		bg 40	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						
0.063	3		acer 30							
			ص عن 20							
		SILT/CLAY	10							
			0.0	0001 0.0	001	0.01	0.1	1	10	100
				CLA	Υ	SILT S	Sieve size (mm)	SAND	GRAVEL	
							Approved by:		Date:	Page no:
		IGSL Lt	d Materi	als Laborat	ory		AR	your	15-02-16	1 of 1
						Persons aut	horised to approve re	port: J Barrett (De	p. Quality Manager) H By	rne (Quality Manag

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R70495
size	passing			Contract:	GCTP Pha	se 3 - Co	ontact 1
75	100	COBBLES		TP:	TP03/19		
63	95	OODDELO		Sample No.	AA44491	Lab. Sa	ample No. A16/0349
50	87			Sample Type:	В		
37.5	75			Depth (m)	0.50	Custom	ner: Galway Co.Co.
28	65			Date Received	01-02-16	Date Te	esting started 04-02-16
20	59			Description:	Dark brow	n/black cla	ayey/silty, very sandy, GRAVEL with some cobbles
14	52	GRAVEL					
10	47	GRAVEL		Remarks			
6.3	41						5 8 5 5
5	38						0.063 0.425 0.6 1.18 2 2 3.35 5.3 5.3 5.3 5.3 6.3 7.5 6.3
3.35	34			00			
2	28		(90 			
1.18	24		9	30 			
0.6	18		%) f	70 🕂			
0.425	16	SAND	Ssine	60 + + + + + + + + + + + + + + + + + + +			
0.3	13		ba ,	50			
0.15	10		g	40			
0.063	6		cen				
				30 + + + + + + + + + + + + + + + + + + +			
				20 + + + + + + + + + + + + + + + + + + +			
		SILT/CLAY		10 +			
				0			
				0.0001 0.0		0.01	0.1 1 10 100
				CLA	<i>(</i>	SILT	Sieve size (mm) SAND GRAVEL
		1001 11	al N# - 4 :	whole Labers (Approved by: Date: Page no:
		IGSL Lt	a wate	erials Laborato	ory		18-02-16 1 of 1

Determination of Particle Size Distribution





	T	I							1	
particle	%			Contract No:	18963	Report No.				
size	passing	<u> </u>		Contract:	GCTP Phas	se 3 - Conta	act 1			
75	90	COBBLES		TP:	TP03/21					
63	90			Sample No.	AA44494	Lab. Samp	ole No.	A16/0356		
50	76			Sample Type:	В					
37.5	65			Depth (m)	0.15	Customer:	Galway C	co.Co.		
28	59			Date Received	02-02-16	Date Testi	-	04-02-16		
20	50			Description:	Dark brown	n/black claye	y/silty, sand	y, GRAVEL with s	ome cobbles	
14	43	GRAVEL								
10	39	ONAVEL		Remarks						
6.3	35							8	22	ις.
5	33						0.063	0.13 0.425 0.6 1.18	2 3.35 5.3 10 14 20	28 37. 530 530
3.35	31		100							
2	28		90	 						
1.18	25		80	 						- /
0.6	22		§ 70	+	-+++					
0.425	21	SAND	ils 60		\longrightarrow					
0.3	19		86 50							
0.15	17		Percentage passing (%) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0							
0.063	14		cent							
				T						
			20							
		SILT/CLAY	10							
		OIL 170L7(1	0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						
			0.0	0.0)1	0.01	0.1	1	10	100
				CLAY	•	SILT S i	ieve size (m	ım) SAND	GRAVEL	
		100: 11		-1-1-1-1			Approved	by:	Date:	Page no:
		IGSL Lt	d Materi	als Laborato	ry		AR	ene	29-02-16	1 of 1
						Persons author	orised to appro	ve report: J Barrett (De	ep. Quality Manager) H E	Byrne (Quality Manage

Determination of Particle Size Distribution





								<u> </u>	
particle	%		Contrac	et No: 18963	Report N	No. R70377			
size	passing		Contrac	et: GCTP P	hase 3 - Coi	ntact 1			
75	100	COBBLES	TP:	TP03/22					
63	100	0000000	Sample	No. AA33947	7 Lab. Sar	mple No.	A16/0359		
50	100		Sample	Type: B					
37.5	94		Depth (m) 0.15	Custome	er: Galway Co.C	Co.		
28	92		Date R			sting started	05-02-16	6	
20	85		Descrip	otion: Brown s	andy, slightly	gravelly, SILT/CL	-AY		
14	85	GRAVEL							
10	83	OTTAL	Remark	(S					
6.3	81					53	25	35	75
5	80		400			0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	733 37. 733 37.
3.35	78		100						
2	75		90						
1.18	72		80						+++++++
0.6	67		8 70						+++++++
0.425	64	SAND	ig 60 +						
0.3	60		50						
0.15	50		40 						
0.063	38		Percentage passing (%) 80						
0.037	32								
0.027	27		20						
0.017	23	SILT/CLAY	10						
0.010	19		0 +						
0.007	16		0.0001	0.001	0.01	0.1	1	10	100
0.005	13			CLAY	SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	11					Approved by		Data	Dogo po:
		IGSL Ltd	d Materials La	aboratory		Approved by	>	Date:	Page no:
						471	ajene	15-02-16	1 of 1
1					Persons au	uthorised to approve re	port: J Barrett (De	ep. Quality Manager) H By	rne (Quality Manager)

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



particle	%			Contract No:			R70378			
size	passing			Contract:	GCTP Phase 3	- Contac	t 1			
75	100	COBBLES		TP:	TP03/23					
63	100			Sample No.	AA33941 Lab	o. Sample	e No.	A16/0361		
50	95			Sample Type:	В					
37.5	95			Depth (m)	0.50 Cus	stomer:	Galway Co.	Co.		
28	93			Date Received		te Testin		04-02-16	3	
20	93			Description:	Light brown sligh	ntly sand	y, slightly gra	velly, SILT		
14	90	GRAVEL								
10	88	JIVAVEL		Remarks						
6.3	86						5 5	8 8		3
5	85						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	28 37.5 53 63 63
3.35	81		100 -							
2	78		90 -							
1.18	73		80 -							
0.6	69		8 70 -	 						
0.425	67	SAND	ils 60 -							
0.3	64		Sercentage passing (%) 09 09 00 00 00 00 00 00 00 00 00 00 00							
0.15	52		12 40 -							
0.063	46		ceni							
0.036	43									
0.026	37		20 -							
0.017	33	SILT/CLAY	10 -							
0.010	28	GIL I / OLA I	0 -							
0.007	25		0.0	0.00	0.0)1	0.1	1	10	100
0.005	21			CLAY	SI	LT Sie	ve size (mm) SAND	GRAVEL	
0.002	14									
		ICCL I to	d Matori	als Laborato			Approved by		Date:	Page no:
		IGGL LU	u materi	ais Labuialu	ıy		A Byen	~	15-02-16	1 of 1

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



Description Particle Size Passing Pa				(•,		Table Media	
TP: TP03/23 Sample No. A33943 Lab. Sample No. A16/0363	particle	%			Contract No:	18963	Report	No. R70379		
COBBLES Sample No. AA33943 Lab. Sample No. A16/0363	size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1		
Sample No. AA33943 Lab. Sample No. A16/0363 Sample No. AA3943 Lab. Sample No. A16/0363 Sample No. AA3943 Lab. Sample No. A16/0363 Sample No. AA3943 Lab. Sample No. A16/0363 Sample No. A16/0363 Sample No. AA3943 Lab. Sample No. A16/0363 Sample No. A16/0364 Description Sample No. A16/0363 Sample No. A16/0364 Description Sample No. A16/0364 Sample No. A16/0364 Description Sample No. A16/0364 Sample No. A16/0364 Description Sample No. A16/0364 Sam	75	100	CORRLES		TP:	TP03/23				
Depth (m) 1.10 Customer: Galway Co.Co.	63	92	OOBBLLO		Sample No.	AA33943	Lab. Sa	ample No. A16/0363		
Date Received Date Testing started Date Testing started Description: Light brown slightly sandy, gravelly, SILT with some cobbles	50	92			Sample Type:	В				
Description: Light brown slightly sandy, gravelly, SiLT with some cobbles	37.5	92			Depth (m)	1.10	Custon	ner: Galway Co.Co.		
14 84 10 81 81 81 81 81 81 81 81 81 81 81 81 81	28	92			Date Received					
Remarks Rem	20	88			Description:	Light brown	slightly	sandy, gravelly, SILT with some	cobbles	
Remarks Rema	14	84	GRAV/FI							
5 75 3.35 67 2 62 1.18 57 0.6 53 0.425 51 0.3 49 0.15 42 0.063 37 0.007 23 0.017 27 0.010 24 0.007 23 0.0007 23 0.0005 20 0.0005 20 0.0002 14 IGSI Ltd Materials Laboratory Approved by: Date: Page no:	10	81	OIVAVEE		Remarks					
3.35 67 2 62 1.18 57 0.6 53 0.425 51 SAND 0.15 42 0.063 37 0.037 34 0.027 31 0.017 27 0.010 24 0.007 23 0.0005 20 0.0005 14 IGSI Itd Materials Laboratory Approved by: Date: Page no:	6.3	77						8 : 55 : 8		ις.
3.35 67 2 62 1.18 57 0.6 53 0.425 51 SAND 0.15 42 0.063 37 0.037 34 0.027 31 0.017 27 0.010 24 0.007 23 0.0005 20 0.0005 14 IGSI Itd Materials Laboratory Approved by: Date: Page no:	5	75						0.06 0.14 0.45 0.66	2 3 3 3 4 7 6 5 6 5 6 5 6 5 6 6 6 6 6 6 6 6 6 6 6	7930 7 8
1.18 57 0.6 53 0.425 51 0.3 49 0.15 42 0.063 37 0.037 34 0.027 31 0.017 27 0.010 24 0.007 23 0.0005 20 0.0005 14 Columbia Solution Columbia	3.35	67								
0.6 53	2	62		90						
0.027 31 0.017 27 0.010 24 0.007 23 0.005 20 0.002 14 SILT/CLAY SILT Sieve size (mm) SAND GRAVEL Approved by: Date: Page no:	1.18	57		<u> </u>						
0.027 31 0.017 27 0.010 24 0.007 23 0.005 20 0.002 14 SILT/CLAY SILT Sieve size (mm) SAND GRAVEL Approved by: Date: Page no:	0.6	53		% 70	+					
0.027 31 0.017 27 0.010 24 0.007 23 0.005 20 0.002 14 SILT/CLAY SILT Sieve size (mm) SAND GRAVEL Approved by: Date: Page no:	0.425	51	SAND	issing 60						
0.027 31 0.017 27 0.010 24 0.007 23 0.005 20 0.002 14 SILT/CLAY SILT Sieve size (mm) SAND GRAVEL Approved by: Date: Page no:	0.3	49		8 50						
0.027 31 0.017 27 0.010 24 0.007 23 0.005 20 0.002 14 SILT/CLAY SILT Sieve size (mm) SAND GRAVEL Approved by: Date: Page no:	0.15	42		tage						
0.027 31 0.017 27 0.010 24 0.007 23 0.005 20 0.002 14 SILT/CLAY SILT Sieve size (mm) SAND GRAVEL Approved by: Date: Page no:	0.063	37		cen						
0.017 27 0.010 24 0.007 23 0.0001 0.001 0.01 0.1 1 10 100 100 1000 14	0.037	34								
0.010 24 0.007 23 0.0001 0.001 0.01 1 1 10 100 0.005 20 0.002 14 SILT Sieve size (mm) SAND GRAVEL 0.002 14 Approved by: Date: Page no:	0.027	31			1					
0.010 24 0 0 0 0.001 0.01 0.01 1 1 10 100 0.005 20 0.002 14 SILT Sieve size (mm) SAND GRAVEL Approved by: Date: Page no:	0.017		SILT/CLAY	10						
0.005 20 CLAY SILT Sieve size (mm) SAND GRAVEL 0.002 14 Approved by: Date: Page no:	0.010	24	0.21702711		 					
0.002 14 Approved by: Date: Page no:	0.007	23		0.0	0.0	01	0.01	0.1 1	10	100
Approved by: Date: Page no:	0.005	20			CLA	′	SILT	Sieve size (mm) SAND	GRAVEL	
IGSL I td Materials Laboratory	0.002	14								
15-02-16 1 of 1			IGSL Lt	d Materi	als I ahorato)rv		110		
			IOOL LU	a materi		"' y		H Dejane	15-02-16	1 of 1

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Papart Na	p. R70401			
size	passing			Contract:		se 3 - Conta				
75	91			TP:	TP03/23	30 0 - 00110	401 1			
63	91	COBBLES		Sample No.	AA33945	Lab. Sam	nle No	A16/0365		
50	80			Sample Type:	В	Lab. Gam	pio 110.	7110,0000		
37.5	74			Depth (m)	2.00	Customer:	: Galway Co.C	0.		
28	67			Date Received	01-02-16		ing started	05-02-16		
20	62			Description:			ndy, gravelly, SIL			
14	60	CDAVEL		·						
10	58	GRAVEL		Remarks						
6.3	55						5 53	8 12	ιO	2
5	54						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 14 20	93.0 93.0 93.0
3.35	52		100							
2	50		90							
1.18	47		80							
0.6	44		Percentage passing (%) 80 00 00 00 00 00 00 00 00 00 00 00 00	+ + + + + + + + + + + + + + + + + + + +						 / -
0.425	43	SAND	ssin 60							
0.3	40		ed 50							
0.15	34		ntage 10							
0.063	26		30							
0.036	24		ص 30 20							
0.026	21									
0.017	18	SILT/CLAY	10							
0.010	16		0	0001 0.0	 ∩1	0.01	0.1	1	10	100
0.007 0.005	14 13		0.					•		100
0.005	9			CLA	•	SILT S	ieve size (mm)	SAND	GRAVEL	
0.002	J						Approved by:		Date:	Page no:
		IGSL Lt	d Mater	ials Laborato	ory		A Bejan		16-02-16	1 of 1
						Persons auth	orised to approve rep	port: J Barrett (De	p. Quality Manager) H By	rne (Quality Manag

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R70402			
size	passing			Contract:	GCTP Pha	se 3 - Co	ontact 1			
75	100	COBBLES		TP:	TP03/25					
63	100	OODDELO		Sample No.	AA33935	Lab. Sa	ample No.	A16/0367		
50	93			Sample Type:	В					
37.5	81			Depth (m)	0.15	Custon	ner: Galway Co.C	0.		
28	74			Date Received	01-02-16		esting started	05-02-16		
20	66			Description:	Brown silty	, very sai	ndy, GRAVEL			
14	60	GRAVEL								
10	55	OIVWLL		Remarks						
6.3	49						53	3 25 3 18		75
5	46		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 14 20	37.5 37.5 63 63
3.35	43		100							
2	39		90							
1.18	35		© 80	† 						
0.6	29		Percentage passing (%) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	+					 	
0.425	27	SAND	.jsgi 60							
0.3	25		<u>ω</u> 50							
0.15	20		bept 40							
0.063	14		Je 30							
			20							
			10							
		SILT/CLAY								
			0 0.0	0001 0.0	01	0.01	0.1	1	10	100
				CLA	Y	SILT	Sieve size (mm)	SAND	GRAVEL	
							Approved by:		Date:	Page no:
		IGSL Lt	d Materi	als Laborat	ory 		A Byen	-	16-02-16	1 of 1
						Persons a	authorised to approve rep	port: J Barrett (De	p. Quality Manager) H By	rne (Quality Manage

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



particle	%			Contract No:	18963	Report	No. R70380			
size	passing			Contract:	GCTP Phas	se 3 - Co	ntact 1			
75	100	COBBLES		TP:	TP03/25					
63	100	0000000		Sample No.	AA33937	Lab. Sa	mple No. A	16/0369		
50	87			Sample Type:	В					
37.5	81			Depth (m)	1.00	Custom	er: Galway Co.Co.			
28	76			Date Received	01-02-16	Date Te	sting started	05-02-16		
20	64			Description:	Light brown	/grey clay	ey/silty, very sandy,	GRAVEL		
14	60	GRAVEL								
10	55	GRAVEL		Remarks	Sample size did not meet the rec	quirements of BS1377				
6.3	49						5 53	8 35	2	2
5	47						0.063	0.425 0.6 1.18	2 3.35 6.3 10 20	23.0 23.0 23.0 25.0
3.35	40		100							
2	35		90							
1.18	31		80	+ + + + + + + + + + + + + + + + + + + +						
0.6	27		× 70	+ + + + + + + + + + + + + + + + + + + +					 	
0.425	25	SAND	sinis							
0.3	23		se 50							
0.15	19		obatic 40							
0.063	15		<u>ö</u>							
0.039	13									
0.028	10		20							
0.018	9	SILT/CLAY	10							
0.010	7	OIL I / OLA I	0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1					1 111 1 11111 1 1 1	
0.007	6		0.0	0.00)1	0.01	0.1	1	10	100
0.005	5			CLAY	,	SILT	Sieve size (mm) S	AND	GRAVEL	
0.002	5									
		ICSI I 4	d Matar	iale I aboroto			Approved by:	-	Date:	Page no:
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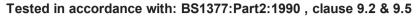
Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R70381			
size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1			
75	100	COBBLES		TP:	TP03/25					
63	94	COBBLES		Sample No.	AA33939	Lab. Sa	ample No.	A16/0371		
50	94			Sample Type:	В					
37.5	89			Depth (m)	2.00	Custom	er: Galway Co.C	o.		
28	82			Date Received	01-02-16		esting started	05-02-16		
20	76			Description:	Light brown	n/grey slig	htly sandy, gravelly	y, SILT/CLAY v	vith some cobbles	
14	71	GRAVEL								
10	68	0.000		Remarks						
6.3	61						63	3 25 3 3 18	35	ro.
5	58		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20 20	37. 93. 93.
3.35	50		100							
2	41		90							
1.18	35		© 80							
0.6	28		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00	+						
0.425	26	SAND	iss 60							
0.3	25		ed 50							
0.15	23		tage 40							
0.063	20		90 30							
			20							
		SILT/CLAY	10							
			0	 						
			0.0	0.00		0.01	0.1	1	10	100
				CLAY	•	SILT	Sieve size (mm)	SAND	GRAVEL	
		100: : :					Approved by:		Date:	Page no:
		IGSL Lt	d Materi	als Laborato	ory		A Byen		16-02-16	1 of 1
						Persons a	authorised to approve rep	port: J Barrett (De	p. Quality Manager) H Byr	ne (Quality Manage

Determination of Particle Size Distribution





particle	%		С	ontract No:	18963	Report I	No. R70382			
size	passing		С	ontract:	GCTP Phase	e 3 - Co	ntact 1			
75	100	COBBLES	TI	P:	TP3/27					
63	100	OODDELO	S	ample No.	AA44452	Lab. Sa	mple No.	A16/0373		
50	96		S	ample Type:	В					
37.5	83		D	epth:	0.50	Custome	er: Galway Co.Co	D.		
28	78		D	ate Received	01-02-16	Date Te	esting started	05-02-16		
20	75		D	escription:	Brown slightl	ly sandy,	, gravelly, SILT/CL	ΑY		
14	72	GRAVEL								
10	69	OIVAVLL	R	emarks						
6.3	66						5 53	8 822	22	ιύ
5	65		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20 20	930.7. 630.7.
3.35	58		¹⁰⁰ T							
2	53		90 +							
1.18	49		<u> </u>							
0.6	44		% 70 							
0.425	42	SAND	ilig 60 +							
0.3	40		50 							
0.15	35		Percentage passing (%) 20 40 40 40 40 40 40 40 40 40 40 40 40 40							
0.063	31		cen cen							
0.037	29									
0.027	26		20 —							
0.017	24	SILT/CLAY	10							
0.010	21	OIL 170L7(1	o 							
0.007	19		0.000	0.00	1	0.01	0.1	1	10	100
0.005	16			CLAY		SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	11									
		IGGL LE	d Matorial	le Laborato	~\/		Approved by:		Date:	Page no:
		IGSL LI	u materia	Is Laborato	У		A Bejon	_	16-02-16	1 of 1
						Persons a	uthorised to approve rep	ort: J Barrett (De	p. Quality Manager) H Byr	ne (Quality Manag

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



particle	%		Contract No:	18963 Report	No. R70403		
size	passing		Contract:	GCTP Phase 3 - Co	ontact 1		
75	100	COBBLES	TP:	TP03.27			
63	100	CODDLES	Sample No.	AA44454 Lab. Sa	ample No. A16/0375		
50	95		Sample Type:	В			
37.5	88		Depth (m)	1.00 Custom	er: Galway Co.Co.		
28	84		Date Received		esting started 09-02-16		
20	83		Description:	Grey/brown slightly	sandy, slightly gravelly, SILT/CLA	Y	
14	80	GRAVEL					
10	78	JIVAVEL	Remarks				
6.3	75				53 15 15 8		ιċ
5	73		400		0.063 0.3 0.425 0.6	2 3.35 6.3 14 20 20	930 7 20 20 20 20 20 20 20 20 20 20 20 20 20
3.35	72		100				
2	69		90 +				
1.18	65		80				
0.6	61		70				
0.425	56	SAND	ig 60 				
0.3	54		80 50				
0.15	49		Dercentage passing (%) 90 90 90 90 90 90 90 90 90 9				
0.063	42		30 -				
0.035	38						
0.026	35		20				
0.016	32	SILT/CLAY	10 + + + + + + + + + + + + + + + + + + +				
0.010	29		0 +				
0.007	26			.001 0.01	0.1 1	10	100
0.005	24		CL	AY SILT	Sieve size (mm) SAND	GRAVEL	
0.001	16					In .	
		IGSI I to	d Materials Labora	torv	Approved by:	Date:	Page no:
		.001 10	a matorialo Eusora	,	A Ryane	16-02-16	1 of 1

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R70383		
size	passing			Contract:	GCTP Pha	-			
75	100	COBBLES		TP:	TP03/27				
63	100	COBBLES		Sample No.	AA44456	Lab. Sa	mple No. A16/0377		
50	100			Sample Type:	В				
37.5	100			Depth (m)	2.00	Custom	er: Galway Co.Co.		
28	99			Date Received	01-02-16	Date Te	sting started 05-02-16		
20	99			Description:	Light brown	n slightly s	andy, slightly gravelly, SILT/CLAY	•	
14	98	GRAVEL							
10	97	OIVWEE		Remarks					
6.3	93						63 15 15 18	35	ιċ
5	92		400				0.063 0.15 0.3 0.425 0.6	23 3.35 10 10 20 20 20 20	37.5 50 63 63
3.35	87		100						
2	82		90						
1.18	77		€ 80 €						
0.6	71		<u>်</u>) 70						
0.425	69	SAND	.js 60						
0.3	66		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00						
0.15	60		10 dagu	 					
0.063	53		<u>5</u> 30						
			20						
			10						
		SILT/CLAY	0						
			_	0.0	01	0.01	0.1 1	10	100
				CLA	/	SILT	Sieve size (mm) SAND	GRAVEL	
		1001 11					Approved by:	Date:	Page no:
		IGSL Lt	d Materi	als Laborato	ory		A Ryane	16-02-16	1 of 1
	•					Persons a	uthorised to approve report: J Barrett (Dep	o. Quality Manager) H Byri	ne (Quality Manage

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



			`			,				
particle	%			Contract No:	18963	Report	No. R70384		-	
size	passing		ı	Contract:	GCTP Phase	e 3 - Co	ontact 1			
75	86	COBBLES		TP:	TP03/28					
63	86	OOBBLLO		Sample No.	AA37831	Lab. Sa	ample No.	A16/0379		
50	86			Sample Type:	В					
37.5	85			Depth (m)	0.50	Custom	ner: Galway Co.0	Co.		
28	78			Date Received	01-02-16	Date Te	esting started	04-02-16		
20	72			Description:	Light brown	slightly	sandy, gravelly, SI	LT/CLAY with s	ome cobbles	
14	68	GRAVEL								
10	65	GNAVEL		Remarks	Sample size did not meet the requ	uirements of BS1377				
6.3	61						5 53	8 82	22	2
5	59						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 14 20	37. 50 53 53
3.35	53		100							
2	46		90							
1.18	42		_ 80	+ + + + + + + + + + + + + + + + + + + +						
0.6	39		<u>%</u> 70	+						
0.425	37	SAND	Sing 60							
0.3	36		50 bas							
0.15	32		Percentage passing (%) 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0						 	
0.063	28		cent							
0.038	25					Ш				
0.027	23		20							
0.017	20	SILT/CLAY	10	+ + + + + + + + + + + + + + + + + + + +						
0.010	17	SIL I / CLAY	0							
0.007	14		0.0	0.0	01	0.01	0.1	1	10	100
0.005	11			CLA	,	SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	7									
		1001 14	d Materi				Approved by		Date:	Page no:
		IGSL L	u water	ials Laborato	лу		A Byen	-	16-02-16	1 of 1

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



particle	%			Contract No:	18963	Report	No. R70385		<u> </u>	
size	passing			Contract:	GCTP Pha	se 3 - Co	ontact 1			
75	100	COBBLES		TP:	TP3/28					
63	100	CODDLLO		Sample No.	AA37833	Lab. Sa	ample No.	A16/0381		
50	97			Sample Type:	В					
37.5	97			Depth (m)	1.00	Custom	er: Galway Co.C	Ο.		
28	95			Date Received	01-02-16	Date Te	esting started	04-02-16		
20	92			Description:	Light brown	n slightly s	sandy, slightly grave	elly, SILT/CLA	<i>(</i>	
14	87	GRAVEL								
10	83	GNAVEL		Remarks						
6.3	78						5 33	8 8	ιΩ	Ŋ
5	77						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	37.0 530.7
3.35	71		100							
2	66		90							
1.18	63		<u> </u>	 						
0.6	58		% 70	+						
0.425	56	SAND	is 60	 					1	
0.3	52		86 50							
0.15	44		Percentage passing (%) 80 00 00 00 00 00 00 00 00 00 00 00 00							
0.063	38		Cen 40							
0.037	33			<u> </u>						
0.027	30		20							
0.017	27	SILT/CLAY	10	 						
0.010	22	SIL I / OL/ (I	0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						
0.007	18		0.0	0.00	01	0.01	0.1	1	10	100
0.005	14			CLAY	•	SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	10									
		IGSL Ltd	d Materi	als Laborato	r\/		Approved by:		Date:	Page no:
		IOOL LU	u Matell	ais Laboratt	'ı y		A Bejan	-	16-02-16	1 of 1

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R70386			
size	passing			Contract:	GCTP Pha	se 3 - Co	ontact 1			
75	100	COBBLES		TP:	TP03/28					
63	100	CODDLLO		Sample No.	AA37835	Lab. Sa	ample No.	A16/0383		
50	98			Sample Type:	В					
37.5	98			Depth (m)	2.00	Custom	er: Galway Co.C	0.		
28	93			Date Received	01-02-16	Date Te	esting started	09-02-16		
20	87			Description:	Light brown	n slightly s	sandy, slightly grav	elly, SILT/CLA	1	
14	83	GRAVEL								
10	81	GIVAVLL		Remarks						
6.3	77						5 5	8 25	ις.	ري ا
5	75						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	37.5 50 53 53
3.35	70		100							
2	67		90							
1.18	64		80							
0.6	60		8 70	+						
0.425	57	SAND	ils 60							
0.3	55		<u>α</u> 50							
0.15	48		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.063	39		acen 30							
			20							
		SILT/CLAY	10	1						
			0	 						
			0.0	0.0		0.01	0.1	1	10	100
				CLA		SILT	Sieve size (mm)	SAND	GRAVEL	
			d M. a.t.a:	ala Labarati			Approved by:		Date:	Page no:
		IGSL LT	a wateri	als Laborato	огу		A Bejon		16-02-16	1 of 1
						Persons a	uthorised to approve re	port: J Barrett (De	p. Quality Manager) H Byr	rne (Quality Manaເ

Determination of Particle Size Distribution

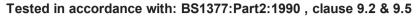


(note: Sedimentation stage not accredited)



particle	%			Contract No:	18963	Report	No. R70387			
size	passing	<u> </u>	ı	Contract:	GCTP Phas	se 3 - Co	ontact 1			
75	100	COBBLES		TP:	TP03/28					
63	100	OODDELEO		Sample No.	AA37837	Lab. Sa	mple No.	A16/0085		
50	78			Sample Type:	В					
37.5	67			Depth (m)	3.00	Custom	er: Galway Co.C	0.		
28	66			Date Received	01-02-16		esting started	05-02-16	i	
20	63			Description:	Light brown	n slightly s	andy, gravelly, SIL	T/CLAY		
14	61	GRAVEL								
10	59	SIVIVEL		Remarks	Sample size did not meet the re	requirements of BS1377				
6.3	56						53	8 8		
5	54		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 14 20	23 53 53 53
3.35	52		100							
2	47		90							
1.18	45		<u> </u>							
0.6	43		% 70	+						
0.425	41	SAND	ssing 60							
0.3	39		05 pg							
0.15	34		Percentage passing (%) 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0						T	
0.063	29		cen							
0.036	27									
0.026	25		20							
0.017	22	SILT/CLAY	10							
0.010	19	SIL I / OL/ (I	0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						
0.007	18		0.0	0001 0.0)01	0.01	0.1	1	10	100
0.005	16			CLA	Y	SILT	Sieve size (mm)	SAND	GRAVEL	
0.001	12									
		ICCI I +	d Matori	ials Laborat	orv		Approved by:		Date:	Page no:
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Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R70508		
size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1		
75	100	COBBLES		TP:	TP03/29				
63	86	CODDLLO		Sample No.	AA37812	Lab. Sa	ample No. A16/0389		
50	86			Sample Type:	В				
37.5	84			Depth (m)	1.00	Custom	er: Galway Co.Co.		
28	81			Date Received	01-02-16		esting started 04-02-16		
20	75			Description:	Mottled gre	y/brown	sandy, gravelly, SILT/CLAY with some	e cobbles	
14	74	GRAVEL							
10	73	OIVWLL		Remarks	Sample Size did not meet the r	requirements of BS1377			
6.3	71						533 15 18		ιċ
5	70		400				0.063 0.3 0.425 0.6 1.18	3.35 6.3 6.3 10 20 28	37. 50. 53. 53.
3.35	67		100						
2	63		90						
1.18	56		© 80	† 					
0.6	48		§ 70	+ + + + + + + + + + + + + + + + + + + +					
0.425	44	SAND	ssin 60						
0.3	39		ed 50						
0.15	31		Percentage passing (%) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0						
0.063	22		30 acer						
			20						
		SILT/CLAY	10	1					
			0	1	0.4			10	400
			0.0	0.0		0.01	0.1 1	10	100
				CLA	/	SILT	Sieve size (mm) SAND	GRAVEL	
	l	1001 11	-1 84 - 4 - *	-1-1-1 (Approved by: Dat	te:	Page no:
		IGSL Lt	d Materi	als Laborato	ory		A Rejone	19-02-16	1 of 1
						Persons a	uthorised to approve report: J Barrett (Dep. Qu	uality Manager) H Byrn	e (Quality Manage

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R70448			
size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1			
75	100	COBBLES		TP:	TP03/29					
63	90	OODDELO		Sample No.	AA37813	Lab. Sa	ample No.	A16/0391		
50	90			Sample Type:	В					
37.5	90			Depth (m)	1.60	Custom	ner: Galway Co.Co	D.		
28	87			Date Received	01-02-16	Date To	esting started	04-02-16		
20	85			Description:	Dark brown	n/grey cla	yey/silty, very sandy	y, GRAVEL wi	th some cobbles	
14	83	GRAVEL								
10	81	OIVAVEE		Remarks						
6.3	76						5 53	8 22	ις.	5
5	73						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	37.5 37.5 53 63
3.35	65		100							
2	57		90							
1.18	49		80							
0.6	40		∑ 70 ·							
0.425	37	SAND	ils 60							
0.3	33		6 50 m						1	
0.15	24		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.063	19		cen							
			20							
		SILT/CLAY	10							
			0							
			0.0	0.00	01	0.01	0.1	1	10	100
				CLAY	•	SILT	Sieve size (mm)	SAND	GRAVEL	
	<u> </u>	1001.11		-1-1-1			Approved by:		Date:	Page no:
		IGSL Lt	d Materi	als Laborato	ory		A Ryan	_	17-02-16	1 of 1
						Persons a	authorised to approve rep	ort: J Barrett (De	p. Quality Manager) H By	rne (Quality Manager

Determination of Particle Size Distribution





particle	%		Со	ntract No:	18963	Report	No. R70388			
size	passing		Co	ntract:	GCTP Phas	se 3 - Co	ontact 1			
75	100	COBBLES	TP	:	TP03/34					
63	100		Sa	mple No.	AA44468	Lab. Sa	ample No. A16	0397		
50	100		Sa	mple Type:	В					
37.5	100		De	pth (m)	1.00	Custom	ner: Galway Co.Co.			
28	99		Da		01-02-16		0	04-02-16		
20	96		De	scription:	Grey/browr	n slightly	sandy, slightly gravelly, S	ILT/CLA	Y	
14	96	GRAVEL								
10	94	OI WEE	Re	marks						
6.3	92						53 15 25		. 35	ı.
5	90		400				0.063 0.15 0.3 0.425	0.6	2 3.35 6.3 14 20	930 7 0
3.35	80		100							
2	71		90							
1.18	63		80 +							
0.6	55		Percentage passing (%) 80 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0						/ 	
0.425	52	SAND	iss 60 							
0.3	49		<u>8</u> 50 —					11111		
0.15	44		96 + 40 							
0.063	40		30 							
0.038	35						1			
0.027	32		20							
0.018	28	SILT/CLAY	10							
0.010	23		0 +				 	111111		
0.007	20		0.000		1	0.01	0.1	1	10	100
0.005	15			CLAY		SILT	Sieve size (mm) SAN	D	GRAVEL	
0.002	10						A		Dete	ID
IGSL Ltd Materials Laboratory							Approved by:		Date:	Page no:
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						Persons a	authorised to approve report: J	Barrett (De	p. Quality Manager) H By	rne (Quality Manage

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R70389		•	
size	passing			Contract:	GCTP Pha	se 3 - C	ontact 1			
75	100	COBBLES		TP:	TP03/34					
63	100	OODDELO		Sample No.	AA44470	Lab. Sa	ample No.	A16/0399		
50	95			Sample Type:	В					
37.5	83			Depth (m)	2.00	Custon	ner: Galway Co.0	Co.		
28	73			Date Received	01-02-16		esting started	05-02-16		
20	64			Description:	Grey claye	ey/silty, sa	andy, GRAVEL			
14	57	GRAVEL								
10	51	OTTAL		Remarks						
6.3	41						53	3 25 3 18	35	τċ
5	37		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 14 20	37.5 37.5 50 63 63
3.35	26		100							
2	21		90							
1.18	19		<u> </u>	† 						
0.6	16		Percentage passing (%) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	+ + + + + + + + + + + + + + + + + + + +					 	H + H + H + H + H + H + H + H + H + H +
0.425	15	SAND	iss 60	1						
0.3	14		<u>ed</u> 50							
0.15	11) 40							
0.063	8		acen 30	<u> </u>						
			20							
		SILT/CLAY	10	1						
			0	 						
			0.0	0.0		0.01	0.1	1	10	100
				CLA	Y	SILT	Sieve size (mm)	SAND	GRAVEL	
	<u>I</u>	1001.11	-1.80-4.	-1-1-1 4			Approved by		Date:	Page no:
		IGSL Lt	a Materi	als Laborate	ory		A Bejan	~	16-02-16	1 of 1
· ·	_					Persons a	authorised to approve re	eport: J Barrett (De	p. Quality Manager) H By	rne (Quality Manag

Test Report

Dry Density/Moisture Content Relationship



Tested in accordance with BS1377:Part 4:1990

Report No. R70469 Contract No. 18963

Contract Name: GCTP Phase 3 - Contract 1 GI

Lab Contract No. 18963 Location: TP03/03

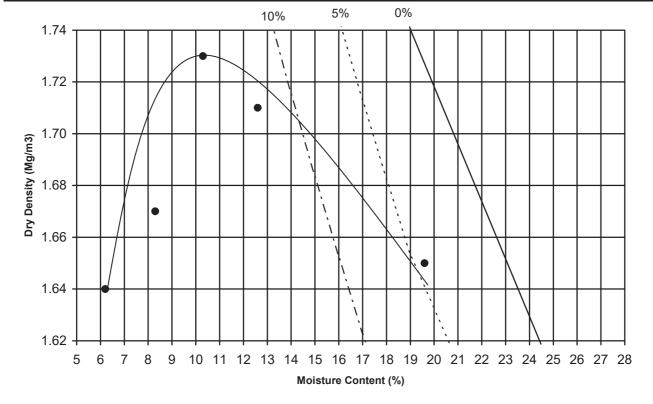
Sample No. AA44484 Depth (m) 1.6 Material Type B

Lab sample no. A16/0318 Customer: Galway Co.Co.

Date Received: 01-02-16 Test Method: 2.5 KG Rammer

Date Tested: 08-02-16 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	1.49	1.67	1.73	1.71	1.64	1.65	
Moisture Content (%)	28	8.3	10	13	6.2	20	



Maximum Dry Density (Mg/m³): 1.73 Optimum Moisture Content (%): 10

Description: Dark brown silty, very sandy, GRAVEL with occasional cobbles

Sample Preparation: Material passing 20mm Single / Separate samples used

Particle Density (Mg/m³): 2.60 Particle Density: Assumed

% retained on 20/37.5mm sieve: 30

IGSL Materials Laboratory

Persons authorised to approve reports

J Barrett (Dep. Quality Manager)

H Byrne (Quality Manager)

The result relates to the specimen tested.

Opinions and interpretations are outside the scope of accreditation

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Test Report

Dry Density/Moisture Content Relationship



Tested in accordance with BS1377:Part 4:1990

Report No. R71145 Contract No. 18963

Contract Name: GCTP Phase 3 - Contract 1 GI

Lab Contract No. 18963 Location: TP03/08

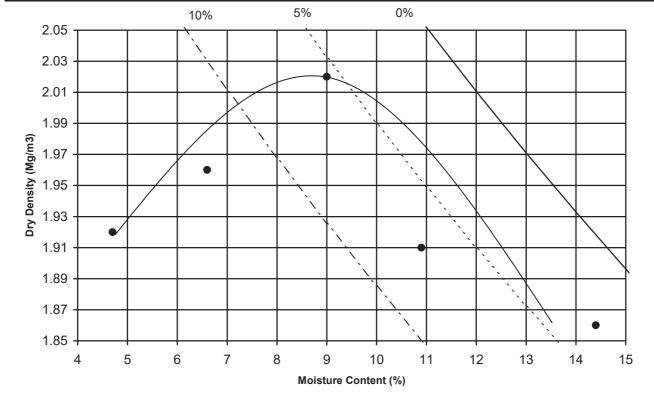
Sample No. AA37821 Depth (m) 0.5 Material Type

Lab sample no. A16/0332 Customer: Galway Co.Co.

2.5 KG Rammer Date Received: 01-02-16 Test Method:

Date Tested: BS1377:Part 4:1990 19-02-16 3.3

Dry Density (Mg/m ³)	1.86	1.96	1.91	2.02	1.92	
Moisture Content (%)	14	6.6	11	9.0	4.7	



Maximum Dry Density (Mg/m³): 2.02 Optimum Moisture Content (%): 9

Description: Light brown/grey clayey/silty, very sandy, GRAVEL

Single / Separate samples used Sample Preparation: Material passing 20mm

Particle Density (Mg/m³): 2.65 Particle Density: Assumed

% retained on 20/37.5mm sieve: 24

The result relates to the specimen tested.

H Byrne (Quality Manager) Opinions and interpretations are outside the scope of accreditation

Approved by Date **IGSL Materials Laboratory** 29-03-16 1 of 1 A Byen

J Barrett (Dep. Quality Manager)

Persons authorised to approve reports

Test Report

Dry Density/Moisture Content Relationship



Tested in accordance with BS1377:Part 4:1990

Report No. R71142 Contract No. 18963

Contract Name: GCTP Phase 3 - Contract 1 GI

Lab Contract No. 18963 Location: TP03/11

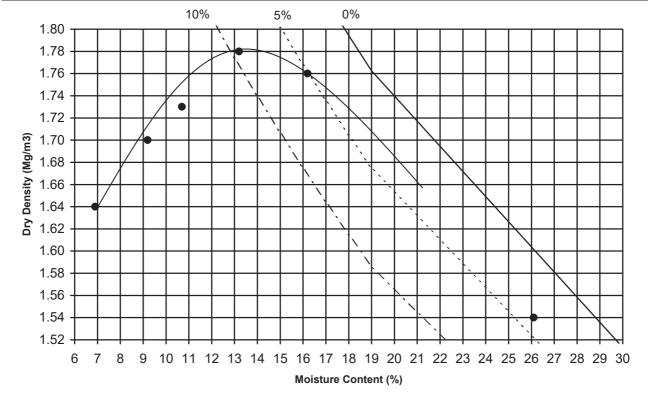
Sample No. AA37814 Depth (m) 0.25 Material Type E

Lab sample no. A16/333 Customer: Galway Co.Co.

Date Received: 01-02-16 Test Method: 2.5 KG Rammer

Date Tested: 09-03-16 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	1.54	1.64	1.70	1.73	1.78	1.76	
Moisture Content (%)	26	6.9	9.2	11	13	16	



Maximum Dry Density (Mg/m³): 1.78 Optimum Moisture Content (%): 13

Description: Dark brown clayey/silty, very sandy, GRAVEL with many cobbles

Sample Preparation: Material passing 20mm Single / Separate samples used

Particle Density (Mg/m³): 2.65 Particle Density: Assumed

% retained on 20/37.5mm sieve: 21

The result relates to the specimen tested.

Opinions and interpretations are outside the scope of accreditation

Persons authorised to approve reports

J Barrett (Dep. Quality Manager)

H Byrne (Quality Manager)

IGSL Materials Laboratory

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Date Page
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Test Report

Dry Density/Moisture Content Relationship



Tested in accordance with BS1377:Part 4:1990

Report No. R70463 Contract No. 18963

Contract Name: GCTP Phase 3 - Contract 1 GI

Lab Contract No. 18963 Location: TP03/17

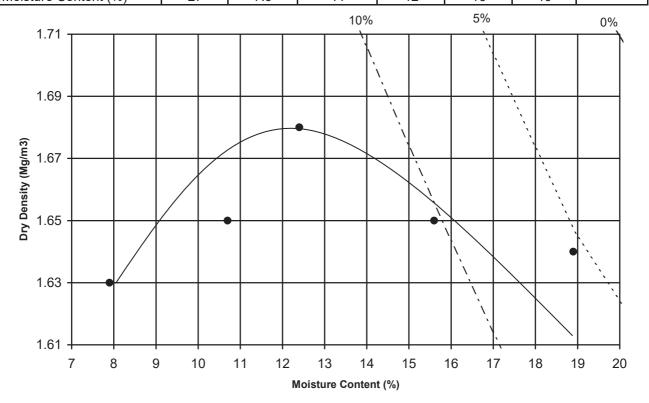
Sample No. AA44489 Depth (m) 0.5 Material Type B

Lab sample no. A16/0344 Customer: Galway Co.Co.

Date Received: 01-02-16 Test Method: 2.5 KG Rammer

Date Tested: 08-02-16 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	1.49	1.63	1.65	1.68	1.65	1.64	
Moisture Content (%)	27	7.9	11	12	16	19	



Maximum Dry Density (Mg/m³): 1.68 Optimum Moisture Content (%): 12

Description: Orange/brown clayey/silty, sandy, GRAVEL with some cobbles

Sample Preparation: Material passing 20mm Single / Separate samples used

Particle Density (Mg/m³): 2.58 Particle Density: Assumed

% retained on 20/37.5mm sieve: 34.8

The result relates to the specimen tested.

Opinions and interpretations are outside the scope of accreditation

Persons authorised to approve reports

J Barrett (Dep. Quality Manager)

H Byrne (Quality Manager)

IGSL Materials Laboratory

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Date Page
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Test Report

Dry Density/Moisture Content Relationship



Tested in accordance with BS1377:Part 4:1990

Report No. R71003 Contract No. 18963

Contract Name: GCTP Phase 3 - Contract 1 GI

Lab Contract No. 18963 Location: TP03/18

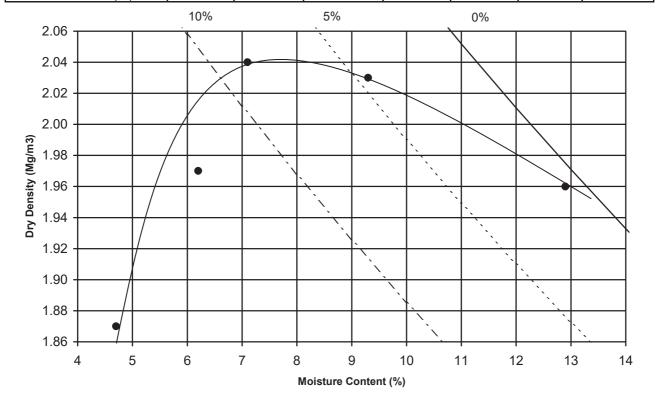
Sample No. AA37826 Depth (m) 1 Material Type B

Lab sample no. A16/0346 Customer: Galway Co.Co.

Date Received: 01-02-16 Test Method: 2.5 KG Rammer

Date Tested: 19-02-16 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	1.96	1.97	2.04	2.03	1.87	
Moisture Content (%)	13	6.2	7.1	9.3	4.7	



Maximum Dry Density (Mg/m³): 2.04 Optimum Moisture Content (%): 7

Description: Brown clayey/silty, sandy, GRAVEL

Sample Preparation: Material passing 20mm Single / Separate samples used

Particle Density (Mg/m³): 2.65 Particle Density: Assumed

% retained on 20/37.5mm sieve: 37

The result relates to the specimen tested.

Opinions and interpretations are outside the scope of accreditation

Persons authorised to approve reports

J Barrett (Dep. Quality Manager)

H Byrne (Quality Manager)

IGSL Materials Laboratory

Approved by
Date Page
15-03-16 1 of 1

Test Report

Dry Density/Moisture Content Relationship



Tested in accordance with BS1377:Part 4:1990

Report No. R70464 Contract No. 18963

Contract Name: GCTP Phase 3 - Contract 1 GI

Lab Contract No. 18963 Location: TP03/19

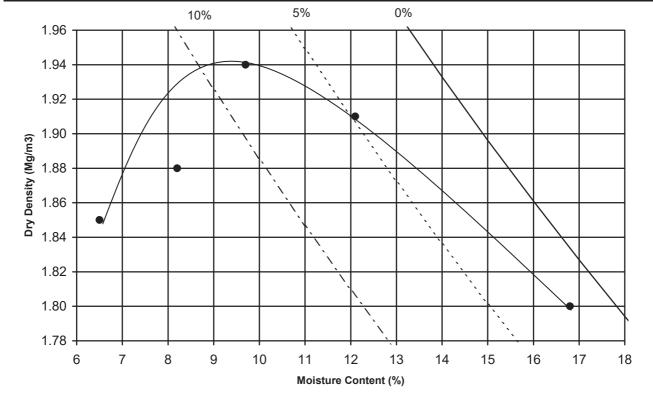
Sample No. AA44492 Depth (m) 0.5 Material Type E

Lab sample no. A16/0350 Customer: Galway Co.Co.

Date Received: 01-02-16 Test Method: 2.5 KG Rammer

Date Tested: 08-02-16 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	1.80	1.88	1.94	1.91	1.85	
Moisture Content (%)	17	8.2	10	12.1	6.5	



Maximum Dry Density (Mg/m³): 1.94 Optimum Moisture Content (%): 10

Description: Dark brown/black clayey/silty, very sandy, GRAVEL with some cobbles

Sample Preparation: Material passing 20mm Single / Separate samples used

Particle Density (Mg/m³): 2.65 Particle Density: Assumed

% retained on 20/37.5mm sieve: 42.6

The result relates to the specimen tested.

Opinions and interpretations are outside the scope of accreditation

Persons authorised to approve reports

J Barrett (Dep. Quality Manager)

H Byrne (Quality Manager)

IGSL Materials Laboratory

Approved by
Date Page
17-02-16 1 of 1

Test Report

Dry Density/Moisture Content Relationship



Tested in accordance with BS1377:Part 4:1990

Report No. R70462 Contract No. 18963

Contract Name: GCTP Phase 3 - Contract 1 GI

Lab Contract No. 18963 Location: TP03/21

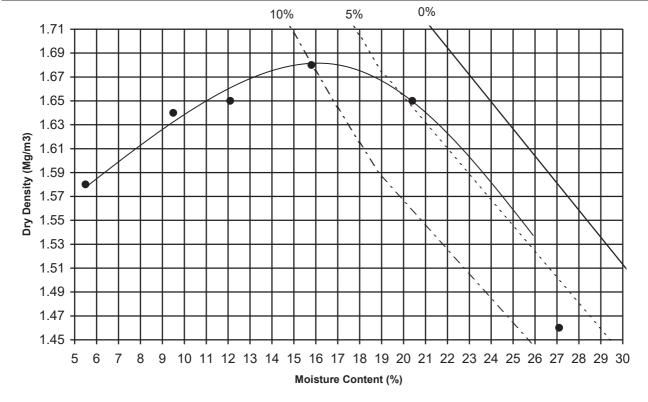
Sample No. AA44495 Depth (m) 0.15 Material Type B

Lab sample no. A16/0357 Customer: Galway Co.Co.

Date Received: 01-02-16 Test Method: 2.5 KG Rammer

Date Tested: 12-02-16 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	1.46	1.58	1.64	1.65	1.68	1.65	
Moisture Content (%)	27	5.5	10	12	16	20	



Maximum Dry Density (Mg/m³): 1.68 Optimum Moisture Content (%): 16

Description: Dark brown/black clayey/silty, sandy, GRAVEL with some cobbles

Sample Preparation: Material passing 20mm Single / Separate samples used

Particle Density (Mg/m³): 2.65 Particle Density: Assumed

% retained on 20/37.5mm sieve: 51

J Barrett (Dep. Quality Manager)
The result relates to the specimen tested.

H Byrne (Quality Manager)
Opinions and interpretations are outside the scope of accreditation

IGSL Materials Laboratory

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Date Page
17-02-16 1 of 1

Persons authorised to approve reports

Test Report

Dry Density/Moisture Content Relationship



Tested in accordance with BS1377:Part 4:1990

R70465 Report No. Contract No. 18963

Contract Name: GCTP Phase 3 - Contract 1 GI

Lab Contract No. 18963 Location: TP03/25

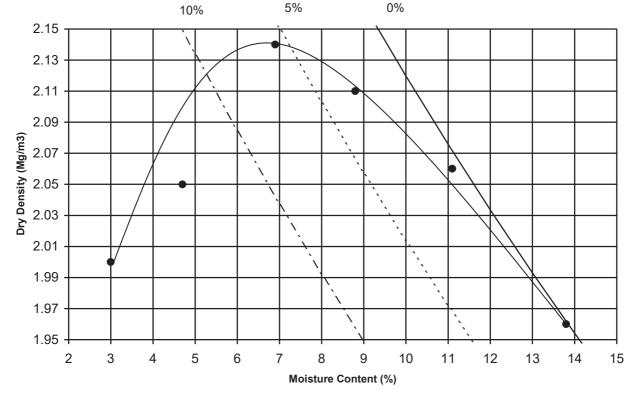
Sample No. AA33937 Depth (m) Material Type 1

Lab sample no. A16/0369 Customer: Galway Co.Co.

2.5 KG Rammer Date Received: 01-02-16 Test Method:

Date Tested: BS1377:Part 4:1990 12-02-16 3.3

Dry Density (Mg/m ³)	2.06	2.11	1.96	2.05	2.14	2.00	
Moisture Content (%)	11	8.8	14	4.7	6.9	3.0	



Maximum Dry Density (Mg/m³): Optimum Moisture Content (%): 2.14 7

Description: Light brown/grey very sandy very gravelly SILT

Single / Separate samples used Sample Preparation: Material passing 20mm

Particle Density (Mg/m³): 2.69 Particle Density: Assumed

% retained on 20/37.5mm sieve: 25.6

The result relates to the specimen tested.

Opinions and interpretations are outside the scope of accreditation

Persons authorised to approve reports J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

Approved by Date **IGSL Materials Laboratory** 17-02-16 1 of 1

Test Report

Dry Density/Moisture Content Relationship



Tested in accordance with BS1377:Part 4:1990

Report No. R71146 Contract No. 18963

Contract Name: GCTP Phase 3 - Contract 1 GI

Lab Contract No. 18963 Location: TP03/16

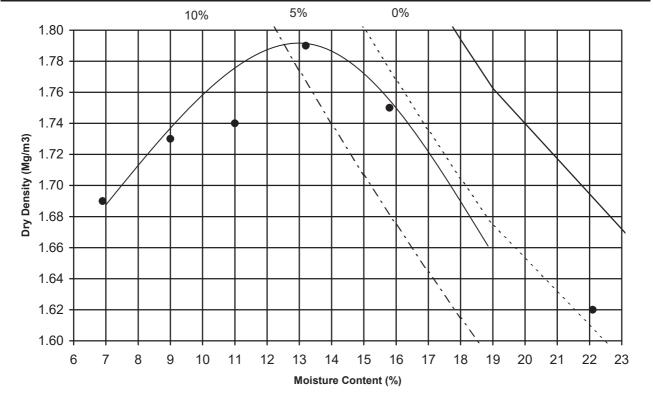
Sample No. AA37817 Depth (m) 0.2 Material Type B

Lab sample no. A16/0342 Customer: Galway Co.Co.

Date Received: 01-02-16 Test Method: 2.5 KG Rammer

Date Tested: 19-02-16 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	1.62	1.69	1.73	1.74	1.79	1.75	
Moisture Content (%)	22	7	9	11.0	13	16	



Maximum Dry Density (Mg/m³): 1.79 Optimum Moisture Content (%): 11

Description: Dark brown slightly clayey/silty, sandy, GRAVEL

Sample Preparation: Material passing 20mm Single / Separate samples used

Particle Density (Mg/m³): 2.65 Particle Density: Assumed

% retained on 20/37.5mm sieve: 43

J Barrett (Dep. Quality Manager)
The result relates to the specimen tested.

H Byrne (Quality Manager)

Opinions and interpretations are outside the scope of accreditation

IGSL Materials Laboratory

Approved by
Date Page
29-03-16 1 of 1

Persons authorised to approve reports

IGSL Ltd Materials Laboratory

Unit J5,M7 Business Park

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R70466 Contract GCTP Phase 3 - Contact 1

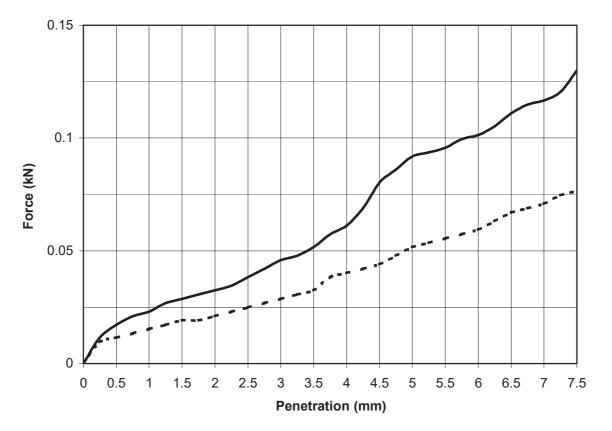
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 08-02-16

BH/TP No. TP03/34 Sample No. AA44472 Type: B

Depth (m) 1.00 Lab sample No. A16/0401



Key: ----- Base

Description: Grey/brown slightly sandy, slightly gravelly, SILT				
Initial Condition:	Unsoake	d Point 1 of 5		
Moisture Content (%):	25	Bulk Density (Mg/m ³):	1.96	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.56	
% Material >20mm:	10			
Method of compaction:	Static Compaction Method 2			

Test Result	Тор	Base
CBR %	0.5	0.3
Moisture	25	25
Content %		

Persons authorized to approve reports

J Barrett (Dep. Quality Manager)

H Byrne (Quality Manager)

Approved by Date Page No. 17-02-16 1 of 5

IGSL Ltd Materials Laboratory Unit J5,M7 Business Park

Naas Co.Kildare

045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No.	R70466	Contract	GCTP Phase 3 - Contact 1
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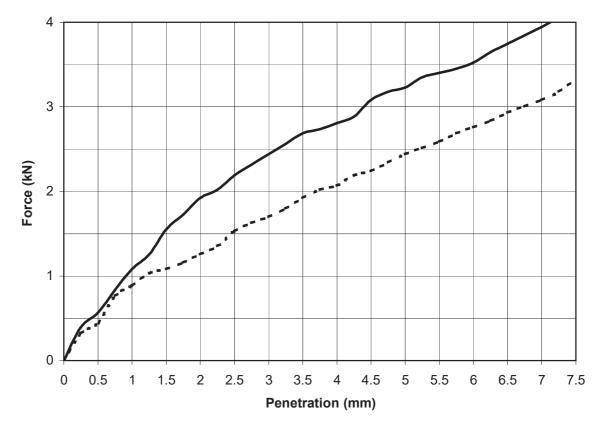
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 09-02-16

BH/TP No. TP03/34 Sample No. AA44472 Type: B

Depth (m) 1.00 Lab sample No. A16/0401



Key: ----- Base

Description: Grey/brown slightly sandy, slightly gravelly, SILT				
Initial Condition:	Unsoaked	d Point 2 of 5		
Moisture Content (%):	8	Bulk Density (Mg/m ³):	1.86	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.72	
% Material >20mm:	10.2			
Method of compaction:	Static Co	mpaction Method 2		

Test Result	Тор	Base
CBR %	17	12
Moisture	8.1	8.2
Content %	5.1	0.2

Persons authorized to approve reports

J Barrett (Dep. Quality Manager)

H Byrne (Quality Manager)

Unit J5,M7 Business Park Naas Co.Kildare

045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R70466 Contract GCTP Phase 3 - Contact 1

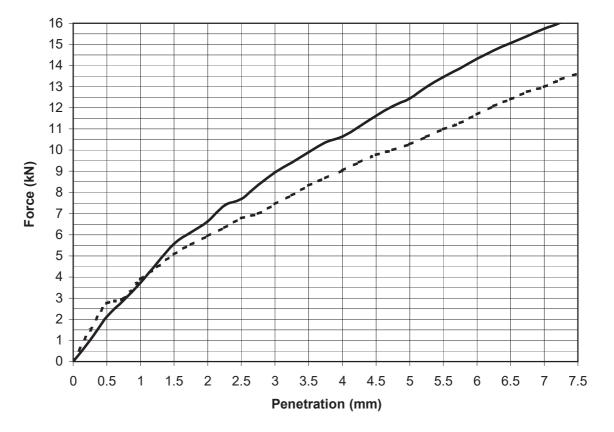
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 10-02-16

BH/TP No. TP03/34 Sample No. AA44472 Type: B

Depth (m) 1.00 Lab sample No. A16/0401



Key: ----- Base

Description: Grey/brown slightly sandy, slightly gravelly, SILT				
Initial Condition:	Unsoake	d Point 3 of 5		
Moisture Content (%):	10	Bulk Density (Mg/m ³):	1.95	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.78	
% Material >20mm:	10			
Method of compaction:	Static Co	mpaction Method 2		

Test Result	Тор	Base
CBR %	62	51
Moisture	10	10
Content %	'0	10

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

Approved by Date Page No.

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Unit J5,M7 Business Park Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No.	R70466	Contract	GCTP Phase 3 - Contact 1
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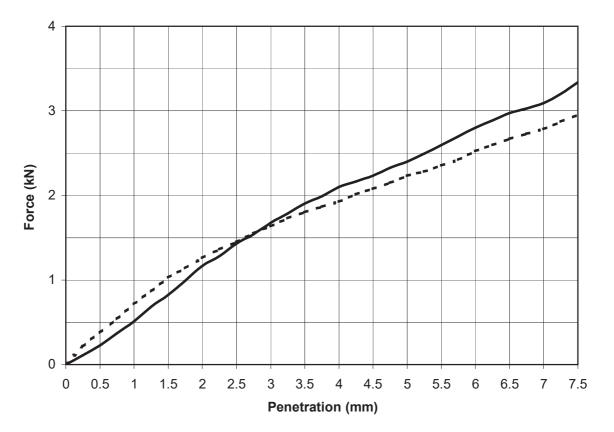
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 10-02-16

BH/TP No. TP03/34 Sample No. AA44472 Type: B

Depth (m) 1.00 Lab sample No. A16/0401



Key: ----- Base

Description: Grey/brown slightly sandy, slightly gravelly, SILT				
Initial Condition:	Unsoake	d Point 4 of 5		
Moisture Content (%):	12	Bulk Density (Mg/m ³):	1.99	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.77	
% Material >20mm:	10			
Method of compaction:	Static Co	mpaction Method 2		

Test Result	Тор	Base
CBR %	12	11
Moisture	12	13
Content %	12	10

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

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045 899324

Materials Laboratory

Unit J5,M7 Business Park Naas Co.Kildare

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R70466 Contract GCTP Phase 3 - Contact 1

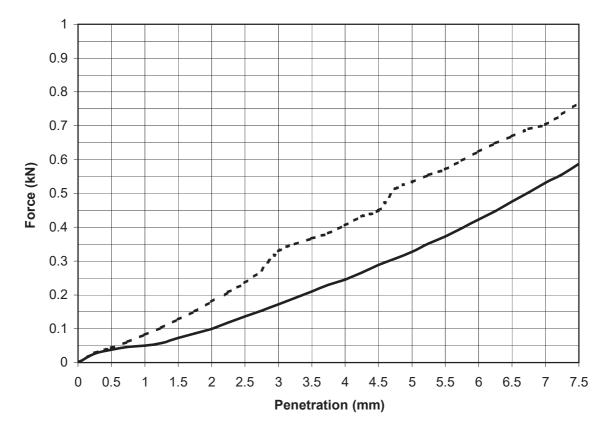
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 **Date Tested** 10-02-16

BH/TP No. TP03/34 Sample No. В AA44472 Type:

Depth (m) 1.00 Lab sample No. A16/0401



Key: -Top --- Base

Description: Grey/brown slightly sandy, slightly gravelly, SILT				
Initial Condition:	Unsoaked	d Point 5 of 5		
Moisture Content (%):	16	Bulk Density (Mg/m ³):	2.04	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.76	
% Material >20mm:	10.2			
Method of compaction:	Static Co	mpaction Method 2		

R70466.TP3.34@1.00m.CBR4.xls

Test Result	Тор	Base
CBR %	1.6	2.7
Moisture	16	17
Content %	'0	l ''

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

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Materials Laboratory Unit J5,M7 Business Park

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R70467 Contract GCTP Phase 3 - Contact 1

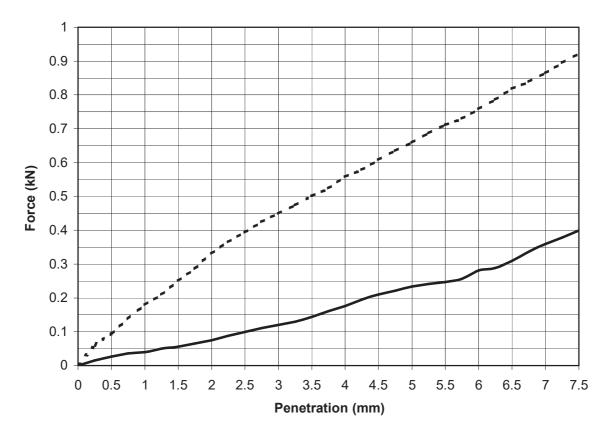
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 08-02-16

BH/TP No. TP03/17 Sample No. AA44488 Type: B

Depth (m) 0.50 Lab sample No. A16/0343



Key: ----- Base

Description: Orange/b	rown claye	y/silty, sandy, GRAVEL with	some cobbles
Initial Condition:	Unsoake	d Point 1 of 5	
Moisture Content (%):	25	Bulk Density (Mg/m ³):	1.93
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.54
% Material >20mm:	41		
Method of compaction:	Static Co	mpaction Method 2	

Test Result	Тор	Base
CBR %	1.2	3.3
Moisture	24	27
Content %		

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

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Unit J5,M7 Business Park Naas Co.Kildare

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TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R70467 Contract GCTP Phase 3 - Contact 1

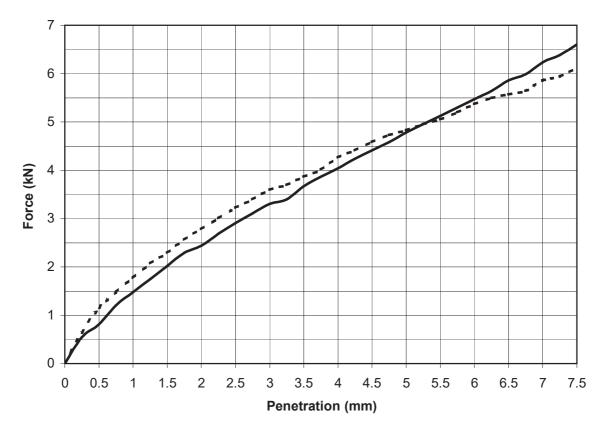
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 08-02-16

BH/TP No. TP03/17 Sample No. AA44488 Type: B

Depth (m) 0.50 Lab sample No. A16/0343



Key: ----- Base

Description: Orange/b	rown claye	y/silty, sandy, GRAVEL with	some cobbles
Initial Condition:	Unsoake	d Point 2 of 5	
Moisture Content (%):	8	Bulk Density (Mg/m ³):	1.74
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.61
% Material >20mm:	41		
Method of compaction:	Static Co	mpaction Method 2	

Test Result	Тор	Base
CBR %	24	24
Moisture	8.1	7.5
Content %] 0.1	7.5

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

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IGSL Ltd Materials Laboratory Unit J5,M7 Business Park

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R70467 Contract GCTP Phase 3 - Contact 1

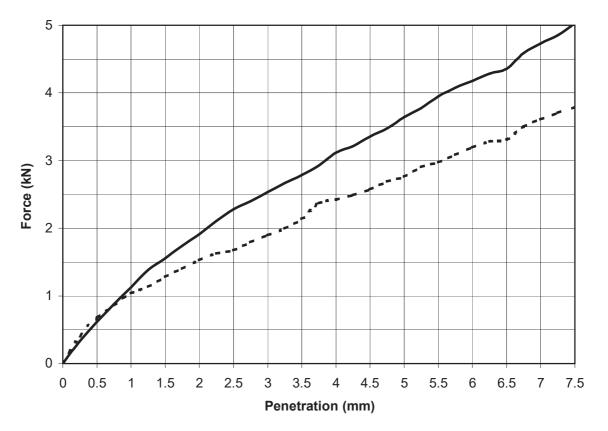
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 08-02-16

BH/TP No. TP03/17 Sample No. AA44488 Type: B

Depth (m) 0.50 Lab sample No. A16/0343



Key: ----- Base

Description: Orange/b	rown claye	y/silty, sandy, GRAVEL with	some cobbles
Initial Condition:	Unsoake	d Point 3 of 5	
Moisture Content (%):	10	Bulk Density (Mg/m ³):	1.77
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.61
% Material >20mm:	41		
Method of compaction:	Static Co	mpaction Method 2	

Test Result	Тор	Base
CBR %	18	14
Moisture	9.4	10
Content %	JT	10

Persons authorized to approve reports

J Barrett (Dep. Quality Manager)

H Byrne (Quality Manager)

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TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R70467 Contract GCTP Phase 3 - Contact 1

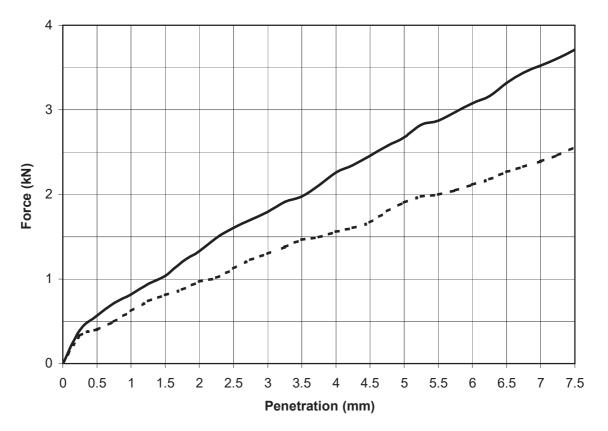
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 08-02-16

BH/TP No. TP03/17 Sample No. AA44488 Type: B

Depth (m) 0.50 Lab sample No. A16/0343



Key: ----- Base

Description: Orange/b	rown claye	y/silty, sandy, GRAVEL with	some cobbles
Initial Condition:	Unsoake	d Point 4 of 5	
Moisture Content (%):	13	Bulk Density (Mg/m ³):	1.86
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.64
% Material >20mm:	41		
Method of compaction:	Static Co	mpaction Method 2	

Test Result	Тор	Base
CBR %	13	10
Moisture	13	13
Content %	10	10

Persons authorized to approve reports

J Barrett (Dep. Quality Manager)

H Byrne (Quality Manager)

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Materials Laboratory
Unit J5,M7 Business Park

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R70467 Contract GCTP Phase 3 - Contact 1

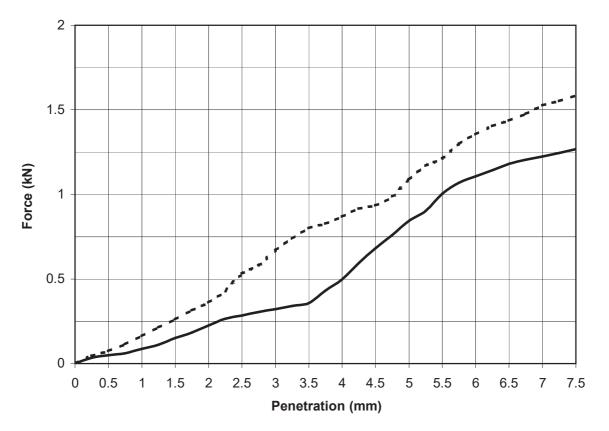
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 08-02-16

BH/TP No. TP03/17 Sample No. AA44488 Type: B

Depth (m) 0.50 Lab sample No. A16/0343



Key: ----- Base

Description: Orange/b	rown claye	y/silty, sandy, GRAVEL with	some cobbles
Initial Condition:	Unsoake	d Point 5 of 5	
Moisture Content (%):	16	Bulk Density (Mg/m ³):	2.06
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.78
% Material >20mm:	41		
Method of compaction:	Static Co	mpaction Method 2	

Test Result	Тор	Base
CBR %	4.2	5.5
Moisture	16	16
Content %	10	10

Persons authorized to approve reports

J Barrett (Dep. Quality Manager)

H Byrne (Quality Manager)

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Unit J5,M7 Business Park

Naas Co.Kildare

045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R70623 Contract GCTP Phase 3 - Contact 1

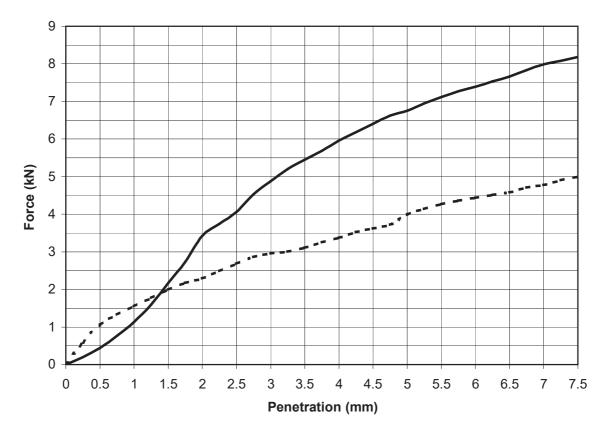
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 12-02-16

BH/TP No. TP03/01 Sample No. AA37829 Type: B

Depth (m) 1.00 Lab sample No. A16/0343



Key: ----- Base

Description: Grey/brov	vn clayey/s	silty, very sandy, GRAVEL		
Initial Condition:	Unsoake	d Point 1 of 5		
Moisture Content (%):	6	Bulk Density (Mg/m ³):	1.91	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.81	
% Material >20mm:	25			
Method of compaction: Static Compaction Method 2				

Test Result	Тор	Base
CBR %	34	20
Moisture	5.4	5.7
Content %] 5.4	5.7

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

IGSL Ltd Materials Laboratory

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Date Page No.
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Unit J5,M7 Business Park Naas Co.Kildare

045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R70623 Contract GCTP Phase 3 - Contact 1

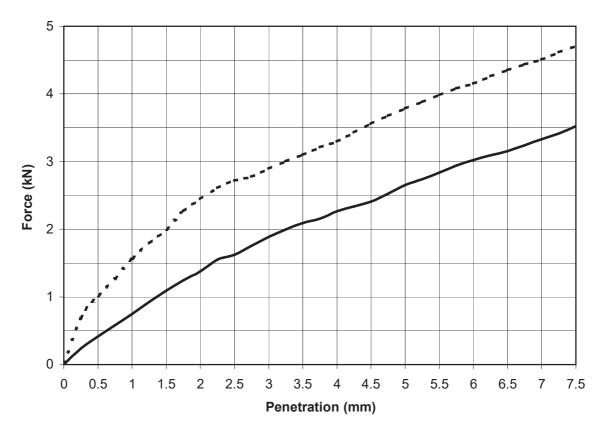
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 12-02-16

BH/TP No. TP03/01 Sample No. AA37829 Type: B

Depth (m) 1.00 Lab sample No. A16/0343



Key: ----- Base

Description: Grey/brov	wn clayey/s	ilty, very sandy, GRAVEL		
Initial Condition:	Unsoake	d Point 2 of 5		
Moisture Content (%):	9	Bulk Density (Mg/m ³):	2.02	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.86	
% Material >20mm:	25			
Method of compaction:	Static Co	mpaction Method 2		

Test Result	Тор	Base
CBR %	13	21
Moisture	8.0	9.3
Content %	1 0.0	5.5

Persons authorized to approve reports

J Barrett (Dep. Quality Manager)

H Byrne (Quality Manager)

IGSL Ltd Materials Laboratory

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Date Page No.
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Materials Laboratory
Unit J5,M7 Business Park

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R70623 Contract GCTP Phase 3 - Contact 1

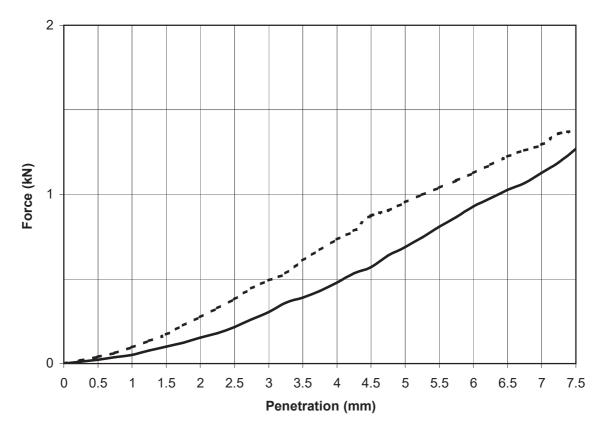
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 12-02-16

BH/TP No. TP03/01 Sample No. AA37829 Type: B

Depth (m) 1.00 Lab sample No. A16/0343



Key: ----- Base

Description: Grey/brov	wn clayey/s	ilty, very sandy, GRAVEL		
Initial Condition:	Unsoake	d Point 3 of 5		
Moisture Content (%):	11	Bulk Density (Mg/m ³):	2.19	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.97	
% Material >20mm:	25			
Method of compaction:	Static Co	mpaction Method 2		

Test Result	Тор	Base
CBR %	3.5	4.8
Moisture	11	11
Content %	''	· · ·

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

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Materials Laboratory Unit J5,M7 Business Park

Naas Co.Kildare

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R70623 Contract GCTP Phase 3 - Contact 1

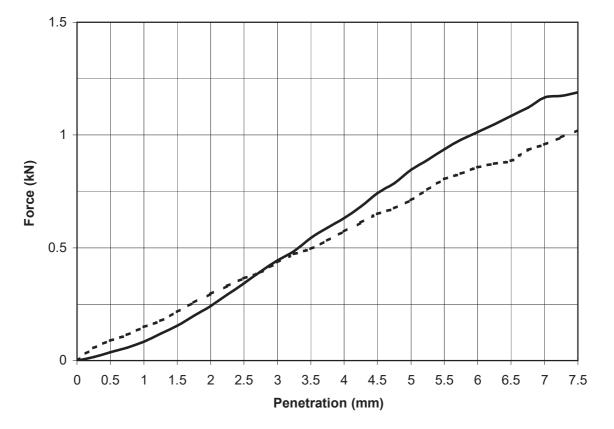
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 **Date Tested** 11-02-16

BH/TP No. TP03/01 Sample No. В AA37829 Type:

A16/0343 Depth (m) 1.00 Lab sample No.



Key: -Top ----- Base

Description: Grey/brov	wn clayey/s	ilty, very sandy, GRAVEL		
Initial Condition:	Unsoake	d Point 4 of 5		
Moisture Content (%):	13	Bulk Density (Mg/m ³):	2.17	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.92	
% Material >20mm:	25			
Method of compaction:	Static Co	mpaction Method 2		

Test Result	Тор	Base
CBR %	4.2	3.6
Moisture Content %	13	14

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

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Unit J5,M7 Business Park

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

R70623 Report No. Contract GCTP Phase 3 - Contact 1

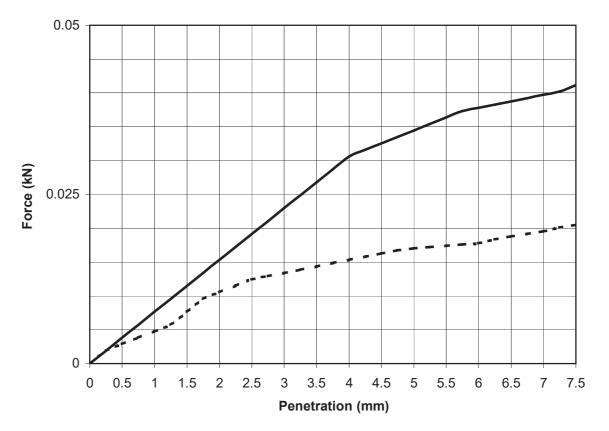
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 12-02-16

BH/TP No. TP03/01 Sample No. AA37829 Type: В

A16/0343 Depth (m) 1.00 Lab sample No.



Key: -Тор ----- Base

Description: Grey/brov	vn clayey/s	ilty, very sandy, GRAVEL		
Initial Condition:	Unsoake	d Point 5 of 5		
Moisture Content (%):	17	Bulk Density (Mg/m ³):	2.14	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.88	
% Material >20mm:	25			
Method of compaction:	Static Co	mpaction Method 2		

Test Result	Тор	Base
CBR %	0.2	0.9
Moisture	16	17
Content %	'0	''

Persons authorized to approve reports

J Barrett (Dep. Quality Manager)

H Byrne (Quality Manager)

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Materials Laboratory
Unit J5,M7 Business Park

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R71175 Contract GCTP Phase 3 - Contact 1

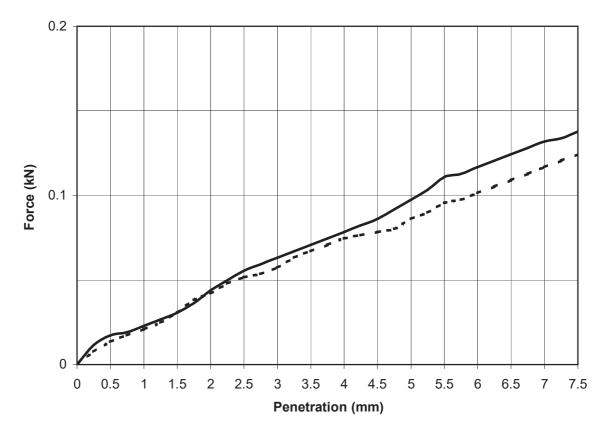
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 21-03-16

BH/TP No. TP03/05 Sample No. AA44477 Type: B

Depth (m) 1.00 Lab sample No. A16/0485



Key: ----- Base

Description: Dark brow	vn/grey cla	yey/silty, very sandy, GRAVI	ΞL	
Initial Condition:	Natural U	Jnsoaked Point 1 of 5		
Moisture Content (%):	39	Bulk Density (Mg/m ³):	1.79	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.29	
% Material >20mm:	28			
Method of compaction:	Static Co	mpaction Method 2		

Test Result	Тор	Base
CBR %	0.5	0.4
Moisture	42	36
Content %	72	30

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

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IGSL Ltd Materials Laboratory Unit J5,M7 Business Park

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No.	R71175	Contract	GCTP Phase 3 - Contact 1
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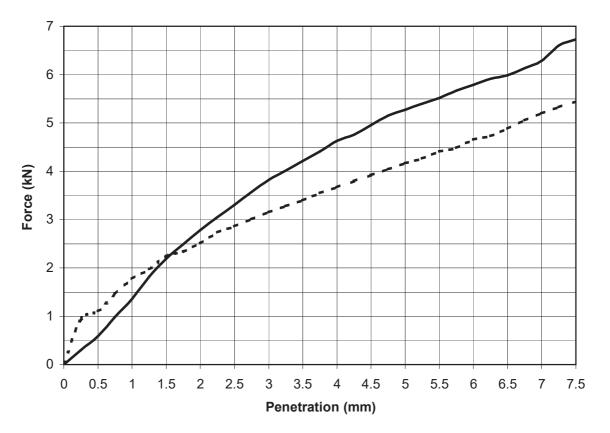
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 29-03-16

BH/TP No. TP03/05 Sample No. AA44477 Type: B

Depth (m) 1.00 Lab sample No. A16/0485



Key: ----- Base

Description: Dark brow	vn/grey cla	yey/silty, very sandy, GRAVI	L	
Initial Condition:	Unsoake	d Point 2 of 5		
Moisture Content (%):	5	Bulk Density (Mg/m ³):	1.61	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.54	
% Material >20mm:	28			
Method of compaction:	Static Co	mpaction Method 2		

Test Result	Тор	Base
CBR %	26	22
Moisture	47	47
Content %	7.7	7.7

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

IGSL Ltd Materials Laboratory

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Unit J5,M7 Business Park

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R71175 Contract GCTP Phase 3 - Contact 1

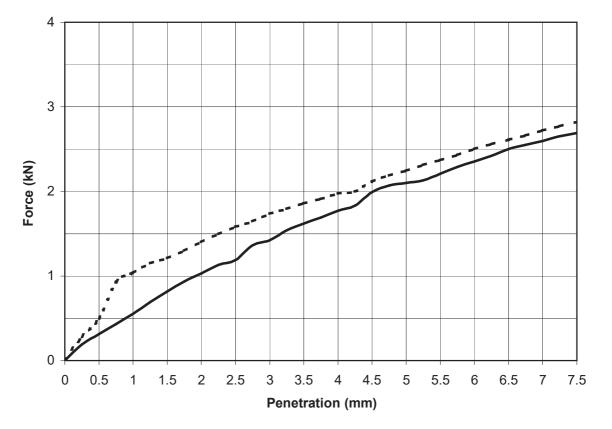
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 23-03-16

BH/TP No. TP03/05 Sample No. AA44477 Type: B

Depth (m) 1.00 Lab sample No. A16/0485



Key: ----- Base

Description: Dark brow	vn/grey cla	yey/silty, very sandy, GRAVI	EL	
Initial Condition:	Unsoake	d Point 3 of 5		
Moisture Content (%):	10	Bulk Density (Mg/m ³):	1.74	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.59	
% Material >20mm:	28			
Method of compaction:	Static Co	empaction Method 2		

Test Result	Тор	Base
CBR %	11	12
Moisture	10	10
Content %	10	10

Persons authorized to approve reports

J Barrett (Dep. Quality Manager)

H Byrne (Quality Manager)

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Unit J5,M7 Business Park Naas Co.Kildare

045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R71175 Contract GCTP Phase 3 - Contact 1

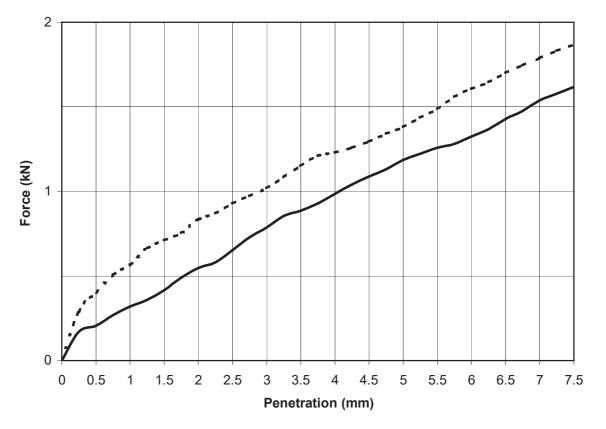
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 23-03-16

BH/TP No. TP03/05 Sample No. AA44477 Type: B

Depth (m) 1.00 Lab sample No. A16/0485



Key: ----- Base

Description: Dark brown/grey clayey/silty, very sandy, GRAVEL				
Initial Condition:	Unsoake	d Point 4 of 5		
Moisture Content (%):	16	Bulk Density (Mg/m ³):	1.85	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.59	
% Material >20mm:	28			
Method of compaction: Static Compaction Method 2				

Test Result	Тор	Base
CBR %	6	7
Moisture	16	16
Content %	10	10

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

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Materials Laboratory
Unit J5,M7 Business Park

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R71175 Contract GCTP Phase 3 - Contact 1

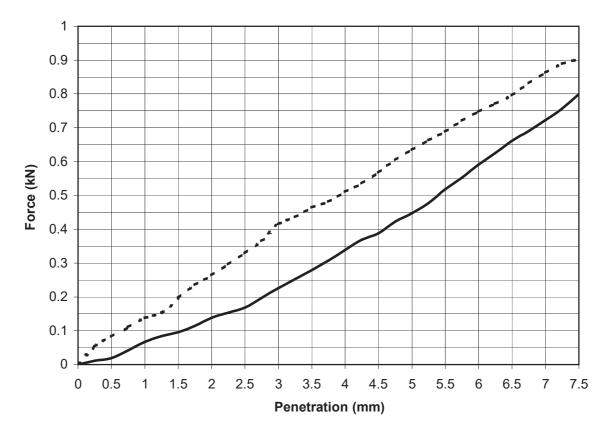
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 23-03-16

BH/TP No. TP03/05 Sample No. AA44477 Type: B

Depth (m) 1.00 Lab sample No. A16/0485



Key: ----- Base

Description: Dark brow	wn/grey cla	yey/silty, very sandy, GRAVE	ĒL	
Initial Condition:	Unsoake	d Point 5 of 5		
Moisture Content (%):	20	Bulk Density (Mg/m ³):	1.94	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.62	
% Material >20mm:	28			
Method of compaction: Static Compaction Method 2				

Test Result	Тор	Base
CBR %	2.2	3.2
Moisture	17	22
Content %	''	22

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

IGSL Ltd Materials Laboratory

Approved by

Date

30-03-16

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Unit J5,M7 Business Park

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R71189 Contract GCTP Phase 3 - Contact 1

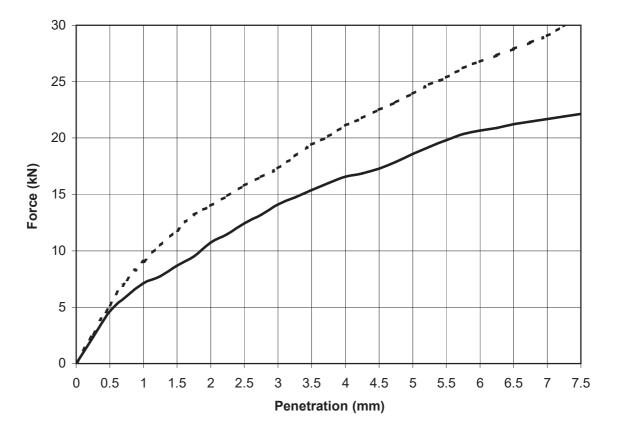
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 23-03-16

BH/TP No. TP03/18 Sample No. AA37827 Type: B

Depth (m) 2.00 Lab sample No. A16/0347



Key: ——Top ----- Base

Description: Light brown slightly clayey/silty, sandy, GRAVEL with some cobbles Initial Condition: Unsoaked Point 1 of 5 Bulk Density (Mg/m³): Moisture Content (%): 6 1.95 4 Dry Density (Mg/m³): Surcharge (kg): 1.84 24 % Material >20mm: Method of compaction: Static Compaction Method 2

Test Result	Тор	Base
CBR %	93	120
Moisture	6	6
Content %		

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

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Materials Laboratory Unit J5,M7 Business Park

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R71189 Contract GCTP Phase 3 - Contact 1

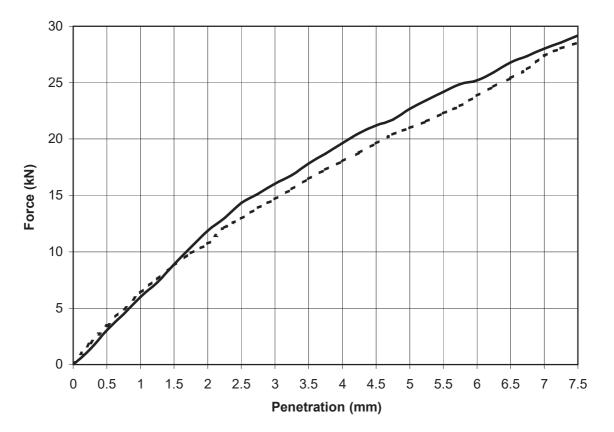
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 24-03-16

BH/TP No. TP03/18 Sample No. AA37827 Type: B

Depth (m) 2.00 Lab sample No. A16/0347



Key: ----- Base

Description: Light brown slightly clayey/silty, sandy, GRAVEL with some cobbles Initial Condition: Unsoaked Point 2 of 5 Bulk Density (Mg/m³): Moisture Content (%): 7 2.01 Dry Density (Mg/m³): Surcharge (kg): 4 1.88 % Material >20mm: 24 Method of compaction: Static Compaction Method 2

Test Result	Тор	Base
CBR %	114	106
Moisture	7	7
Content %	'	,

Persons authorized to approve reports

J Barrett (Dep. Quality Manager)

H Byrne (Quality Manager)

Approved by	Date	Page No.
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Materials Laboratory
Unit J5,M7 Business Park

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R71189 Contract GCTP Phase 3 - Contact 1

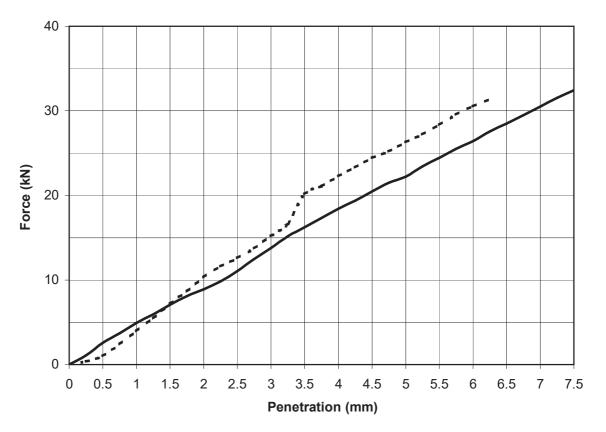
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 29-03-16

BH/TP No. TP03/18 Sample No. AA37827 Type: B

Depth (m) 2.00 Lab sample No. A16/0347



Key: ----- Base

Description: Light brown slightly clayey/silty, sandy, GRAVEL with some cobbles Initial Condition: Unsoaked Point 3 of 5 Bulk Density (Mg/m³): Moisture Content (%): 8 2.06 Dry Density (Mg/m³): Surcharge (kg): 4 1.91 % Material >20mm: 24 Method of compaction: Static Compaction Method 2

Test Result	Тор	Base
CBR %	111	132
Moisture	8	8
Content %		

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

IGSL Ltd Materials Laboratory

Approved by

Date

30-03-16

Page No.

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045 899324

Materials Laboratory Unit J5,M7 Business Park Naas Co.Kildare

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R71189 Contract GCTP Phase 3 - Contact 1

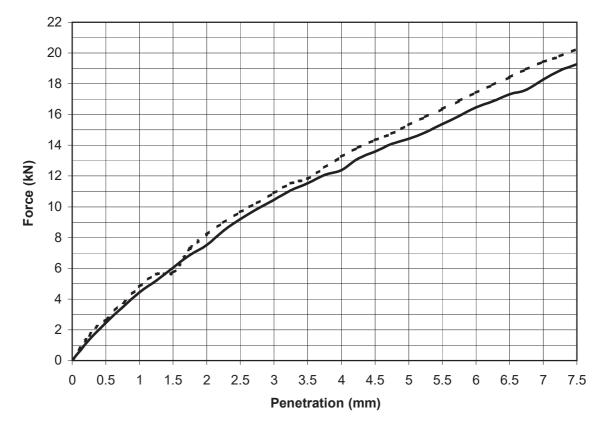
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 29-03-16

BH/TP No. TP03/18 Sample No. AA37827 Type: B

Depth (m) 2.00 Lab sample No. A16/0347



Key: ----- Base

Description: Light brown slightly clayey/silty, sandy, GRAVEL with some cobbles Initial Condition: Unsoaked Point 4 of 5 Bulk Density (Mg/m³): Moisture Content (%): 9 2.12 4 Dry Density (Mg/m³): Surcharge (kg): 1.94 % Material >20mm: 24 Method of compaction: Static Compaction Method 2

Test Result	Тор	Base
CBR %	72	77
Moisture	9	9
Content %		J

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

Approved by Date Page No.

30-03-16 4 of 5

Materials Laboratory Unit J5,M7 Business Park

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R71189 Contract GCTP Phase 3 - Contact 1

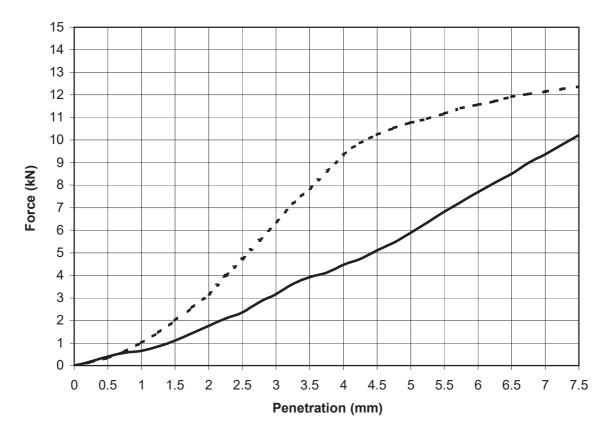
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 29-03-16

BH/TP No. TP03/18 Sample No. AA37827 Type: B

Depth (m) 2.00 Lab sample No. A16/0347



Key: ----- Base

Description: Light brown slightly clayey/silty, sandy, GRAVEL with some cobbles Initial Condition: Unsoaked Point 5 of 5 Bulk Density (Mg/m³): Moisture Content (%): 11 2.16 Dry Density (Mg/m³): Surcharge (kg): 4 1.90 % Material >20mm: 24 Method of compaction: Static Compaction Method 2

Test Result	Тор	Base
CBR %	30	54
Moisture	11	11
Content %	''	''

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

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Unit J5,M7 Business Park Naas Co.Kildare

045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R71385 Contract GCTP Phase 3 - Contact 1

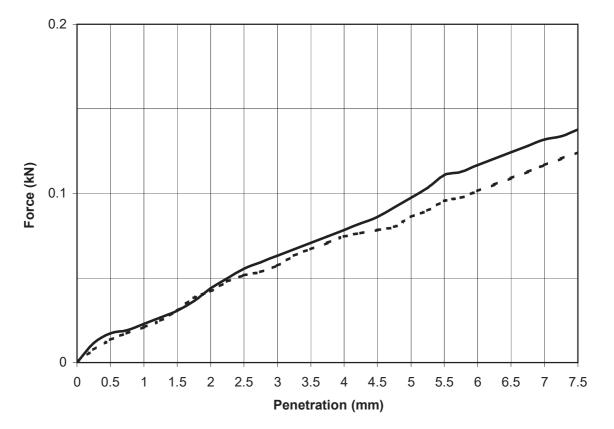
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 21-03-16

BH/TP No. TP03/05 Sample No. AA44477 Type: B

Depth (m) 1.00 Lab sample No. A16/0485



Key: ——Top ------ Base

Description: Dark brov	vn/grey claye	ey/silty, very sandy, GRAV	EL .	
Initial Condition:	Unsoaked			
Moisture Content (%):	39	Bulk Density (Mg/m ³):	1.79	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.29	
% Material >20mm:	28			
Method of compaction:	Static Con	npaction Method 2		

Test Result	Тор	Base
CBR %	0.5	0.4
Moisture	42	36
Content %	72	30

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

IGSL Ltd Materials Laboratory

Approved by

Date
30-03-16

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Materials Laboratory Unit J5,M7 Business Park

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

R70468 Report No. Contract GCTP Phase 3 - Contact 1

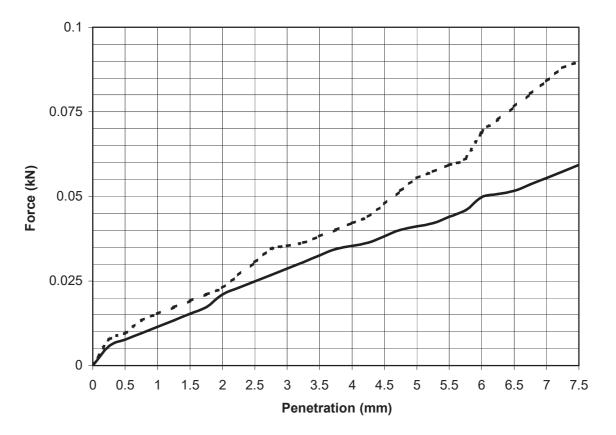
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 **Date Tested** 08-02-16

BH/TP No. TP03/03 Sample No. AA44484 В Type:

A16/0318 Depth (m) 1.60 Lab sample No.



Key: -Тор ----- Base

Description: Dark brow	vn silty, very	sandy, GRAVEL with occa	sional cobbles
Initial Condition:	Unsoaked		
Moisture Content (%):	30	Bulk Density (Mg/m ³):	1.88
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.45
% Material >20mm:	30		
Method of compaction:	Static Con	npaction Method 2	

Test Result	Тор	Base
CBR %	0.2	0.3
Moisture	30	29
Content %		20

Persons authorized to approve reports

J Barrett (Dep. Quality Manager)

H Byrne (Quality Manager)

IGSL Ltd	Materials	Laboratory
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Materials Laboratory Unit J5,M7 Business Park

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

R70616 Report No. Contract GCTP Phase 3 - Contract 1

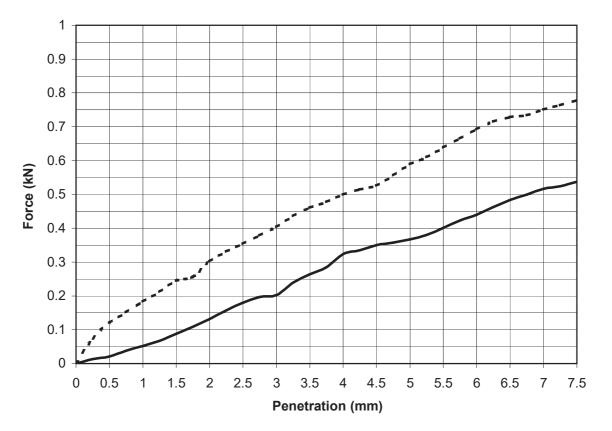
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 **Date Tested** 22-02-16

BH/TP No. TP3/06 Sample No. AA37805 Type: В

A16/0325 Depth (m) 1.10 Lab sample No.



Key: -Top ----- Base

Description: Dark brow	vn/black clay	ey/silty, sandy, GRAVEL v	vith some cobbles
Initial Condition:	Unsoaked		
Moisture Content (%):	26	Bulk Density (Mg/m ³):	1.98
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.57
% Material >20mm:	25		
Method of compaction:	Static Con	npaction Method 2	

Test Result	Тор	Base
CBR %	1.8	3.0
Moisture	28	24
Content %		

Persons authorized to approve reports

J Barrett (Dep. Quality Manager)

H Byrne (Quality Manager)

IGSL Ltd	Materials	Laboratory
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045 899324

Unit J5,M7 Business Park Naas Co.Kildare

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No.	R70617	Contract	GCTP Phase 3 - Contract 1

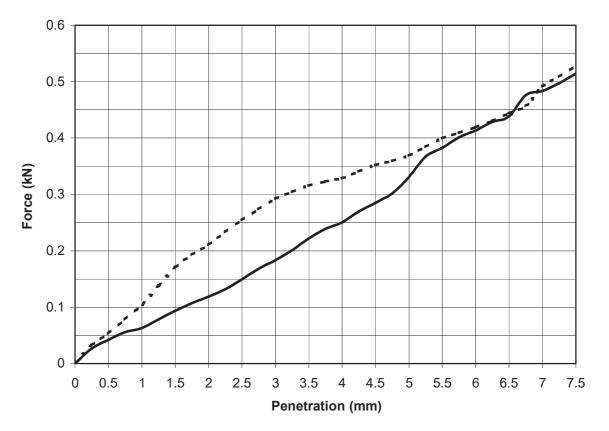
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 22-02-16

AA37821 Type: BH/TP No. TP03/08 Sample No. В

Depth (m) 1.20 Lab sample No. A16/0332



Key: -Top ----- Base

Description: Light brow	wn/grey claye	ey/silty, very sandy, GRAV	EL	
Initial Condition:	Unsoaked			
Moisture Content (%):	16	Bulk Density (Mg/m ³):	2.12	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.83	
% Material >20mm:	24			
Method of compaction:	Static Con	npaction Method 2		

Test Result	Тор	Base
CBR %	1.7	1.9
Moisture	15	16
Content %	.0	

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

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Materials Laboratory Unit J5,M7 Business Park

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R71143 Contract GCTP Phase 3 - Contact 1

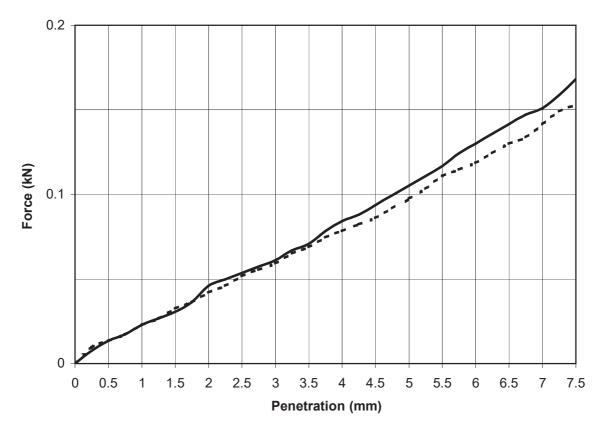
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 09-03-16

BH/TP No. TP3/11 Sample No. AA37814 Type: B

Depth (m) 0.25 Lab sample No. A16/0333



Key: ----- Base

Description: Dark brow	vn clayey/sil	ty, very sandy, GRAVEL w	ith many cobbles
Initial Condition:	Unsoaked		
Moisture Content (%):	26	Bulk Density (Mg/m ³):	1.94
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.54
% Material >20mm:	21		
Method of compaction:	Static Con	npaction Method 2	

Test Result	Тор	Base
CBR %	0.5	0.5
Moisture	26	26
Content %		20

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

IGSL Ltd Materials Laboratory

Approved by
Date Page No.
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Materials Laboratory Unit J5,M7 Business Park

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R70280 Contract N6 Galway

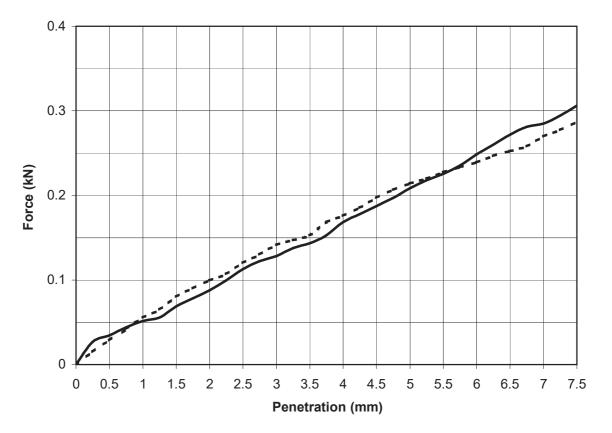
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 08-02-16

BH/TP No. TP3/21 Sample No. AA44494 Type: B

Depth (m) 0.15 Lab sample No. A16/0356



Key: ----- Base

Description: Dark brov	vn/black clay	yey/silty, sandy, GRAVEL v	vith some cobbles
Initial Condition:	Unsoaked		
Moisture Content (%):	39	Bulk Density (Mg/m ³):	1.74
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.25
% Material >20mm:	53		
Method of compaction:	Static Cor	npaction Method 2	

Test Result	Тор	Base
CBR %	1.0	1.1
Moisture	36	43
Content %	00	7

Persons authorized to approve reports

J Barrett (Dep. Quality Manager)

H Byrne (Quality Manager)

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Unit J5,M7 Business Park

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No.	R71004	Contract	GCTP Phase 3 - Contact 1
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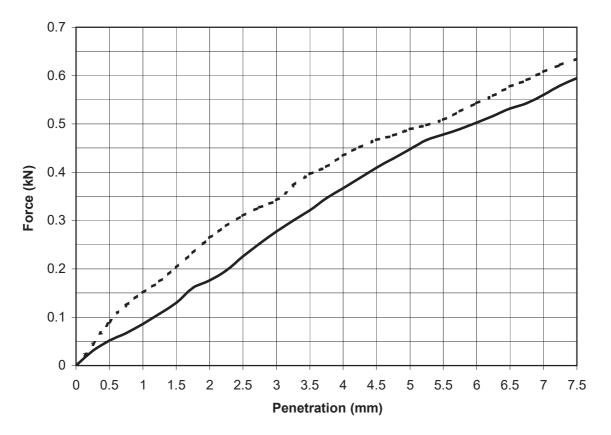
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 09-03-16

BH/TP No. TP03/22 Sample No. AA33947 Type: B

Depth (m) 0.15 Lab sample No. A16/0559



Key: ----- Base

Description: Brown sa	ndy, slightly	gravelly, SILT		
Initial Condition:	Unsoaked			
Moisture Content (%):	25	Bulk Density (Mg/m ³):	1.92	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.54	
% Material >20mm:	2			
Method of compaction:	Static Con	npaction Method 2		

Test Result	Тор	Base
CBR %	2.2	2.5
Moisture	25	26
Content %		20

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

IGSL Ltd Materials Laboratory

Approved by
Date Page No.
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Unit J5,M7 Business Park

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R70618 Contract GCTP Phase 3 - Contract 1

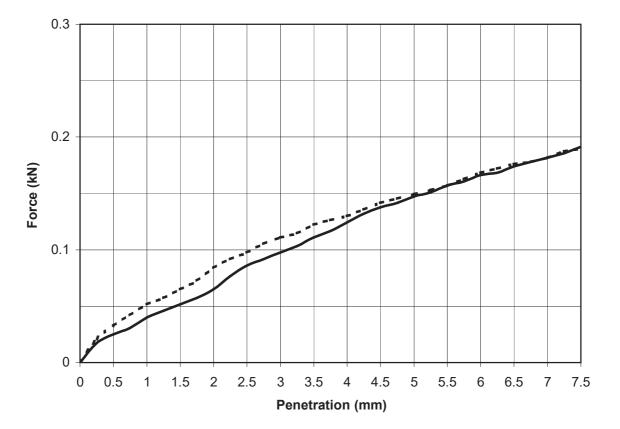
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 19-02-16

BH/TP No. TP03/23 Sample No. AA33941 Type: B

Depth (m) 0.50 Lab sample No. A16/0361



Key: _____ Top _____ Base

Description: Light brown slightly sandy, slightly gravelly, SIL1				
Initial Condition:	Unsoaked			
Moisture Content (%):	18	Bulk Density (Mg/m ³):	2.11	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.79	
% Material >20mm:	6.1			
Method of compaction:	Static Con	npaction Method 2		

Test Result	Тор	Base
CBR %	0.7	0.8
Moisture Content %	19	18

Persons authorized to approve reports

J Barrett (Dep. Quality Manager)

H Byrne (Quality Manager)

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IGSL Ltd Materials Laboratory Unit J5,M7 Business Park

TEST REPORT Determination of California Bearing Ratio (CBR)



Naas Co.Kildare 045 899324

Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R70619 Contract GCTP Phase 3 - Contract 1

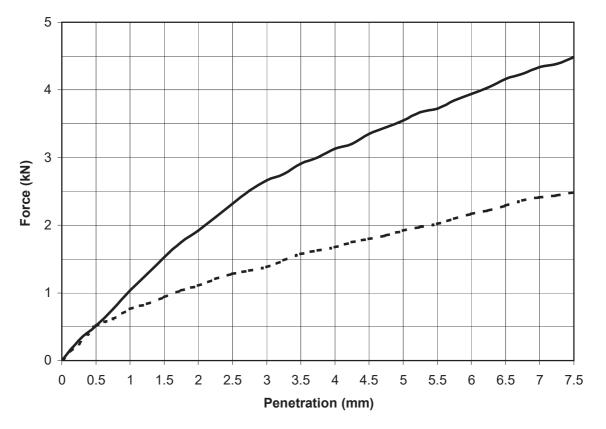
Contract No. 18963 Customer

Galway Co.Co.

Date received 12-02-16 Date Tested 22-02-16

BH/TP No. TP03/25 Sample No. AA43895 Type: B

Depth (m) 2.00 Lab sample No. A16/0371



Key: ----- Base

Description: Light brown/grey slightly sandy, gravelly, SILT/CLAY with some cobbles			
Initial Condition:	Unsoaked		
Moisture Content (%):	8	Bulk Density (Mg/m ³):	2.21
Surcharge (kg):	4	Dry Density (Mg/m ³):	2.05
% Material >20mm:	15.7		
Method of compaction:	npaction: Static Compaction Method 2		

Test Result	Тор	Base
CBR %	18	10
Moisture	7.6	7.9
Content %	7.0	7.5

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

IGSL Ltd Materials Laboratory

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IGSL Ltd Materials Laboratory Unit J5,M7 Business Park

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No.	R70620	Contract	GCTP Phase 3 - Contract 1
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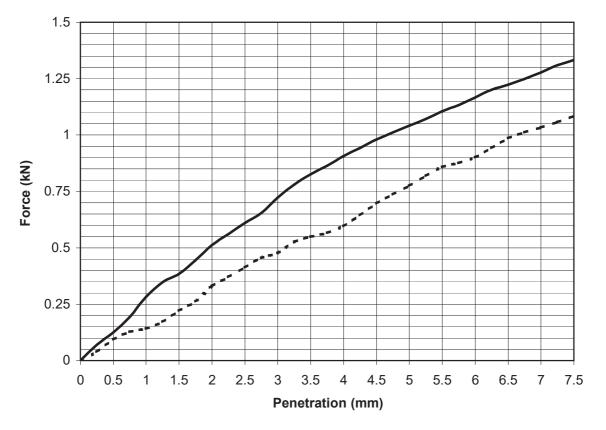
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 19-02-16

BH/TP No. TP03/27 Sample No. В AA44456 Type:

Depth (m) 2.00 Lab sample No. A16/0377



Key: -Top ----- Base

Description: Light brown slightly sandy, slightly gravelly, SILT				
Initial Condition:	Unsoaked			
Moisture Content (%):	9	Bulk Density (Mg/m ³):	2.26	
Surcharge (kg):	4	Dry Density (Mg/m ³):	2.08	
% Material >20mm:	2.6			
Method of compaction: Static Compaction Method 2				

Test Result	Тор	Base
CBR %	5.2	3.9
Moisture	8.7	8.7
Content %	0.7	0.7

Persons authorized to approve reports

J Barrett (Dep. Quality Manager)

H Byrne (Quality Manager)

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Unit J5,M7 Business Park

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R70643 Contract GCTP Phase 3 - Contact 1

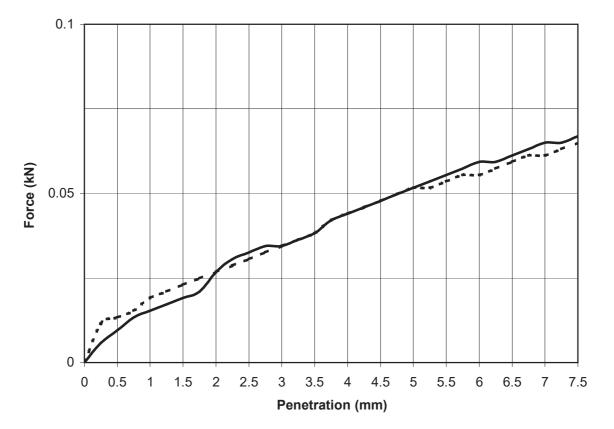
Contract No. 18963 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 28-02-16

BH/TP No. TP03/29 Sample No. 0 Type: B

Depth (m) 1.60 Lab sample No. A16/0391



Key: ----- Base

Description: Dark brown/grey clayey/silty, very sandy, GRAVEL with some cobbles			
Initial Condition:	Unsoaked		
Moisture Content (%):	28	Bulk Density (Mg/m ³):	1.89
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.47
% Material >20mm:	11		
Method of compaction:	Static Cor	npaction Method 2	

Test Result	Тор	Base
CBR %	0.3	0.3
Moisture	28	29
Content %	20	20

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

Approved by	Date	Page No.
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IGSL Ltd Materials Laboratory Unit J5,M7 Business Park

Naas Co.Kildare

045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No.	R70279	Contract	N6 Galway

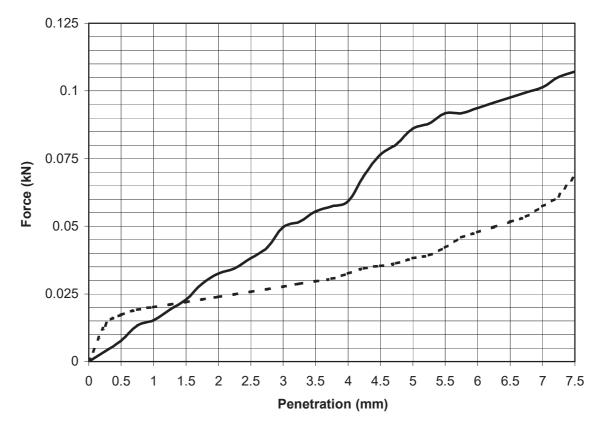
Contract No. R70279 Customer

Galway Co.Co.

Date received 01-02-16 Date Tested 08-02-16

BH/TP No. TP3/34 Sample No. AA44472 Type: B

Depth (m) 1.00m Lab sample No. A16/0400



Key: ----- Base

Description: Dark brown very sandy very gravelly SILT/CLAY with root hairs			
Initial Condition:	Unsoaked		
Moisture Content (%):	25	Bulk Density (Mg/m ³):	1.97
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.57
% Material >20mm:	17		
Method of compaction:	Static Con	npaction Method 2	

Test Result	Тор	Base
CBR %	0.4	0.2
Moisture	25	25
Content %	20	20

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

Approved by Date Page No.

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TEST REPORT Determination of MCV / moisture content Relation of a soil

Tested in accordance with BS1377-4:1990, clause 5.5

Report No. R70763 Contract GCTP Phase 3 Contract 1 GI

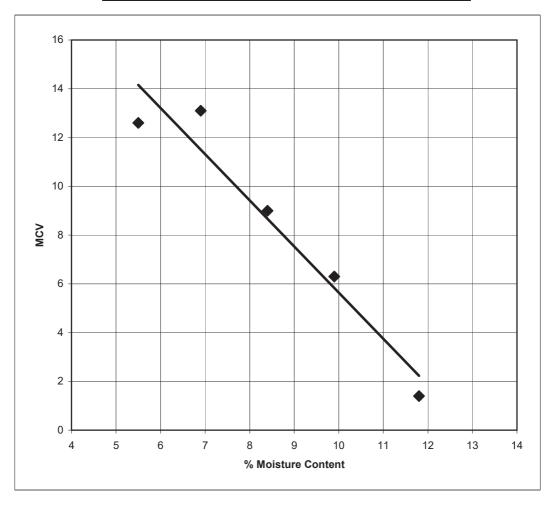
Contract No. 18963 Customer Galway Co.Co.

Date received 01-02-16 Date Tested 16-02-16

BH/TP No. TP3/23 Sample No. AA33943 Type: B

Depth (m) 1.10 Lab sample No. A16/0363

MC% 12 5.5 6.9 8.4 9.9 MCV 1.4 12.6 13.1 9.0 6.3



% material >20mm 3.5

Persons authorized to approve reports

J Barrett (Deputy Quality Manager) H Byrne (Quality Manager)

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TEST REPORT Determination of MCV / moisture content Relation of a soil

Tested in accordance with BS1377-4:1990, clause 5.5

Report No. R70622 Contract GCTP Phase 3 Contract 1 GI

Contract No. 18963 Customer Galway Co.Co.

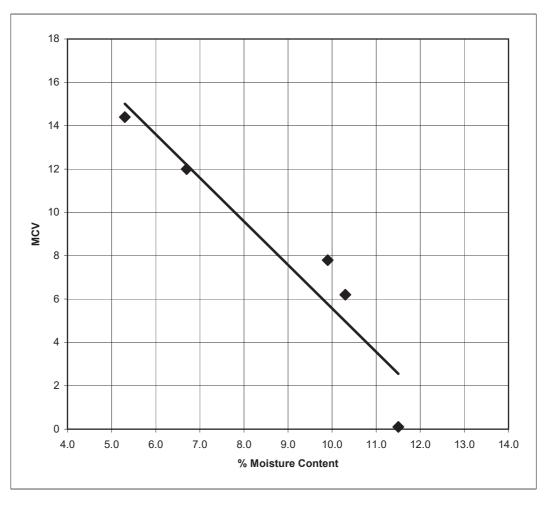
Date received 01-02-16 Date Tested 18-06-16

BH/TP No. TP3/23 Sample No. AA33943 Type: B

Depth (m) 2.00 Lab sample No. A16/0365

 MC%
 9.9
 12
 6.7
 5.3
 10.30

 MCV
 7.8
 0.1
 12
 14.4
 6.2



% material >20mm 16.2

Persons authorized to approve reports

J Barrett (Deputy Quality Manager) H Byrne (Quality Manager)

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TEST REPORT Determination of MCV / moisture content Relation of a soil

Tested in accordance with BS1377-4:1990, clause 5.5

Report No. R70766 Contract GCTP Phase 3 Contract 1 GI

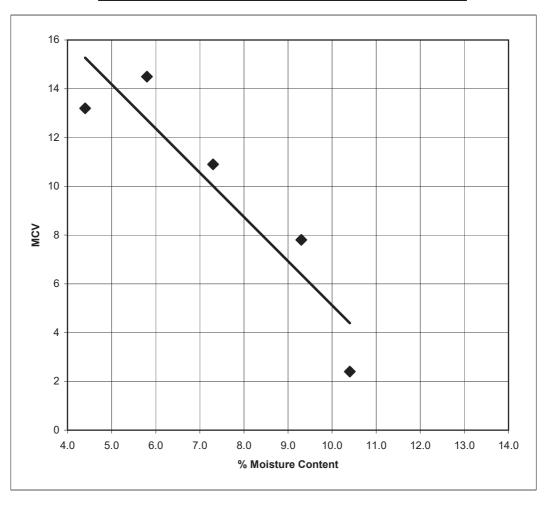
Contract No. 18963 Customer Galway Co.Co.

Date received 01-02-16 Date Tested 16-02-16

BH/TP No. TP3/27 Sample No. AA44454 Type: B

Depth (m) 1.00 Lab sample No. A16/0375

MC% 5.8 7.3 10 4.4 9.3 MCV 14.5 10.9 2.4 13.2 7.8



% material >20mm 6.4

Persons authorized to approve reports

J Barrett (Deputy Quality Manager) H Byrne (Quality Manager)

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TEST REPORT Determination of MCV / moisture content Relation of a soil

Tested in accordance with BS1377-4:1990, clause 5.5

Report No. R70760 Contract GCTP Phase 3 Contract 1 GI

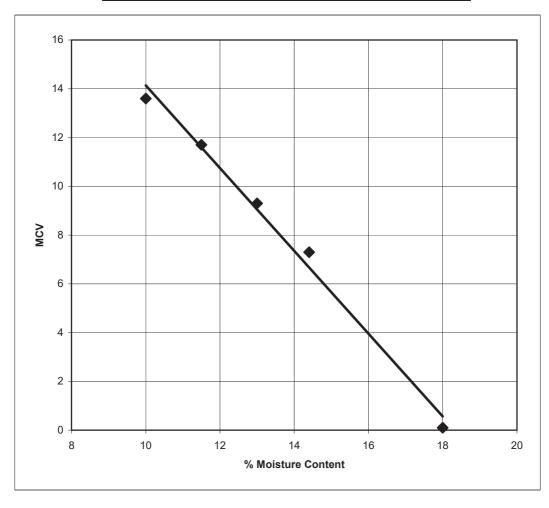
Contract No. 18963 Customer Galway Co.Co.

Date received 01-02-16 Date Tested 16-02-16

BH/TP No. TP3/34 Sample No. AA44468 Type: B

Depth (m) 1.00 Lab sample No. A16/0397

MC% 14 13 12 10 18 MCV 7.3 9.3 11.7 13.6 0.1



% material >20mm 11.1

Persons authorized to approve reports

J Barrett (Deputy Quality Manager) H Byrne (Quality Manager)

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Co. Kildare 045 899324

Test Report

Determination of Moisture Condition Value at Natural Moisture Content



Tested in accordance with BS1377:Part 4:1990, clause 5.4

R70281

Report No.	R70281
Contract No.	18963
Contract Name:	N6 Galway
Customer:	Galway Co. Co.
BH/TP	TP3/07
Sample No.	AA37807
Depth (m)	0.50
Sample Type:	В
Lab Sample No.	A16/0328
Source (if applicable)	unknown
Material Type (if applicable):	В
Sample Received:	01-02-16
Date Tested:	08-02-16
Sample Cert:	N/A

MCV: <1

Interpretation of Plot: Steepest Straight Line

Description of Soil: Brown silty, very gravelly, SAND with some cobbles

32

5.6

The result relates to the specimen tested.

Any remaining material will be retained for one month.

Moisture Content (%):

% Particles > 20mm

(By dry mass):

Sampling and opinions and interpretations are outside the scope of accreditation.

Persons authorised to approve reports J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

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Naas Co. Kildare 045 899324

Test Report

Determination of Moisture Condition Value at Natural Moisture Content



Tested in accordance with BS1377:Part 4:1990, clause 5.4

Report No.	R70761
------------	--------

Contract No. 18963

GCTP Phase 3 - Contract 1 SI Contract Name:

Customer: Galway Co.Co

BH/TP TP03/13

Sample No. AA44461

Depth (m) 0.50

Sample Type: В

Lab Sample No. A16/0338

Source (if applicable) unknown

Material Type (if applicable): В

Sample Received: 01-02-16

Date Tested: 18-02-16

Sample Cert: N/A

Moisture Content (%): 23

% Particles > 20mm 0

(By dry mass):

MCV: <1

Interpretation of Plot: Steepest Straight Line

Description of Soil: Light brown/grey sandy, slightly gravelly, SILT

The result relates to the specimen tested.

Any remaining material will be retained for one month.

Sampling and opinions and interpretations are outside the scope of accreditation.

Persons authorised to approve reports

J Barrett (Dep. Quality Manager)

H Byrne (Quality Manager)

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Naas Co. Kildare 045 899324

Test Report

Determination of Moisture Condition Value at Natural Moisture Content



Tested in accordance with BS1377:Part 4:1990, clause 5.4

Report No.	R70762
------------	--------

Contract No. 18963

Contract Name: GCTP Phase 3 - Contract 1 SI

Customer: Galway Co.Co

BH/TP TP03/25

Sample No. AA33935

Depth (m) 0.15

Sample Type: B

Lab Sample No. A16/0367

Source (if applicable) unknown

Material Type (if applicable):

Sample Received: 01-02-16

Date Tested: 18-02-16

Sample Cert: N/A

Moisture Content (%): 22

% Particles > 20mm 50

(By dry mass):

MCV: 5

Interpretation of Plot: Steepest Straight Line

Description of Soil: Brown silty, very sandy, GRAVEL

The result relates to the specimen tested.

Any remaining material will be retained for one month.

Sampling and opinions and interpretations are outside the scope of accreditation.

Persons authorised to approve reports

J Barrett (Dep. Quality Manager)

H Byrne (Quality Manager)

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Naas Co. Kildare 045 899324

Test Report

Determination of Moisture Condition Value at Natural Moisture Content



Tested in accordance with BS1377:Part 4:1990, clause 5.4

Report No. R70765

Contract No. 18963

Contract Name: GCTP Phase 3 - Contract 1 SI

Customer: Galway Co.Co

BH/TP TP03/27

Sample No. AA44452

Depth (m) 0.50

Sample Type: B

Lab Sample No. A16/0373

Source (if applicable) unknown

Material Type (if applicable):

Sample Received: 01-02-16

Date Tested: 16-02-16

Sample Cert: N/A

Moisture Content (%): 19

% Particles > 20mm 12

(By dry mass):

MCV: 6

Interpretation of Plot: Steepest Straight Line

Description of Soil: Brown slightly sandy, gravelly, SILT

The result relates to the specimen tested.

Any remaining material will be retained for one month.

Sampling and opinions and interpretations are outside the scope of accreditation.

Persons authorised to approve reports

J Barrett (Dep. Quality Manager)

H Byrne (Quality Manager)

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Naas Co. Kildare

045 899324

Test Report

Determination of Moisture Condition Value at Natural Moisture Content



Tested in accordance with BS1377:Part 4:1990, clause 5.4

Report No.	R70764
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Contract No. 18963

GCTP Phase 3 - Contract 1 SI Contract Name:

Customer: Galway Co.Co

BH/TP TP03/29

Sample No. AA37812

Depth (m) 1.00

Sample Type: В

Lab Sample No. A16/0389

Source (if applicable) unknown

Material Type (if applicable): В

Sample Received: 01-02-16

Date Tested: 16-02-16

Sample Cert: N/A

Moisture Content (%): 29

% Particles > 20mm 6.9

(By dry mass):

MCV: <1

Interpretation of Plot: Steepest Straight Line

Description of Soil: Brown clayey/silty, sandy, GRAVEL with many

cobbles

The result relates to the specimen tested.

Any remaining material will be retained for one month.

Sampling and opinions and interpretations are outside the scope of accreditation.

Persons authorised to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

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Appendix 13

Geotechnical Laboratory Testing

Lab Schedule 2

IGSL Ltd Materials Laboratory Unit J5, M7 Business Park Newhall, Naas Co. Kildare

045 846176

Test Report

Determination of Moisture Content, Liquid & Plastic Limits





Report No. R70322 Contract No. 18963 Contract Name: GCTP Phase 3-Contract 1

Customer Galway Co.Co.

Samples Received: 12/02/16 Date Tested: Various

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample	Moisture	Liquid	Plastic	Plasticity	%	Preparation	Liquid Limit	Classification	Description
		,		Туре	Content %	Limit %	Limit %	Index	<425μm		Clause	(BS5930)	·
TP3/02	AA44496	0.5	A16/0560	D	17								Brown clayey/silty, very sandy, GRAVEL
TP3/02	AA44497	0.5	A15/0561	В	12								Brown clayey/silty, very sandy, GRAVEL
TP3/04	AA44498	0.5	A16/0562	D	218								Dark brown/black PEAT
TP3/04	AA44499	0.5	A15/0563	D	208								Dark brown/black PEAT
TP3/04	AA44500	0.5	A16/0564	В	175								Dark brown /black PEAT
TP3/04	AA49501	8.0	A15/0565	D	30								Grey/brown clayey/silty, very gravelly, SAND
TP3/04	AA49502	8.0	A16/0566	В	26								Grey/brown clayey/silty, very gravelly, SAND
TP3/09	AA49503	0.5	A15/0567	D	136								Dark brown slightly gravelly PEAT
TP3/09	AA49504	0.5	A16/0568	D	140								Dark brown slightly sandy slightly gravelly CLAY
TP3/09	AA49505	0.5	A15/0569	В	190								Dark brown/black PEAT
TP3/24	AA49456	0.5	A16/0570	D	9.7								Brown clayey/silty, sandy, GRAVEL
TP3/24	AA49457	0.5	A15/0571	В	11								Brown clayey/silty, sandy, GRAVEL
TP3/31	AA49458	0.5	A16/0572	D	11	23	NP	NP	66	WS	4.4		Light brown slightly sandy, slightly gravelly, SILT
TP3/31	AA49459	0.5	A15/0573	В	10								Light brown slightly sandy, slightly gravelly, SILT
TP3/31	AA49460	1.5	A16/0574	D	9.5	20	NP	NP	46	WS	4.4		Light brown sandy very gravelly SILT
Notes:	Preparation:	WS - Wet sie	eved	-	Sample Type:	B - bulk distu	rbed	Remarks:		-	<u> </u>		

AR - As received

U - Undisturbed

NP - Non plastic

Liquid Limit 4.3 Cone Penetrometer definitive method

Clause: 4.4 Cone Penetrometer one point method NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014

Opinions and interpretations are outside the scope of accreditation.

The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory

Persons authorized to approve reports

H Byrne (Quality Manager)

Approved by Date Page 18/02/16 1 of 1

IGSL Ltd Materials Laboratory Unit J5, M7 Business Park Newhall, Naas Co. Kildare

045 846176

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2*, 4.3, 4.4 & 5.3



Report No. R70323 Contract No. 18963 Contract Name: GCTP Phase 3-Contract 1

Customer Galway Co.Co.

Samples Received: 12/02/16 Date Tested: Various

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425μm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
TP3/31	AA49461	1.5	A16/0575	В	7.6				0p		0.0.00		Light brown sandy very gravelly SILT
TP3/31	AA49462	2.5	A16/0576	D	9.1	21	NP	NP	61	WS	4.4		Light brown slightly sandy, gravelly, SILT
TP3/31	AA49463	2.5	A16/0577	В	8.5								Light brown slightly sandy, gravelly, SILT
TP3/31	AA49464	3.5	A16/0578	D	11	22	NP	NP	52	WS	4.4		Light brown slightly sandy, gravelly, SILT
TP3/31	AA49465	3.5	A16/0579	В	8.3								Light brown slightly sandy, gravelly, SILT
TP3/32	AA49466	0.4	A16/0580	D	23	39	NP	NP	70	WS	4.4		Brown sandy slightly gravelly SILT
TP3/32	AA49467	0.4	A16/0581	D	27	38	NP	NP	81	WS	4.4		Brown sandy slightly gravelly SILT
TP3/32	AA49468	0.4	A16/0582	В	28	32	NP	NP	70	WS	4.4		Brown sandy slightly gravelly SILT

Remarks:

Notes: Preparation:

Liquid Limit

Clause:

WS - Wet sieved

Sample Type: B - bulk disturbed

U - Undisturbed

H Byrne (Quality Manager)

AR - As received

NP - Non plastic

4.4 Cone Penetrometer one point method

4.3 Cone Penetrometer definitive method

NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014

Opinions and interpretations are outside the scope of accreditation.

The results relate to the specimens tested. Any remaining material will be retained for one month. Approved by Date Page

IGSL Ltd Materials Laboratory

Persons authorized to approve reports

19/02/16

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Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	t No. R70659
size	passing			Contract:	GCTP Phas	se 3 - C	Contact 1
75	100	COBBLES		TP:	TP03/02		
63	100	OODDEEO		Sample No.	AA44497	Lab. Sa	sample No. A16/0561
50	100			Sample Type:	В		
37.5	94			Depth (m)	0.50	Custon	mer: Galway Co.Co.
28	85			Date Received			Festing started 18/02/2016
20	80			Description:	Brown clay	ey/silty, \	very sandy, GRAVEL
14	78	GRAVEL					
10	76	OIVWEE		Remarks			
6.3	72						55 55 53
5	70		400				0.063 0.15 0.3 0.425 0.6 1.18 1.18 1.10 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.
3.35	64		100				
2	55		90				
1.18	47		<u> </u>	+ + + + + + + + + + + + + + + + + + + +			
0.6	38		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00	+ + + + + + + + + + + + + + + + + + + +			
0.425	34	SAND	iss 60				
0.3	30		ed 50				
0.15	22) tage 40	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			
0.063	14		30				
			20				
		SILT/CLAY	10				
			0		0.4		
			0.	0.001		0.01	0.1 1 10 100
				CLA	/	SILT	Sieve size (mm) SAND GRAVEL
		1001 11		tala Labanat			Approved by: Date: Page no:
		IGSL Lt	a Mater	ials Laborato	ory		29/02/16 1 of 1
						Persons a	authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manage

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	t No. R70660
size	passing			Contract:	GCTP Phas	se 3 - Co	Contact 1
75	100	COBBLES		TP:	TP03/04		
63	100	COBBLES		Sample No.	AA49502	Lab. Sa	ample No. A16/0566
50	100			Sample Type:	В		
37.5	100			Depth (m)	0.80	Custom	mer: Galway Co.Co.
28	94			Date Received	12/02/2016	Date To	esting started 18/02/2016
20	92			Description:	Grey/brown	clayey/s	silty, very gravelly, SAND
14	91	GRAVEL					
10	89	OIVWEE		Remarks			
6.3	86						0.063 0.3 0.3 0.3 0.6 0.6 1.18 1.18 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0
5	83		100				0.063 0.15 0.3 0.425 0.6 1.18 1.18 1.10 1.10 1.10 1.10 1.10 1.10
3.35	76		100				
2	66		90				
1.18	57		© 80				
0.6	46		<u>်</u>) 70				
0.425	41	SAND	Percentage passing (%) 80 00 00 00 00 00 00 00 00 00 00 00 00				
0.3	36		<u>ω</u> 50				
0.15	27		bate 40				
0.063	19		Ja 30				
			20				
			10				
		SILT/CLAY					
			0.0	0001 0.00	01	0.01	0.1 1 10 100
				CLAY		SILT	Sieve size (mm) SAND GRAVEL
		1001.11					Approved by: Date: Page no:
		IGSL Lt	d Materi	als Laborato	ory		1 of 1
						Persons a	authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Mana

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R70663		•		
size	passing			Contract:	GCTP Phas	se 3 - C	ontact 1				
75	100	COBBLES		TP:	TP03/24						
63	100	00000		Sample No.	AA49457	Lab. Sa	ample No.	A16/0571			
50	87			Sample Type:	В						
37.5	73			Depth (m)	0.50	Custon	ner: Galway Co.	Co.			
28	62			Date Received			esting started	18/02/2016			
20	51			Description:	Brown clay	ey/silty, s	sandy, GRAVEL				
14	45	GRAVEL									
10	39			Remarks							
6.3	35						0.063	0.3 0.425 0.6 1.18	2 3.35 5.3 6.3 10 20	75.020	
5	33		100	ı 			0.0	0.4.0	2 8 6 2 7 8 8	00000	
3.35	31		90								
2	28										
1.18	26		80 %								
0.6	25	SAND	6) gu								
0.425 0.3	24 23	SAND	Percentage passing (%) 80 00 00 00 00 00 00 00 00 00 00 00 00) 					 		
0.3	20		g 50) 							
0.13	17		40 auta) 							
0.003	17		9 30) 							
			<u> </u>) 							
			10	, 📙 📗							
		SILT/CLAY	0						<u> </u>		
			•	.0001 0.0	01	0.01	0.1	1	10	100	
				CLA	/	SILT	Sieve size (mm) SAND	GRAVEL		
	Approved by: Date: Page no:										
		IGSL Lt	d Mater	rials Laborato	ory 		Me	Eyene	29/02/16	1 of 1	
						Persons	authorised to approve i	eport: J Barrett (De	p. Quality Manager) H By	rne (Quality Manage	

Determination of Particle Size Distribution





	1											
particle	%		Cor	ntract No: 1	8963 F	Report No.	R70664					
size	passing		Cor	ntract: C	CTP Phase	3 - Conta	ct 1					
75	100	COBBLES	TP:	Т	P03/31							
63	100	OODDELC	San	nple No. A	A49459 L	ab. Sampl	le No.	A16/057	' 3			
50	98		San	nple Type: E	i							
37.5	96		Dep	oth (m) 0	.50 C	Customer:	Galway (Co.Co.				
28	92		Dat		2/02/2016 E		-	18/02/	2016			
20	87		Des	scription: L	ight brown sl	lightly sand	dy, slightly (gravelly, SILT				
14	84	GRAVEL										
10	81	OIVWEE	Rer	narks								
6.3	78						53	5 25	8 4	2	.5	
5	76		400				0.063	0.15 0.3 0.425 0.6	1.18	5.00 0 4	20 28 37. 50	75
3.35	74		100									
2	70		90									
1.18	67		80	 								#
0.6	62		70									# 1
0.425	59	SAND	iss 60 									##
0.3	57		<u>8</u> 50 —								+	
0.15	50		40 									Ш
0.063	42		Dercentage passing (%) 90 90 90 90 90 90 90 90 90 9									
0.036	38											
0.026	35		20									
0.017	30	SILT/CLAY	10									
0.010	24		0 +					<u> </u>	 			""
0.007	21		0.0001			0.01	0.1		1	10		100
0.005	17			CLAY		SILT Sie	eve size (n	nm) SAND		GRAVE	L	
0.002												
		IGSL Lt	d Materials	Laborator	V		Approved		Date		Page	
								J Byene	_	29/02/16		1 of 1
					Р	ersons autho	rised to appro	ve report: J Barr	ett (Dep. Qua	ality Manager)	H Byrne (Qual	ity Manager

Determination of Particle Size Distribution





particle	%		C	Contract No:	18963	Report	No. R70540			
size	passing		C	Contract:	GCTP Phas	e 3 - Co	ontact 1			
75	100	COBBLES	Т	P:	TP03/31					
63	100	OODDELO	S	Sample No.	AA49463	Lab. Sa	ample No.	A16/0577		
50	100		S	Sample Type:	В					
37.5	90		D	Depth (m)	2.50	Custom	er: Galway Co.C	0.		
28	85		D	ate Received	12/02/2016	Date Te	esting started	16/02/2016		
20	80		D	Description:	Light brown	slightly s	sandy, gravelly, SIL	.T		
14	78	GRAVEL								
10	75	OIVAVEE	R	Remarks						
6.3	72						5 5	8 25	75	ιĊ
5	70						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 14 20	37.5 93 93 93
3.35	65		¹⁰⁰ T							
2	62		90 +							
1.18	59		80 +							
0.6	54		8 70 							
0.425	51	SAND	issin 60							
0.3	49		<u>8</u> 50 +							
0.15	44		Percentage passing (%) 40 + 40 + 40 + 40 + 40 + 40 + 40 + 40							
0.063	39		cen							
0.035	36									
0.025	34		20 +							
0.016	31	SILT/CLAY	10 +							
0.010	27	0.21702711	0 +							
0.007	24		0.00	01 0.00)1	0.01	0.1	1	10	100
0.005	21			CLAY		SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	12								1_	
		IGSL Ltd	d Materia	Is Laborato	rv		Approved by:		Date:	Page no:
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						Persons a	authorised to approve re	port: J Barrett (De	p. Quality Manager) H Byr	rne (Quality Manager

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R70665					
size	passing		•	Contract:	GCTP Pha	se 3 - C	ontact 1					
75	100	COBBLES		TP:	TP03/31							
63	100	OODBLEO		Sample No.	AA49465	Lab. Sa	ample No. A16/0579					
50	93			Sample Type:	В							
37.5	83			Depth (m)	3.50	Custon	ner: Galway Co.Co.					
28	80			Date Received			esting started 18/02/2016					
20	75			Description:	Light brown	n slightly	sandy, gravelly, SILT					
14	70	GRAVEL										
10	69	OIVWEE		Remarks								
6.3	66						55 8 53 55 55					
5	64		400				0.063 0.425 0.425 0.66 1.18 1.18 1.18 1.10 1.10 1.10 1.10 1.10					
3.35	62		100									
2	59		90									
1.18	56		<u></u> 80	+ + + + + + + + + + + + + + + + + + + +								
0.6	52		<u>ိ</u> စ္က 70	+ + + + + + + + + + + + + + + + + + + +								
0.425	50	SAND	iss 60	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1								
0.3	48		<u>a</u> 50									
0.15	43		bet 40									
0.063	37		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00									
			ور 20									
		SILT/CLAY	10									
			0	0001 0.0	 ∩1	0.01	0.1 1 10 100					
			0.	CLA		SILT	Sieve size (mm) SAND GRAVEL					
	CLAT SIEVE SIZE (IIIII) SAND GNAVEL											
							Approved by: Date: Page no:					
		IGSL Lt	d Mater	ials Laborato	ory		1 of 1					
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IGSL Ltd Materials Laboratory

Unit J5,M7 Business Park

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R71005 Contract GCTP Phase 3 - Contact 1

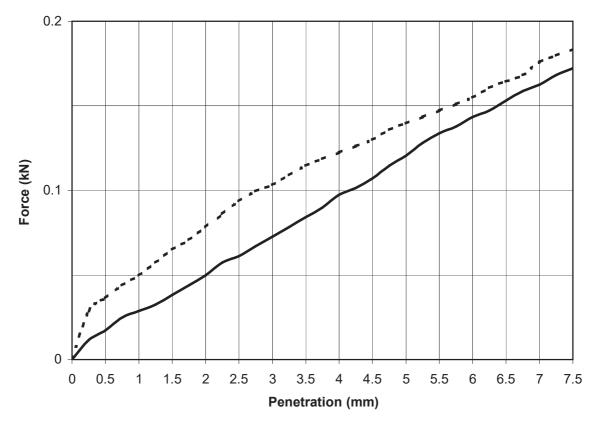
Contract No. 18963 Customer

Galway Co.Co.

Date received 01/02/16 Date Tested 09/03/16

BH/TP No. TP03/31 Sample No. AA49459 Type: B

Depth (m) 0.50 Lab sample No. A16/0573



Key: ----- Base

Description: Light brow	wn slightly sa	andy, slightly gravelly, SIL	T/CLAY	
Initial Condition:	Unsoaked			
Moisture Content (%):	11	Bulk Density (Mg/m ³):	2.31	
Surcharge (kg):	4	Dry Density (Mg/m ³):	2.08	
% Material >20mm:	20			
Method of compaction:	Static Con	npaction Method 2		

Test Result	Тор	Base
CBR %	0.6	0.7
Moisture	11	11
Content %	''	

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

Approved by Date Page No. 15/03/16 1 of 1

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R70621 Contract GCTP Phase 3 - Contract 1

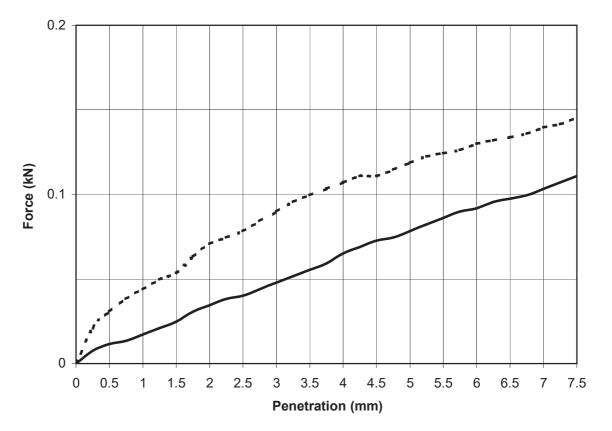
Contract No. 18963 Customer

Galway Co.Co.

Date received 12/02/16 Date Tested 22/02/16

BH/TP No. TP3/31 Sample No. AA49465 Type: B

Depth (m) 3.50 Lab sample No. A16/0579



Key: ----- Base

Description: Light brow	vn slightly sa	andy, gravelly, SILT		
Initial Condition:	Unsoaked			
Moisture Content (%):	11	Bulk Density (Mg/m ³):	2.29	
Surcharge (kg):	4	Dry Density (Mg/m ³):	2.07	
% Material >20mm:	18			
Method of compaction:	Static Con	npaction Method 2		

Test Result	Тор	Base
CBR %	0.4	0.6
Moisture	10	11
Content %	10	· · ·

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

Approved by	Date	Page No.
4 Byene	24/02/16	1 of 1

Test Report

Dry Density/Moisture Content Relationship



Tested in accordance with BS1377:Part 4:1990

Report No. R71144 Contract No. 18963

Contract Name: GCTP Phase 3 - Contract 1 GI

Lab Contract No. 18963 Location: TP03/02

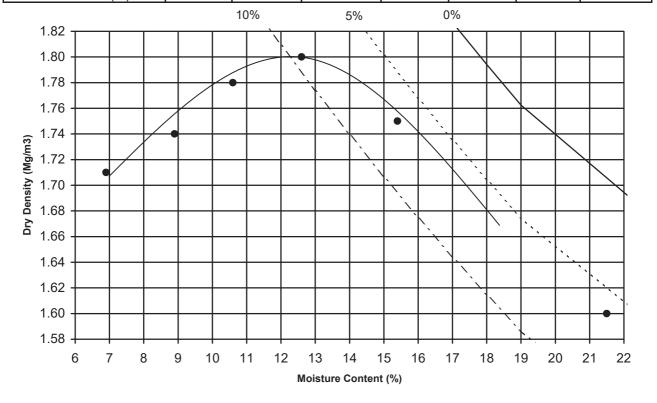
Sample No. AA44497 Depth (m) 0.5 Material Type B

Lab sample no. A16/0561 Customer: Galway Co.Co.

Date Received: 12/02/2016 Test Method: 2.5 KG Rammer

Date Tested: 09/03/2016 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	1.60	1.71	1.74	1.78	1.80	1.75	
Moisture Content (%)	22	6.9	8.9	11	13	15	



Maximum Dry Density (Mg/m³): 1.80 Optimum Moisture Content (%): 13

Description: Brown clayey/silty, very sandy, GRAVEL

Sample Preparation: Material passing 20mm Single / Separate samples used

Particle Density (Mg/m³): 2.65 Particle Density: Assumed

% retained on 20/37.5mm sieve: 9

The result relates to the specimen tested.

Opinions and interpretations are outside the scope of accreditation

Persons authorised to approve reports

J Barrett (Dep. Quality Manager)

H Byrne (Quality Manager)

IGSL Materials Laboratory	Approved by	Date	Page
IGSL Materials Laboratory	JAR	29/03/16	1 of 1





Contract Number: 30014

Client's Reference: **18963 PO: 8215** Report Date: **08-03-2016**

Client Irish Geotechnical Services Limited

M7 Business Park

Naas

Co. Kildare Ireland

Contract Title: **GCTP Phase 3**For the attention of: **Hugh Byrne**

Date Received: 22-02-2016
Date Commenced: 22-02-2016
Date Completed: 08-03-2016

Test Description Qty

Immediate Shear Strength - set of 3 60 x 60 mm Shear Box Specimens by Direct Shearing (note suitable for free draining material only)

Non Accredited Test - @ Non Accredited Test

Disposal of Samples on Project

1

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)

GEO Site & Testing Services Ltd

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

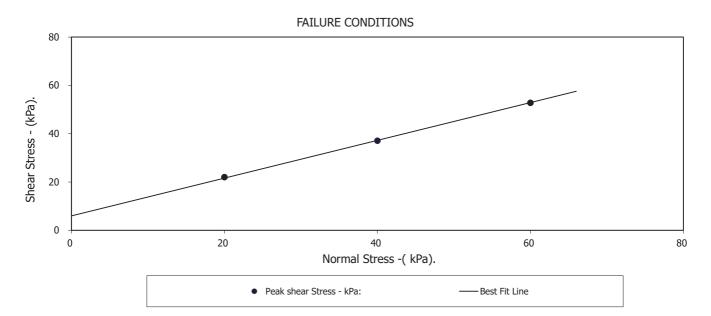
Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk

Test Report: Quick Shearbox Test BS1377:Part 7:4.5 :1990.

BH3/09 A16/0586 Depth (m) from: Depth (m) to: 1.00 Borehole: Sample Number: 1.30

Sample Type:	D								
Particle Density - Mg/m3:	2.65	(Assumed)							
Specimen Tested:	Submerged, Remoulded	l material above 2.00mm	removed						
Sample Description:									
Light brown grey sandy (fine-medium) gravelly (f	ine-coarse/angular-s	ubangular) 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 - %:		11	11	11					
Bulk Density - Mg/m3:		2.31	2.31	2.31					
Dry Density - Mg/m3:		2.09	2.09	2.09					
Voids Ratio:		0.2705	0.2704	0.2701					
Normal Pressure- kPa		20	40	60					
Consolidation									
Consolidated Height - mm:		24.43	24.09	23.75					
Shear									
Rate of Strain (mm/min)		1.250	1.250	1.250					
Strain at peak shear stress (mm)		10.45	10.03	9.60					
Peak shear Stress - kPa:		22	37	53					

PEAK	
Angle of Shearing Resistance:(θ)	38.0
Effective Cohesion - kPa:	6



2P Gans

08/03/16

Checked Page 1 by: Date

DP Gons

08/03/16

Approved Page 1 by: Date

> Contract No.: 30014

Client Ref Number:

18963



GCTP Phase 3

030704 QSHEARBOX 1 of 1

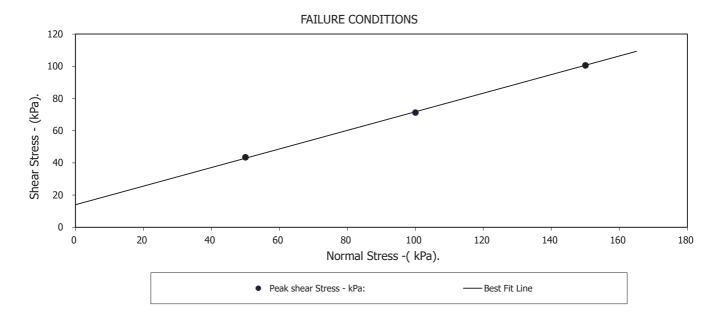
Test Report: Quick Shearbox Test BS1377:Part 7:4.5 :1990.

TP3/31 A16/0575 Depth (m) from: 1.50 Borehole:

Sample Number: Depth (m) to:

Sample Type:	D							
Particle Density - Mg/m3: 2.65 (Assumed)								
Specimen Tested:	Submerged, Remoulde	ed material above 2.00mm rer	moved					
Sample Description:								
	m) gravelly (fine-coarce/angular-	cubangular) CLAV						
Light brown grey sandy (fine-medius	ii) gravelly (lille-coarse/aligular-	1	2	3				
Initial Conditions		_	_					
Height - mm:		24.50	24.50	24.50				
Length - mm:		59.90	59.90	59.90				
Moisture Content - %:		11	11	11				
Bulk Density - Mg/m3:		2.31	2.31	2.31				
Dry Density - Mg/m3:		2.09	2.09	2.09				
Voids Ratio:		0.2699	0.2672	0.2655				
Normal Pressure- kPa		50	100	150				
Consolidation								
Consolidated Height - mm:		24.09	23.48	22.87				
Shear	<u>-</u>			·				
Rate of Strain (mm/min)	<u>-</u>	1.250	1.250	1.250				
Strain at peak shear stress (mm)	<u>-</u>	10.38	9.92	9.46				
Peak shear Stress - kPa		43	71	101				

PEAK	
Angle of Shearing Resistance:(θ)	30.0
Effective Cohesion - kPa:	14



2P Gans 08/03/16

Checked Page 1 by: Date

08/03/16 DP Gons

Approved Page 1 by: Date

> Contract No.: 30014

Client Ref Number:

030704 QSHEARBOX

18963



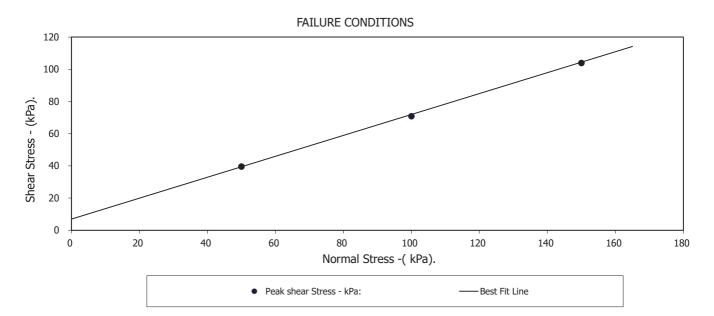


Test Report: Quick Shearbox Test BS1377:Part 7:4.5 :1990.

TP3/31 A16/0577 Depth (m) from: Depth (m) to: 2.50 Borehole: Sample Number:

Sample Type:	D	·	·	·
Particle Density - Mg/m3:	2.65	(Assumed)		
Specimen Tested:	Submerged, Remoulded	material above 2.00mm rer	noved	
Sample Description:	I			
Light brown grey sandy (fine-mediu	n) gravelly (fine-coarse/angular-su	bangular) 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 - %:		10	10	10
Bulk Density - Mg/m3:		2.29	2.30	2.30
Dry Density - Mg/m3:		2.08	2.08	2.08
Voids Ratio:		0.2750	0.2745	0.2734
Normal Pressure- kPa		50	100	150
Consolidation				
Consolidated Height - mm:		24.18	23.69	23.21
Shear				
Rate of Strain (mm/min)		1.250	1.250	1.250
Strain at peak shear stress (mm)		10.43	10.45	10.47
Peak shear Stress - kPa:		40	71	104

PEAK	
Angle of Shearing Resistance:(θ)	33.0
Effective Cohesion - kPa:	7



2P Gans 08/03/16

Checked Page 1 by: Date

08/03/16 DP Gons

Approved Page 1 by: Date

> Contract No.: 30014

Client Ref Number:

18963





Appendix 13

Geotechnical Laboratory Testing

Lab Schedule 3

NOTE:

For BH3/09 Shearbox see GSTL Report 30014 featured in Appendix 13, Schedule 2

IGSL Ltd

045 846176

Materials Laboratory Unit J5, M7 Business Park Newhall. Naas Co. Kildare

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2*, 4.3, 4.4 & 5.3



Report No. Contract Name: GCTP Phase 3-Contract 1 R70324 Contract No. 18963

Customer GCC

Samples Received: Date Tested: 14/03/16 12/02/16

	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425μm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
BH3/06	AA43886	0.5	A16/0583	В	15	35	NP	NP	25	WS	4.4		Brown silty, very sandy, GRAVEL
BH3/08	AA38885	0.5	A16/0584	В	28								Dark brown clayey/silty, very sandy, GRAVEL with some cobbles
BH3/09	AA43887	0.5	A16/0585	D	28	51	NP	NP	13	WS	4.4		Mottled grey/brown slightly peatyy very sandy gravelly SILT
BH3/09	AA43888	1.0	A16/0586	В	15								Mottled grey/brown clayey/silty, very sandy, GRAVEL
BH3/09	AA43889	1.3	A16/0587	D	11	32	NP	NP	40	WS	4.4		Light brown sandy gravelly SILT
BH3/11	AA43876	1.0	A16/0588	В	519								Dark brown/black slightly gravelly PEAT
BH3/11	AA43877	1.0	A16/0589	D	98								Dark brown/black slightly gravelly PEAT
BH3/11	AA43878	2.0	A16/0590	D	7.0								Dark brown slightly clayey/silty, sandy, GRAVEL with some cobbles
BH3/11	AA43879	2.0	A16/0591	В	6.8								Dark brown slightly clayey/silty, sandy, GRAVEL with some cobbles
BH3/12	AA43880	0.5	A16/0592	D	93	130	NP	NP	43	WS	4.4		Black slightly gravelly organic SILT
BH3/12	AA43881	0.5	A16/0593	В	23								Dark brown/black slightly silty, sandy, GRAVEL with many cobbles
BH3/12	AA43882	1.5	A16/0594	D	15	37	NP	NP	30	WS	4.4		Dark brown/grey silty, sandy, GRAVEL
BH3/12	AA43883	1.5	A16/0595	В	15								Dark brown/grey silty, sandy, GRAVEL
BH3/25	AA43893	0.5	A16/0596	В	15	32	NP	NP	41	WS	4.4		Mottled brown silty, very sandy, GRAVEL with some cobbles
BH3/25	AA43894	1.0	A16/0597	В	12	31	NP	NP	41	WS	4.4		Mottled brown silty, sandy, GRAVEL with some cobbles

AR - As received

NP - Non plastic

Liquid Limit 4.3 Cone Penetrometer definitive method 4.4 Cone Penetrometer one point method

Clause:

NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014

Opinions and interpretations are outside the scope of accreditation.

The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory

Persons authorized to approve reports

U - Undisturbed

H Byrne (Quality Manager)

Page Approved by Date 18/02/16 1 of 1

IGSL Ltd Materials Laboratory Unit J5, M7 Business Park Newhall, Naas Co. Kildare 045 846176

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2*, 4.3, 4.4 & 5.3



Report No. R70325 Contract No. 18963 Contract Name: GCTP Phase 3-Contract 1

Customer GCC

Samples Received: 12/02/16 Date Tested: 00/01/00

DI I/TD	Camania Na	Danth (m)	Lab Daf	Camanda	Majatura	امادادا	Disetie	Disatisitu	0/	Б "	I	Classification	Decemention
BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample	Moisture	Liquid	Plastic	Plasticity		Preparation	Liquid Limit	(BS5930)	Description
				Туре	Content %	Limit %	Limit %	Index	<425μm		Clause	, ,	
BH3/25	AA43895	2.0	A16/0598	В	9.5	15	NP	NP	62	WS	4.4		Light brown slightly sandy, gravelly, SILT
BH3/25	AA43896	3.0	A16/0599	В	7.7	18	NP	NP	47	WS	4.4		Light brown/grey slightly sandy, gravelly, SILT with many cobbles
BH3/29	AA43890	1.0	A16/0600	В	12.1	37	NP	NP	64	WS	4.4		Brown silty, sandy, GRAVEL with many cobbles
BH3/29	AA43891	1.5	A16/0601	В	9.4	23	NP	NP	37	WS	4.4		Light brown silty, sandy, GRAVEL with many cobbles
BH3/29	AA43892	2.5	A16/0602	В	23.1	35	19	16	82	WS	4.4	CL	Light brown slightly sandy, slightly gravelly, CLAY with many cobbles
					_								
			-									·	

WS - Wet sieved Notes: Preparation:

AR - As received

NP - Non plastic

Liquid Limit 4.3 Cone Penetrometer definitive method

Clause: 4.4 Cone Penetrometer one point method

Sample Type: B - bulk disturbed Remarks:

U - Undisturbed

NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014

Opinions and interpretations are outside the scope of accreditation.

The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory

Persons authorized to approve reports

H Byrne (Quality Manager)

Approved by Date Page 05/01/16 1 of 1

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R70736				
size	passing			Contract:	GCTP Pha	se 3 - C	ontact 1				
75	100	COBBLES		BH:	BH3/06						
63	100	OODDELO		Sample No.	AA43886	Lab. Sa	ample No.	A16/0583			
50	100			Sample Type:	В						
37.5	93			Depth (m)	0.50	Custon	ner: Galway Co.0	Co.			
28	87			i							
20	82			Description: Brown silty, very sandy, GRAVEL							
14	76	GRAVEL									
10	73	0.000		Remarks							
6.3	69						63	0.3 1.425 0.6 1.18	2 3.35 5.3 6.3 10 14	520 537.5 53 53	
5	66		100				0.063	0.3 0.425 0.6 1.18	2 8 6 7 4 2 8	37.0	
3.35	62										
2	53		90								
1.18	42		80 ©								
0.6	29		δ) 70	+							
0.425	24	SAND	Percentage passing (%) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	+ + + + + + + + + + + + + + + + + + + +							
0.3	20		မ စ 50	1					/ 		
0.15	14		fagu 10								
0.063	9		- 30 - 30 - 30								
			20								
			10								
		SILT/CLAY	0								
			_	0.001	001	0.01	0.1	1	10	100	
				CLA	Y	SILT	Sieve size (mm)	SAND	GRAVEL		
		1001.11	-	ala Labarat			Approved by	:	Date:	Page no:	
		IGSL Lt	a Wateri	als Laborat	ory 		A Bejon	•	03/03/16	1 of 1	
						Persons	authorised to approve re	eport: J Barrett (De	p. Quality Manager) H By	rne (Quality Manag	

Determination of Particle Size Distribution



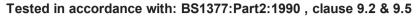


Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

	1	I					
particle	%		Contract No:	18963 Report			
size	passing		Contract:	GCTP Phase 3 - Cont	act 1		
75	100	COBBLES	BH:	BH3/08			
63	88		Sample No.	AA43885 Lab. Sa	mple No. A16	0330	
50	76		Sample Type:	В			
37.5	74		Depth (m)	0.50 Custom	er: Galway Co.Co.		
28	65		Date Received	02-02-16 Date Te	sting started	05-02-16	
20	58		Description:	Dark brown clayey/sil	ty, very sandy, GRAVEL with	some cobbles	
14	50	GRAVEL					
10	45	GKAVEL	Remarks	Sample size did not meet the requirements of BS1377			
6.3	38				δ	8 2	.5
5	35				0.063 0.15 0.3 0.425	0.6 1.18 2 2 3.35 5.3 10 10	28 37.5 50 63
3.35	32		100				
2	26		90				
1.18	22		80				
0.6	17		8 70				
0.425	15	SAND	<u>is</u> 60				4
0.3	13		Dercentage passing (%) 00 00 00 00 00 00 00 00 00				
0.15	10		9 50 T				
0.063	6		g 40 				
			30				
			20				
			10				
		SILT/CLAY	0				
				.001 0.01	0.1	1 10	100
				CLAY SILT	Sieve size (mm) SAND	O GRAVEL	
		1001 1	184		Approved by:	Date:	Page no:
		IGSL Lt	d Materials Laborator	У	A Begane	18-02-16	1 of 1

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Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R70737															
size	passing			Contract:	GCTP Phas	e 3 - Co	ontact 1															
75	100	COBBLES		BH:	BH3/09																	
63	100	CODDLLO		Sample No.	AA43888	Lab. Sa	imple No.	A16/0586														
50	91			Sample Type:	В																	
37.5	84			Depth (m)	1.00	Custom	er: Galway Co.Co).														
28	82			Date Received	24/02/2016 ndy, GRAVEL																	
20	75			Description:																		
14	69	GRAVEL																				
10	62	OTTAL		Remarks																		
6.3	54						0.15	0.3 7.425 0.6 1.18	35	ιζ												
5	50		100				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 14 20 20	37. 50. 53. 53.												
3.35	41																					
2	30		90																			
1.18	22	SAND	© 80	† 																		
0.6	15		<u>©</u> 70	†																		
0.425	14		SAND	SAND	SAND	SAND	SAND	SAND	SAND	SAND	SAND	SAND	SAND	SAND	issi 60	 						
0.3	12		<u>α</u> 50																			
0.15	10		6 pt 40																			
0.063	9		Percentage passing (%) 80 20 40 30 30																			
			20																			
		SILT/CLAY	10																			
			0	2004	04	0.04	0.4	4	40	400												
			0.0	0.00		0.01	0.1	1	10	100												
				CLAY	,	SILT	Sieve size (mm)	SAND	GRAVEL													
	<u>I</u>						Approved by:		Date:	Page no:												
,		IGSL Lt	d Materi	als Laborato	ory		A Byen		03/03/16	1 of 1												
<u> </u>	_		•			Persons a	uthorised to approve rep	ort: J Barrett (De	p. Quality Manager) H Byr	ne (Quality Manage												

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report N	lo. R71176		!			
size	passing			Contract:	GCTP Phas	se 3 - Cor	tact 1					
75	87	COBBLES		BH:	BH03/11							
63	80	OODDEEO		Sample No.	AA43879	Lab. San	nple No.	A16/0591				
50	80			Sample Type:	В							
37.5	77			Depth (m)	2.00	Custome	r: Galway Co.C	o.				
28	69			Date Received	12/02/2016		-	15/03/2016				
20	62			Description:	cription: Dark brown slightly clayey/silty, sandy, GRAVEL with some cobbles							
14	51	GRAVEL										
10	44	0.000		Remarks	Sample size did not meet the Re	equirements of BS1377						
6.3	33						0.15	0.3 0.425 0.6 1.18	35 6 0 4 0 6	3.		
5	29		100	_			0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 14 20	93.0 7.0 7.0 7.0 7.0		
3.35	23											
2	16		90									
1.18	11		© 80									
0.6	5		Percentage passing (%) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	+ + + + + + + + + + + + + + + + + + + +						/ 		
0.425	4	SAND	SAND	issi 60	 				- 	 /		
0.3	3		<u>8</u> 50	 								
0.15	3		14ag	 								
0.063	2		90 30 10 30									
			20									
		SILT/CLAY	10									
			0	0001 0.0	01	0.01	0.1	1	10	100		
			0.0					044/0		100		
				CLAY	•	SILT	Sieve size (mm)	SAND	GRAVEL			
							Approved by:		Date:	Page no:		
		IGSL Lt	d Materi	als Laborato	ory		A Byen	_	20/03/16	1 of 1		
						Persons au	thorised to approve re	port: J Barrett (De	ep. Quality Manager) H By	rne (Quality Manag		

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R71177	
size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1	
75	84	COBBLES		BH:	BH03/12			
63	79	CODDLLO		Sample No.	AA43881	Lab. Sa	ample No. A16/0593	
50	68			Sample Type:	В			
37.5	58			Depth (m)	0.50	Custom	ner: Galway Co.Co.	
28	51			Date Received	12/02/2016	Date Te	esting started 14/03/2016	
20	40			Description:	Dark brown	/black sli	lightly clayey/silty, sandy, GRAVEL with many cobbles	
14	32	GRAVEL						
10	28	OIVAVLL		Remarks	Sample size did not meet the re	equirements of BS1377	7	
6.3	24						5 5 5 2 2 3	
5	22						0.063 0.425 0.425 0.425 0.6 1.18 1.18 1.10 1.4 1.4 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	
3.35	19		100					
2	16		90					
1.18	12		80					
0.6	8		§ 70	+				
0.425	6	SAND	SAND	Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00				
0.3	5		g 50					
0.15	3		40					
0.063	2		cen					
			20					
		SILT/CLAY	10					
			0	 				
			0.0	0.0		0.01	0.1 1 10 100	
				CLA	Y	SILT	Sieve size (mm) SAND GRAVEL	
	1						Approved by: Date: Page no:	
		IGSL Lt	d Materi	als Laborate	ory		1 of 1	
						Persons a	authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manage	

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R71126		!		
size	passing			Contract:	GCTP Phas	e 3 - Co	ontact 1				
75	100	COBBLES		BH:	BH3/12						
63	100	OODDELO		Sample No.	AA43883	Lab. Sa	ample No.	A16/0595			
50	92			Sample Type:	В						
37.5	83			Depth (m)	1.50	Custom	ner: Galway Co.C	0.			
28	76			Date Received							
20	63			Description: Dark brown/grey silty, sandy, GRAVEL							
14	59	GRAVEL									
10	53	GIVAVLL		Remarks							
6.3	49						5 5	8 22	ις.	ιŭ	
5	47						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	930	
3.35	42		100								
2	37		90								
1.18	33		80	+ + + + + + + + + + + + + + + + + + + +							
0.6	28		>° 70	+					 		
0.425	26	SAND	is 60	 							
0.3	24		Percentage passing (%) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0								
0.15	20		eget 40								
0.063	17		cen						T		
			20								
		SILT/CLAY	10	+ + + + + + + + + + + + + + + + + + + +							
		0.21702711	0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		Ш	<u> </u>				
			0.0	0.00	01	0.01	0.1	1	10	100	
				CLAY	•	SILT	Sieve size (mm)	SAND	GRAVEL		
		1001.11	-				Approved by:		Date:	Page no:	
		IGSL Lt	a Materi	als Laborato	ory		A Byon	-	04/04/16	1 of 1	
						Persons a	authorised to approve rep	oort: J Barrett (De	p. Quality Manager) H Byr	ne (Quality Manage	

Determination of Particle Size Distribution





		I								
particle	%			Contract No:	18963		No. R70738			
size	passing			Contract:	GCTP Phas	se 3 - Co	ntact 1			
75	100	COBBLES		BH:	BH3/25					
63	92			Sample No.	AA43893	Lab. Sa	mple No.	A16/0596		
50	77			Sample Type:	В					
37.5	74			Depth (m)	0.50	Custom	er: Galway Co.0	Co.		
28	66			Date Received			sting started	26/02/2016		
20	60			Description:	Mottled bro	/EL with some of	cobbles			
14	55	GRAVEL								
10	52	OIVAVEE		Remarks						
6.3	49						5 5	8	Ω	2
5	47						0.063	0.3 0.425 0.6 1.18	2 3.35 5.3 6.3 10 14 20	28 37. 53 63
3.35	45		100							
2	42		90	1						
1.18	38		_ 80	 						
0.6	33		<u>%</u> 70	 						
0.425	31	SAND	Percentage passing (%) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0							1
0.3	28		sed e 50							
0.15	24		age 10							
0.063	19		seuta 40	1						
0.038	17		ည္ 30	† 						
0.027	16		_ 20	 						
0.017	14	0 7 7 0 1 N 1	10	 						
0.010	12	SILT/CLAY	0							
0.007	11		0.0	0001 0.0	001	0.01	0.1	1	10	100
0.005	10			CLA		SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	7			02/1	•	0.2.	()		3.5.722	
3.00 <u>L</u>	<u>'</u>						Approved by		Date:	Page no:
		IGSL Lt	d Materi	als Laborat	ory		A Rejer		04/03/16	1 of 1
						Persons a	uthorised to approve re	eport: J Barrett (De	ep. Quality Manager) HB	yrne (Quality Mana

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R70756		•		
size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1				
75	100	COBBLES		BH:	BH03/25						
63	94	0000000		Sample No.	AA45894	Lab. Sa	ample No.	A16/0597			
50	78			Sample Type:	В						
37.5	74			Depth (m)							
28	64			Date Received							
20	60			Description: Mottled brown silty, sandy, GRAVEL with some cobbles							
14	56	GRAVEL									
10	52	OIVWLL		Remarks							
6.3	46						5 5	8 22 2		τĊ	
5	44		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 14 20	37 930 930	
3.35	39		100								
2	33		90								
1.18	29		80	† 							
0.6	25		Percentage passing (%) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	+ + + + + + + + + + + + + + + + + + + +							
0.425	24	SAND	iss 60	 							
0.3	23		<u>a</u> 50								
0.15	19		96 40								
0.063	14		arcen 30	<u> </u>							
			20								
		SILT/CLAY	10								
			0	+ + + + + + + + + + + + + + + + + + + +			 				
			0.0	0.0		0.01	0.1	1	10	100	
				CLA	/	SILT	Sieve size (mm)	SAND	GRAVEL		
	<u> </u>						Approved by:		Date:	Page no:	
		IGSL Lt	d Materi	als Laborato	ory		A Byen		10/03/16	1 of 1	
						Persons a	authorised to approve re	port: J Barrett (De	p. Quality Manager) H By	rne (Quality Manage	

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

particle	%			Contract No:	18963	Report	No. R70757			
size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1			
75	100	COBBLES		BH:	BH03/25					
63	100	COBBLLO		Sample No.	AA43895	Lab. Sa	ımple No.	A16/0598		
50	100			Sample Type:	В					
37.5	95			Depth (m)	2.00	Custom	er: Galway Co.	Co.		
28	90			Date Received	02/02/2016	Date Te	esting started	24/02/2016		
20	86			Description:	Light brown	slightly s	sandy, gravelly, SI	LT		
14	80	GRAVEL								
10	76	OIVAVEE		Remarks						
6.3	71						5 5	8	22	5
5	69						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	28 37.5 53 63 63
3.35	66		100							
2	62		90							
1.18	58		80							++++++
0.6	53		8 70	+						
0.425	51	SAND	issi 60							
0.3	49		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.15	44		40 40							
0.063	38		arcen 30							
0.037	33									
0.027	30		20							
0.017	29	SILT/CLAY	10							
0.010	26		0	 						
0.007	22		0.0	0.0		0.01	0.1	1	10	100
0.005	20			CLA	,	SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	14						10		In .	To
		IGSL I to	d Materi	als I aborato	rv		Approved by		Date:	Page no:
	IGSL Ltd Materials Laboratory							03/03/16	1 of 1	

Determination of Particle Size Distribution



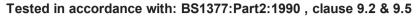
(note: Sedimentation stage not accredited)



Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

			`			<u> </u>				
particle	%			Contract No:	18963	Report	No. R71078			
size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1			
75	77	COBBLES		BH:	BH03/25					
63	77	OOBBEEG		Sample No.	AA43896	Lab. Sa	ample No.	A16/0599		
50	77			Sample Type:	В					
37.5	77			Depth (m)	3.00	Custon	ner: Galway Co.C	Co.		
28	70			Date Received			esting started	14/03/2016		
20	59			Description:	Light brown	n/grey slig	ghtly sandy, gravell	y, SILT with ma	any cobbles	
14	57	GRAVEL								
10	55	SIVIVEL		Remarks	Sample size did not meet the re	equirements of BS1377				
6.3	51						53	8 252		ت
5	49		400				0.063	0.3 0.425 0.6 1.18	2 3.35 5.3 6.3 10 20	28 37.5 53 63
3.35	45		100							
2	41		90							
1.18	38		<u> </u>							
0.6	34		8 70 m 70	+						$\mathcal{X} + \mathcal{Y} + \mathcal{Y} = $
0.425	33	SAND	iss 60							
0.3	31		8 50 0 50							
0.15	28		Percentage passing (%) 80 00 00 00 00 00 00 00 00 00 00 00 00							
0.063	24		cen c							
0.037	22									
0.027	21		20							
0.017	19	SILT/CLAY	10							
0.010	18	3.2.7, 32, 11	0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		Ш	 			
0.007	17		0.	0001 0.0	01	0.01	0.1	1	10	100
0.005	15			CLA	Y	SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	11								1-	
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	IGSL Ltd Materials Laboratory							-	22/03/16	1 of 1

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report I	No. R70739		_	
size	passing			Contract:	GCTP Phas	e 3 - Co	ntact 1			
75	83	COBBLES		BH:	BH3/29					
63	73	COBBLLO		Sample No.	AA43890	Lab. Sa	mple No.	A16/0600		
50	73			Sample Type:	В					
37.5	55			Depth (m)	1.00	Custom	er: Galway Co.C	0.		
28	48			Date Received			esting started	24/02/2016		
20	42			Description:	Brown silty,	sandy, G	SRAVEL with many	cobbles		
14	38	GRAVEL								
10	35	OIVWLL		Remarks	Sample size did not meet the rec	quirements of BS1377				
6.3	32						53	255	35	ιč
5	31		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	37. 50. 53.
3.35	29		100							
2	28		90							
1.18	26		80	† 						
0.6	25		8 70	+ + + + + + + + + + + + + + + + + + + +						
0.425	24	SAND	iss 60							
0.3	23		<u>a</u> 50							
0.15	21		Percentage passing (%) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0							
0.063	17		arcen 30							
			20							
		SILT/CLAY	10							
			0	 						
			0.0	0.0		0.01	0.1	1	10	100
				CLA	/	SILT	Sieve size (mm)	SAND	GRAVEL	
	<u> </u>	1001 11	-1 84 - 4 - *	-1-1-1 4			Approved by:		Date:	Page no:
		IGSL Lt	d Wateri	als Laborato	ory 		A Byen	_	03/03/16	1 of 1
	Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)									

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R70759			
size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1			
75	79	COBBLES		BH:	BH03/29					
63	63	OODDELO		Sample No.	AA43891	Lab. Sa	ample No.	A16/0601		
50	57			Sample Type:	В					
37.5	49			Depth (m)	1.50	Custom	er: Galway Co.C	0.		
28	43			Date Received	02/02/2016	Date Te	esting started	24/02/2016		
20	40			Description:	Light brown	silty, sa	ndy, GRAVEL with	many cobbles		
14	37	GRAVEL								
10	34	GIVAVLL		Remarks	Sample size did not meet the re	quirements of BS1377				
6.3	31						5 53	8 8	ις	2
5	29						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20 20	37.5 933 933 933
3.35	26		100							
2	24		90							
1.18	22		<u> </u>							
0.6	20		% 70	 						
0.425	19	SAND	ils 60							
0.3	19		6 50 0 50							
0.15	17		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.063	14		cen							
			20	1						
		SILT/CLAY	10	+						
			0							
			0.0	0.0	001	0.01	0.1	1	10	100
				CLA	Υ	SILT	Sieve size (mm)	SAND	GRAVEL	
	<u> </u>	1001.11	al BA c 1 c ·	ala Labiri 4			Approved by:		Date:	Page no:
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	Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)									

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

			(11016	. Sedimentation stage	not accredited)	1			W SCOPE RESINGLISS	
particle	%			Contract No:			No. R70740	-		
size	passing			Contract:	GCTP Phase	e 3 - Co	ontact 1			
75	74	COBBLES		BH:	BH3/29					
63	74			Sample No.		Lab. Sa	ample No. A16/060)2		
50	74			Sample Type:	В					
37.5	72			Depth (m)			ner: Galway Co.Co.			
28	71			Date Received			esting started 26/02/			
20	70			Description:	Light brown	slightly	sandy, slightly gravelly, CLAY	with	many cobbles	
14	69	GRAVEL								
10	67			Remarks	Sample size did not meet the requ	uirements of BS1377				
6.3	65						53	8	35	7.
5	64		400				0.063 0.15 0.3 0.425 0.6	1.18	2 3.35 6.3 10 20 20 28	37 37 530 530
3.35	62		100							
2	61		90							
1.18	59		<u> </u>	+ + + + + + + + + + + + + + + + + + + +						
0.6	57		<u>%</u> 70	+						
0.425	55	SAND	iss 60							
0.3	53		Percentage passing (%) 80 00 00 00 00 00 00 00 00 00 00 00 00							
0.15	48		age							
0.063	39		osenta 3euta	1						
0.036	35		Per 30							
0.026	32		20							
0.017	28		10							
0.010	25	SILT/CLAY	0					Ш	1	
0.007	23		0.	0001 0.0	01	0.01	0.1	1	10	100
0.005	21			CLA	,	SILT	Sieve size (mm) SAND		GRAVEL	
0.001	16			<u> </u>			(······) · · · ·			
		1001 14	al N/1 = 4 = :	iala I ab assisti			Approved by:		Date:	Page no:
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IGSL Ltd

Materials Laboratory

045 899324

Unit J5,M7 Business Park
Naas Co.Kildare

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No.	R71002	Contract	GCTP Phase 3 - Contract 1
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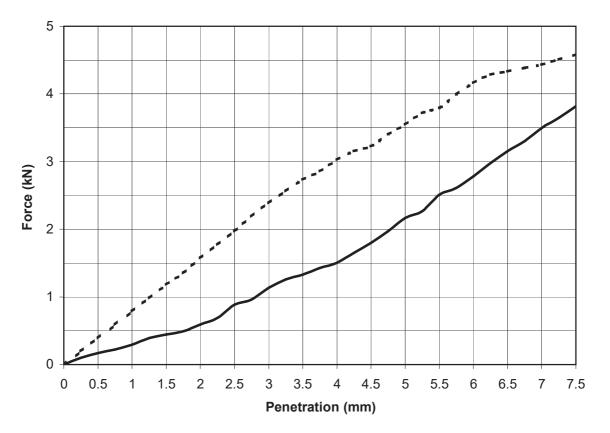
Contract No. 18963 Customer

Galway Co.Co.

Date received 12/02/16 Date Tested 01/03/16

BH/TP No. BH03/06 Sample No. AA43886 Type: B

Depth (m) 0.50 Lab sample No. A16/0583



Key: ----- Base

Description: Brown sile	ty, very sand	ly, GRAVEL		
Initial Condition:	Unsoaked			$\overline{}$
Moisture Content (%):	15	Bulk Density (Mg/m ³):	1.97	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.73	
% Material >20mm:	37			
Method of compaction:	Static Con	npaction Method 2		

Test Result	Тор	Base
CBR %	11	18
Moisture	14	16
Content %	17	10

Persons authorized to approve reports

J Barrett (Dep. Quality Manager)

H Byrne (Quality Manager)

Approved by	Date	Page No.
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Naas Co.Kildare

045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No.	R70619	Contract	GCTP Phase 3 - Contract 1
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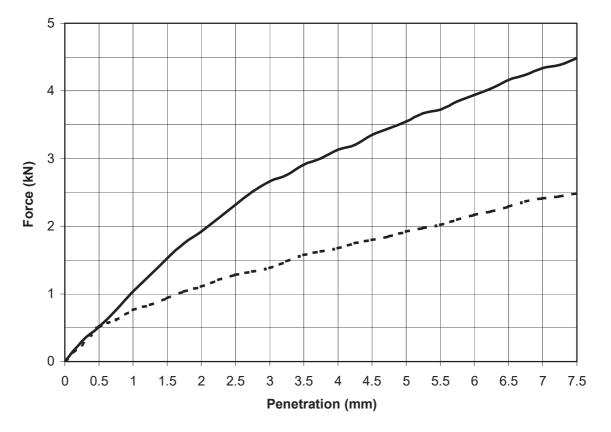
Contract No. 18963 Customer

Galway Co.Co.

Date received 12/02/16 Date Tested 22/02/16

BH/TP No. BH03/29 Sample No. AA43890 Type: B

Depth (m) 1.00 Lab sample No. A16/0600



Key: ----- Base

Description: Brown sil	ty, sandy, G	RAVEL with many cobbles			
Initial Condition:	Unsoaked				
Moisture Content (%):	8	Bulk Density (Mg/m ³):	2.21		
Surcharge (kg):	4	Dry Density (Mg/m ³):	2.05		
% Material >20mm:	16				
Method of compaction: Static Compaction Method 2					

Test Result	Тор	Base
CBR %	18	10
Moisture	8	8
Content %	0	U

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

Approved by	Date	Page No.
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Appendix 13

Geotechnical Laboratory Testing

Lab Schedule 4

IGSL Ltd Materials Laboratory Unit J5, M7 Business Park Newhall, Naas Co. Kildare

045 846176

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2*, 4.3, 4.4 & 5.3



Report No. R70973 Contract No.

18963

Contract Name:

GCTP Phase 3 Contract 1 GL

Customer Galway Co.Co.

Samples Received: 12-02-16 Date Tested:

14-03-16

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample	Moisture	Liquid	Plastic	Plasticity	%	Preparation	Liquid Limit	Classification (BS5930)	Description
				Туре	Content %	Limit %	Limit %	Index	<425μm		Clause	(033930)	
BH3/23	AA32640	1.0	A16/0952	В	17	51	NP	NP	11	WS	4.4		Dark brown silty, very sandy, GRAVEL
BH3/23	AA32641	2.0	A16/0953	В	12	34	NP	NP	24	WS	4.4		Brown silty, very sandy, GRAVEL with some cobbles
BH3/23	AA32643	3.0	A16/0954	В	12								Brown clayey/silty, very sandy, GRAVEL
BH3/32	AA48851	0.5	A16/0955	В	12	21	NP	NP	60	WS	4.4		Light brown slightly sandy, gravelly, SILT
BH3/32	AA48852	1.0	A16/0956	В	8.9	20	NP	NP	55	WS	4.4		Mottled light brown slightly sandy, gravelly, SILT with some cobbles
BH3/32	AA48853	2.0	A16/0957	В	9.3	15	NP	NP	56	WS	4.4		Light brown slightly sandy, gravelly, SILT
BH3/32	AA48854	3.0	A16/0958	В	6.7	16	NP	NP	45	WS	4.4		Light brown slightly sandy, gravelly, SILT
BH3/32	AA48855	4.0	A16/0959	В	12	22	NP	NP	67	WS	4.4		Mottled grey/brown slightly sandy, slightly gravelly, SILT
BH3/32	AA48856	4.5	A16/0960	D	23								Grey/brown sandy gravelly SILT/CLAY
BH3/32	AA48857	5.0	A16/0961	В	25	34	21	13	95	WS	4.4	CL	Grey/brown slightly sandy, slightly gravelly, CLAY
BH3/32	AA48858	6.0	A16/0962	В	24	35	NP	NP	89	WS	4.4		Dark brown/grey slightly sandy, slightly gravelly, SILT
BH3/32	AA48859	7.0	A16/0963	В	24	40	NP	NP	95	WS	4.4		Dark brown/grey slightly sandy, slightly gravelly, SILT
BH3/32	AA48860	8.0	A16/0964	В	29	45	NP	NP	94	WS	4.4		Dark brown/grey slightly sandy, slightly gravelly, SILT
BH3/32	AA48861	9.0	A16/0965	В	29	45	22	23	89	WS	4.4	СІ	Mottled light brown/grey slightly sandy, slightly gravelly, CLAY
BH3/32	AA48862	10.0	A16/0966	В	30	53	NP	NP	97	WS	4.4		Dark brown/grey slightly sandy, slightly gravelly, SILT
Notes:	Preparation:	WS - Wet sie	ved		Sample Type:	B - bulk distu	rbed	Remarks:					

AR - As received

U - Undisturbed

NP - Non plastic

NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014 Opinions and interpretations are outside the scope of accreditation.

Approved by

Liquid Limit 4.3 Cone Penetrometer definitive method

Clause: 4.4 Cone Penetrometer one point method The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory

Persons authorized to approve reports

H Byrne (Quality Manager)

Date 05-04-16

Page

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IGSL Ltd Materials Laboratory Unit J5, M7 Business Park Newhall, Naas Co. Kildare

045 846176

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2*, 4.3, 4.4 & 5.3



Report No. R70974 Contract No. 18963

Contract Name: GCTP Phase 3 Contract 1 GI

Customer Galway Co.Co.

Samples Received: 12/2/166 Date Tested: 14-03-16

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425μm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
BH3/33	AA48863	0.5	A16/0967	Type B	8.9	21	NP	NP	425μπ 45	WS	4.4		Light brown/grey slightly sandy, gravelly, SILT
BH3/33	AA48864	1.0	A16/0968	В	6.4	23	NP	NP	41	WS	4.4		Light brown/grey silty, very sandy, GRAVEL
BH3/33	AA48865	2.0	A16/0969	В	5.6	18	NP	NP	39	WS	4.4		Light brown silty, sandy, GRAVEL with some cobbles
BH3/34	AA48866	0.5	A16/0970	В	13	23	NP	NP	55	WS	4.4		Light brown slightly sandy, gravelly, SILT
BH3/34	AA48867	1	A16/0971	В	10	19	NP	NP	59	WS	4.4		Light brown slightly sandy, gravelly, SILT
BH3/34	AA48868	2	A16/0972	В	8.6	19	NP	NP	49	WS	4.4		Light brown slightly sandy, gravelly, SILT
		1440 144 1			0 1 7	D 1 11 11 1		D 1					

Notes: Preparation: WS - Wet sieved AR - As received

Liquid Limit

WS - Wet sieved Sample Type: B - bulk disturbed

NP - Non plastic

4.3 Cone Penetrometer definitive method

Clause: 4.4 Cone Penetrometer one point method

Remarks:

NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014

Opinions and interpretations are outside the scope of accreditation.

Approved by

The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory

Persons authorized to approve reports

U - Undisturbed

H Byrne (Quality Manager)

A Byane

Date Page 05-04-16

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Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R71181			
size	passing			Contract:	GCTP Phas	se 3 - C	ontact 1			
75	100	COBBLES		BH:	BH03/23					
63	100	OODDELO		Sample No.	AA32640	Lab. Sa	ample No.	A16/0952		
50	88			Sample Type:	В					
37.5	80			Depth (m)	1.00	Custon	ner: Galway Co.C	co.		
28	73			Date Received	12-02-16		esting started	14-03-16		
20	62			Description:	Dark brown	n silty, ve	ry sandy, GRAVEL			
14	52	GRAVEL								
10	46	OIVAVEE		Remarks	Sample size did not meet the r	equirements of BS1377	7			
6.3	39						5 33	8	ις.	ιΩ
5	36						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	37.5 93 93 93
3.35	33		100							
2	28		90							
1.18	23		<u> </u>							
0.6	17		% 70 ·							
0.425	15	SAND	ssing 60						 	
0.3	13		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.15	10		ntage 40							
0.063	7		cen							
			20							
		SILT/CLAY	10					7		
		0.21702711	0							
			0.0	0.001	001	0.01	0.1	1	10	100
				CLA	Y	SILT	Sieve size (mm)	SAND	GRAVEL	
	<u> </u>						Approved by:		Date:	Page no:
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·						Persons	authorised to approve re	port: J Barrett (De	p. Quality Manager) H Byr	ne (Quality Manager

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R71182
size	passing		1	Contract:	GCTP Phas	se 3 - Co	ontact 1
75	86	COBBLES		BH:	BH 03/23		
63	86			Sample No.	AA32641	Lab. Sa	ample No. A16/0953
50	78			Sample Type:	В		
37.5	70			Depth (m)	2.00	Custom	ner: Galway Co.Co.
28	66			Date Received	12-02-16		esting started 14-03-16
20	61			Description:	Brown silty	, very sar	ndy, GRAVEL with some cobbles
14	56	GRAVEL					
10	53	OTTAL		Remarks			
6.3	47						55 15 15 15 15 15 15 15 15 15 15 15 15 1
5	44		400	2			0.063 0.15 0.3 0.425 0.6 1.18 1.18 1.10 1.10 1.10 1.10 1.10 1.10
3.35	38		100	I			
2	31		90				
1.18	25		© 80) 			
0.6	20		°) 70	o † 			
0.425	17	SAND	iss 60	o 			
0.3	15		Percentage passing (%) 20 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	o 			
0.15	11		gestr 40	o 📗 📗 📗			
0.063	8		90 ac				
			<u>و</u> 20				
		SILT/CLAY	10				
).0001 0	.001	0.01	0.1 1 10 100
				CL	AY	SILT	Sieve size (mm) SAND GRAVEL
		1001 14			4		Approved by: Date: Page no:
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		IGSL Lt	d Mate	rials Labora	tory	Persons a	1 1 0

Determination of Particle Size Distribution





	0/	I		O control of NI	40000	D A. I.	D74400			
particle	%			Contract No:	18963	Report No.				
size	passing	 		Contract:		se 3 - Conta	act 1			
75	100	COBBLES		BH:	BH3/23					
63	100			Sample No.	AA32643	Lab. Samp	ole No.	A16/0954		
50	91			Sample Type:	В					
37.5	87			Depth (m)	3.00		Galway Co.C			
28	84			Date Received	12-02-16	Date Testi	-	14-03-16		
20	76			Description:	Brown clay	ey/silty, very	sandy, GRAVE	L		
14	72	GRAVEL								
10	68			Remarks						
6.3	62						53	25 25 18	35	.5
5	59		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	37.0 530.7
3.35	52		100							
2	47		90							
1.18	42		<u> </u>							
0.6	36		<u>%</u> 70	+ + + + + + + + + + + + + + + + + + + +						
0.425	32	SAND	iss 60							
0.3	28		8e 50							
0.15	21		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.063	13		cent							
			20							
		SILT/CLAY	10	+ + + + + + + + + + + + + + + + + + + +						
		SIL1/OLA1	0							
			0.	0001 0.0	001	0.01	0.1	1	10	100
				CLA	Y	SILT Si	ieve size (mm)	SAND	GRAVEL	
		1001 14	al M a.t	iala Labarrat			Approved by:		Date:	Page no:
		IGSL Lt	a water	ials Laborat	ory		AB	your	04-04-16	1 of 1
						Persons author	orised to approve rep	oort: J Barrett (De	p. Quality Manager) H By	ne (Quality Manag

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R71129			
size	passing			Contract:	GCTP Pha	se 3 - Co	ontact 1			
75	100	COBBLES		BH:	BH3/32					
63	100	OODBELO		Sample No.	AA48851	Lab. Sa	ample No.	A16/0955		
50	100			Sample Type:	В					
37.5	98			Depth (m)	0.50	Custon	ner: Galway Co.C	0.		
28	91			Date Received	12-02-16		esting started	14-03-16		
20	74			Description:	Light brown	n slightly :	sandy, gravelly, SIL	T		
14	72	GRAVEL								
10	69	OIVWLL		Remarks						
6.3	66						53	8 8 8		5
5	64		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 14 20	37.5 37.5 53 53
3.35	59		100							
2	55		90						 	
1.18	52		80						 	
0.6	48		% 70							
0.425	46	SAND	ssing 60							
0.3	43		96 pa							
0.15	39		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.063	33		cen							
0.037	30									
0.026	29		20							
0.017	26	SILT/CLAY	10	†						
0.010	23	OIL 170L7 (1	0							
0.007	21		0.0	0.0	01	0.01	0.1	1	10	100
0.005	18			CLA	/	SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	12									
		IGSL L+	d Matori	als Laborate)rv		Approved by:		Date:	Page no:
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						Persons a	authorised to approve rep	oort: J Barrett (De	p. Quality Manager) H By	rne (Quality Manage

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R71183		<u>!</u>	
size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1			
75	100	COBBLES		BH:	BH03/32					
63	93	OODDELO		Sample No.	AA48852	Lab. Sa	imple No.	A16/0956		
50	93			Sample Type:	В					
37.5	86			Depth (m)	1.00	Custom	er: Galway Co.C	0.		
28	81			Date Received	12-02-16		esting started	15-03-16		
20	71			Description:	Mottled light	t brown s	slightly sandy, grave	elly, SILT with s	some cobbles	
14	69	GRAVEL								
10	66	OIVWEE		Remarks						
6.3	62						63	3 25 18	35	rċ.
5	60		100				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20 20	37. 530. 530.
3.35	56		100							
2	53		90							
1.18	49		© 80							1
0.6	45		° 70	 						
0.425	44	SAND	ssin 60							
0.3	41		<u>8</u> 50							
0.15	37		tage 40							
0.063	31		Percentage passing (%) 80 20 40 30 30							
			ور 20							
		SILT/CLAY	10							
			0	0001 0.0		0.01	0.1	1	10	100
			0.0					•		100
				CLAY		SILT	Sieve size (mm)	SAND	GRAVEL	
							Approved by:		Date:	Page no:
		IGSL Lt	d Materi	als Laborato	ory		A Byen		30-03-16	1 of 1
						Persons a	uthorised to approve re	port: J Barrett (De	p. Quality Manager) H Byr	ne (Quality Manage

Determination of Particle Size Distribution





0.1	0/	1		0 1 111	40000	- LN	D74070			
particle	%			Contract No:	18963	•	o. R71079			
size	passing			Contract:		se 3 - Conta	act 1			
75	100	COBBLES		BH:	BH3/32					
63	100			Sample No.	AA48853	Lab. Sam	ple No.	A16/0957		
50	97			Sample Type:	В					
37.5	89			Depth (m)	2.00		: Galway Co.C			
28	84			Date Received	12-02-16		ing started	14-03-16		
20	73			Description:	Light brown	n siigniiy san	ndy, gravelly, SIL	- I		
14	69	GRAVEL		Demonstra						
10	67			Remarks						
6.3	62						0.063	0.3 0.425 0.6 1.18	2 3.35 5.3 6.3 10 20	0.080 5
5	60		100				0.0	0, 0, +	20 1 1 20 20 20 20 20 20 20 20 20 20 20 20 20	930.7.0
3.35	56		90							
2	50									
1.18	46		80 <u>©</u>							
0.6	44	0.1115	ို့ 70	+ + + + + + + + + + + + + + + + + + + +						
0.425	42	SAND	Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00	+ + + + + + + + + + + + + + + + + + + +				- 		
0.3	40		<u>ω</u> 50	+ + + + + + + + + + + + + + + + + + + +						
0.15	36		bet 40	1						
0.063	31) 90 90 90 90							
0.037	28		20							
0.027	26					11111				
0.017	24	SILT/CLAY	10							
0.010	22		0	1004					40	400
0.007	21		0.0		001	0.01	0.1	1	10	100
0.005	18			CLA	Y	SILT S	ieve size (mm)	SAND	GRAVEL	
0.002	12						Ammanalla		Data	D
		IGSL Ltd	d Materi	als Laborat	orv		Approved by:		Date:	Page no:
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Determination of Particle Size Distribution





42.1	0/			0 1 11	40000	D (N	D74000		•	
particle	%			Contract No:	18963	Report No.				
size	passing			Contract:		se 3 - Conta	ct 1			
75	100	COBBLES		BH:	BH3/32					
63	100			Sample No.	AA48854	Lab. Samp	le No.	A16/0958		
50	93			Sample Type:	В					
37.5	88			Depth (m)	3.00		Galway Co.C			
28	83			Date Received	12-02-16	Date Testin	-	14-03-16		
20	77			Description:	Light brown	n siigniiy sand	dy, gravelly, SIL	. 1		
14	73	GRAVEL		Demonstra						
10	69			Remarks						
6.3	64						0.063	0.3 0.425 0.6 1.18	2 3.35 5.3 6.3 10 20	020 \cdot
5	61		100				0.0	0, 0, +		930.7.0
3.35	56		90							
2	51									
1.18	46		80 <u>©</u>							
0.6	41	0.4115	<u>ိ</u> 70	†						
0.425	39	SAND	Percentage passing (%) 80 00 00 00 00 00 00 00 00 00 00 00 00							
0.3	37		<u>ə</u> 50							
0.15	33		bet 40							
0.063	28			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				1		
0.039	26		20							
0.028	24				1 ++++					
0.018	22	SILT/CLAY	10							
0.010	20		0		101				40	400
0.007	19		0.		001	0.01	0.1	1	10	100
0.005	17			CLA	Y	SILT Si	eve size (mm)	SAND	GRAVEL	
0.002	15						Approved by		Data	Dogo :::
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Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report No.	D71081			
size	passing			Contract:		se 3 - Conta				
75	100		1	BH:	BH3/32	55 0 - Oonid	Ot 1			
63	100	COBBLES	ı	Sample No.	AA48855	Lab. Samp	le No	A16/0959		
50	100		ı	Sample Type:	В	Lab. Camp		7110/0000		
37.5	100		ı	Depth (m)	4.00	Customer:	Galway Co.C	Co.		
28	98		ı	Date Received	12-02-16	Date Testir	•	14-03-16		
20	93		ı	Description:			-	ntly gravelly, SI		
14	90	ODA)/EI	ı	•						
10	87	GRAVEL	ı	Remarks						
6.3	84						5 5	8 12	ις	2
5	80						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 14 20	23.0 7.0 7.0 7.0 7.0 7.0
3.35	75		100							
2	71		90							
1.18	68		80							
0.6	64		§ 70	+ + + + + + + + + + + + + + + + + + + +						
0.425	62	SAND	Percentage passing (%) 80 00 00 00 00 00 00 00 00 00 00 00 00							
0.3	60		в о 50							
0.15	54		40 tag							
0.063	47		arcer 30							
0.037	41		ص 20 20							
0.027	38		10							
0.017	36	SILT/CLAY								
0.010	32		0	0001 0.0	001	0.01	0.1	1	10	100
0.007 0.005	27 25		0.					044/0		100
0.005	25 18			CLA	Υ	SILT Si e	eve size (mm)	SAND	GRAVEL	
0.002	10						Approved by:		Date:	Page no:
		IGSL Ltd	d Mater	ials Laborat	ory		AAB	Tient	22-03-16	1 of 1
·			·			Persons autho	rised to approve re	port: J Barrett (De	p. Quality Manager) H By	

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

particle	%	1		Contract No:	18963	Report N	No. R71581		<u>I</u>	
size	passing			Contract:	GCTP Pha	•				
75	100	COBBLES		BH:	BH3.32					
63	100	COBBLES		Sample No.	AA48857	Lab. Sa	mple No.	A16/0961		
50	100			Sample Type:	В					
37.5	100			Depth (m)	5.00	Custome	er: Galway Co	.Co.		
28	100			Date Received	12-02-16	Date Te	sting started	12-04-16	3	
20	100			Description:	Grey/brow	n slightly s	andy, slightly gr	avelly, CLAY		
14	99	GRAVEL		·						
10	99	GRAVEL		Remarks						
6.3	98						2 3	8 ن ت	2	<u>۔۔۔۔</u>
5	98						0.063	0.3 0.425 0.6 1.18	2 3.35 5.3 6.3 10 20	28 37.5 50 63
3.35	97		100							
2	96		90							
1.18	95		_ 80							
0.6	95		<u>%</u> 70	-						
0.425	94	SAND	iss 60							
0.3	94		50 bas			11111 1				
0.15	92		ď							
0.063	91		Seuta 04							
0.029	86			T						
0.021	83		20							
0.014	76	SILT/CLAY	10	+ + + + + + + + + + + + + + + + + + + +						
0.009	65	SIL I / CLAY	0							
0.006	60		0.0	0.0	01	0.01	0.1	1	10	100
0.005	51			CLA	Y	SILT	Sieve size (mn	n) SAND	GRAVEL	
0.001	30									
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Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R71184				
size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1				
75	100	COBBLES		BH:	BH03/32						
63	100	COBBLLO		Sample No.	AA48858	Lab. Sa	ample No.	A16/0962			
50	100			Sample Type:	В						
37.5	100			Depth (m)	6.00	Custom	ner: Galway Co.C	Ю.			
28	98			Date Received	12-02-16	Date Te	esting started	14-03-16			
20	90			Description:	Dark brown	n/grey slig	ghtly sandy, slightly	gravelly, SILT			
14	90	GRAVEL									
10	89	OIVAVLL		Remarks							
6.3	87						5 53	8 25	75	ιĊ	
5	87						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 14 20	37.5 37.5 53 63	
3.35	86		100								
2	84		90								
1.18	83		80								
0.6	82		§ 70	+							
0.425	81	SAND	ilss 60								
0.3	81		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00								
0.15	79		40								
0.063	78		arcen 30								
			20								
		SILT/CLAY	10								
			0	 			<u> </u>			 	
			0.0	0.00	01	0.01	0.1	1	10	100	
				CLAY	•	SILT	Sieve size (mm)	SAND	GRAVEL		
	<u> </u>	1001 / /	al B# a4 c - 1	ala Labassists			Approved by:		Date:	Page no:	
		IGSL Lt	d Materi	als Laborato	ory		A Byen		30-03-16 1 of 1		
	Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)										

Determination of Particle Size Distribution





particle	%		Contrac	ct No:	18963	Rep	ort N	o. R71	185																	
size	passing		Contrac	ct:	GCTP Pha	ase 3	- Con	tact 1																		
75	100	COBBLES	BH:		BH03/32																					
63	100		Sample	e No.	AA48859	Lab	. Sam	nple No.			A16/	0963	3													
50	100		Sample	e Type:	В																					
37.5	100		Depth ((m)	7.00	Cus	tome	r: Galv	vay C	Co.Co).															
28	97		Date R		12-02-16			ting star				14-03														
20	88		Descrip	otion:	Dark brow	n/grey	sligh	tly sand	y, slig	ghtly g	grave	lly, S	ILT													
14	86	GRAVEL																								
10	85	0.0	Remark	ks																						
6.3	84							53	ı	15	25	ro	1.18	7.	3 ^	.			ri.							
5	84		100 —					0.063		0.15	0.3	9.0	<u></u>	0 %		19	44 6	78	37.5 50	72						
3.35	83		100															\mathbb{Z}								
2	82		90																							
1.18	81		80						#	+	+	+++	\top						+							
0.6	80		% 70 																							
0.425	79	SAND	iss 60									Ш		+	+			Ш	+++							
0.3	78		g 50 									Ш			$\perp \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \!$			Ш	$\parallel \parallel$							
0.15	77		Nercentage passing (%) 80																							
0.063	75		30																							
0.032	72																									
0.023	71		20																							
0.015	68	SILT/CLAY	10								$\dagger \dagger \dagger$	+++			+				+++							
0.009	60	5.2.7, 32 7,11	0 +						Щ							Ш				ШЩ						
0.006	54		0.0001	0.00	1	0.0	1		0.1			,	1			10)			100						
0.005	45			CLAY		SIL	.T \$	Sieve si	ze (n	nm)	SAN	D			C	RA	VEL									
0.001	22																									
		IGSL I to	d Materials La	ahorato	r\/		Approved by:				Date	e:			I	⊃age										
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						Perso	ons aut	horised to	appro	ve rep	ort: J	Barre	tt (De	p. Qua	lity M	Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)										

Determination of Particle Size Distribution





	T	1							ļ	
particle	%			Contract No:	18963	•	o. R71186			
size	passing			Contract:	GCTP Pha	se 3 - Cont	act 1			
75	100	COBBLES		BH:	BH03/32					
63	100			Sample No.	AA48860	Lab. Sam	ple No.	A16/0964		
50	100			Sample Type:	В					
37.5	100			Depth (m)	8.00	Customer	: Galway C	o.Co.		
28	100			Date Received	12-02-16		ting started	14-03-16		
20	95			Description:	Dark brown	n/grey slight	ly sandy, sligl	ntly gravelly, SILT		
14	95	GRAVEL								
10	94	OIVWLL		Remarks						
6.3	93						33	8 22 0	5	5:
5	92		460				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	28 33.7. 530.7.
3.35	91		100							
2	90		90 -							
1.18	89		80 -							++++++
0.6	88		∑ 70 ·							
0.425	88	SAND	ils 60 -			4111				
0.3	87		50 - ba							
0.15	86		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.063	84		cen							
0.029	80									
0.021	77		20 -							
0.014	74	SILT/CLAY	10 -							
0.008	68	CIL 170L7 (1	0 -							
0.006	62		0.0	0.0	01	0.01	0.1	1	10	100
0.004	54			CLA	Y	SILT S	Sieve size (m	m) SAND	GRAVEL	
0.001	30									
		ICSL 14	d Matori	als Laborat	orv		Approved		Date:	Page no:
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						Persons auth	norised to approv	e report: J Barrett (De	ep. Quality Manager) H By	yrne (Quality Manage

Determination of Particle Size Distribution





	0.1									
particle	%			Contract No:	18963	Report No.				
size	passing		i	Contract:		ise 3 - Conta	act 1			
75	100	COBBLES	ı	BH:	BH03/32					
63	100		i	Sample No.	AA48861	Lab. Samp	le No.	A16/0965		
50	100		ı	Sample Type:	В					
37.5	100		ı	Depth (m)	9.00		Galway Co.C			
28	96		ı	Date Received	12-02-16	Date Testi	-	15-03-16		
20	88		ı	Description:	Mottled ligh	ht brown/grey	y slightly sandy,	, slightly gravell	y, CLAY	
14	88	GRAVEL	ı							
10	87		ı	Remarks						
6.3	86						0.15	3 25 3 3	35	ιči
5	85		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	3 3 3 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5
3.35	84		100							
2	83		90							
1.18	82		80	1						++++
0.6	81		8 70	+ + + + + + + + + + + + + + + + + + + +						++++++
0.425	80	SAND	ilss 60							
0.3	80		6 50							
0.15	78		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.063	76		cen							
0.031	71									
0.022	68		20							
0.014	67	SILT/CLAY	10	1						++++
0.008	64	OIL 170LA1	0							
0.006	60		0.	0001 0.	001	0.01	0.1	1	10	100
0.004	56			CLA	ΙΥ	SILT Si	eve size (mm)	SAND	GRAVEL	
0.001	37									
		1001 14	d Matar	iolo I oborot			Approved by	:	Date:	Page no:
		IGSL LI	u water	ials Laborat	огу		47 E	Ejene	30-03-16	1 of 1
						Persons autho	orised to approve re	eport: J Barrett (De	p. Quality Manager) H By	rne (Quality Mana

Determination of Particle Size Distribution





particle	%		Conf	ract No:	18963	Repo	rt No	. R7113	30				-														
size	passing		Cont	ract:	GCTP Ph	ase 3 - 0	Conta	act 1																			
75	100	COBBLES	BH:		BH3/32																						
63	100		Sam	ple No.	AA48862	Lab.	Samp	ole No.		A16	6/096	66															
50	100		Sam	ple Type:	В																						
37.5	100		Depf	th (m)	10.00	Custo	mer:	Galwa	ay Co.	Co.																	
28	100		Date	Received	12-02-16			ng starte)3-16															
20	93		Desc	cription:	Dark brow	vn/grey s	lightly	y sandy,	slightly	y grav	elly,	SILT															
14	92	GRAVEL																									
10	91	OIVIVEE	Rem	arks																							
6.3	90							53	5	3 25	6	<u>∞</u>	35	~			5.										
5	90		400					0.063	0.15	0.3	9.0	1.18	2 8	5 6.3	10	14 20 20	37	63									
3.35	89		100																								
2	89		90								##	#	+														
1.18	88		80																								
0.6	87		8 70 																								
0.425	87	SAND	ig 60 +		++	111111	_																				
0.3	87		50		-4																						
0.15	85		Percentage passing (%) 70								Ш				Ш			Ш									
0.063	84		ceu																								
0.029	78																										
0.021	76		20												Ш												
0.013	74	SILT/CLAY	10								+++				H												
0.008	68	3.E 1, 3.E 11	0 —					<u> </u>				Щ			Щ				ł								
0.006	67		0.0001	0.0	01	0.01		().1			1			10			10)0								
0.004	62			CLA	1	SILT	Si	ieve size	(mm)	SAN	ΝD			GI	RAV	EL											
0.001	42																										
		IGGL L+	d Materials	Laborato	>r\/		Approved by:			Date	:			Pag	e no:	<u>:</u>											
		IGGL LU	u Waterials	Laborati	л y				#1	Syer	·	_		29-0	3-16	6		1 of	f 1								
						Person	s autho	orised to a	prove r	eport: .	J Barr	ett (De	p. Qual	ity Mar	nager	Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)											

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report No.	D71131		!	
size	passing			Contract:		se 3 - Conta				
75	100		ı	BH:	BH3/33		AOC 1			
63	100	COBBLES	ı	Sample No.	AA48863	Lab. Samp	ale No	A16/0967		
50	95		ı	Sample Type:	В	Lab. Gamp	ole 140.	A10/0307		
37.5	89		ı	Depth (m)	0.50	Customer:	Galway Co.C			
28	83		ı	Date Received	12-02-16	Date Testi	•	14-03-16		
20	77		ı	Description:			y sandy, gravell <mark>y</mark>			
14	75		ı	Boochption.	· ·					
10	71	GRAVEL	ı	Remarks						
6.3	65							. 2	10	ري د
5	62						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	37.6 530.1 530.1
3.35	56		100					$\overline{}$		ПИШ
2	49		90							
1.18	44		_ 80	+ + + + + + + + + + + + + + + + + + + +						
0.6	38		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00	+ + + + + + + + + + + + + + + + + + + +						
0.425	35	SAND	sing 60							
0.3	32		50 bas							
0.15	26		ntage 40							
0.063	22		acen 30							
0.038	18									
0.027	17		20							
0.017	16	SILT/CLAY	10							
0.010	14		0			1111		<u> </u>		
0.007	11		0.		001	0.01	0.1	1	10	100
0.005	11			CLA	Y	SILT S i	ieve size (mm)	SAND	GRAVEL	
0.002	7						Approved by:		Date:	Dago no:
		IGSL Ltd	d Mater	ials Laborat	ory				İ	Page no:
							171 8	ejene	04-04-16 p. Quality Manager) H Byr	1 of 1

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R71332			
size	passing			Contract:	GCTP Pha	se 3 - Co	ontact 1			
75	100	COBBLES		BH:	BH3/33					
63	100	OODDELO		Sample No.	AA48864	Lab. Sa	ample No.	A16/0968		
50	86			Sample Type:	В					
37.5	78			Depth (m)	1.00	Custom	ner: Galway Co.Co	ο.		
28	70			Date Received	12-02-16	Date Te	esting started	30-03-16		
20	65			Description:	Light brown	n/grey silt	y, very sandy, GRA	VEL		
14	60	GRAVEL								
10	56	OIVAVEE		Remarks	Sample size di dnot meet the r	requirements of BS1377				
6.3	51						5 5	8	ις.	ιū
5	48						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	37.5 93 93 93
3.35	42		100							
2	37		90							
1.18	33		80							
0.6	29		§ 70	+				+		
0.425	27	SAND	ilss 60							
0.3	25		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.15	21		40							
0.063	17		arcen 30						T	
			20							
		SILT/CLAY	10							
			0	 			 			
			0.0	0.0		0.01	0.1	1	10	100
				CLA	Y	SILT	Sieve size (mm)	SAND	GRAVEL	
	l	1001 : 1					Approved by:		Date:	Page no:
		IGSL Lt	d Materi	als Laborate	ory 		1 of 1			1 of 1
						Persons a	authorised to approve rep	ort: J Barrett (De	p. Quality Manager) H Byr	ne (Quality Manager

Determination of Particle Size Distribution





	64			0 (())	40000	- · · ·	D74000			
particle	%			Contract No:	18963	•	. R71082			
size	passing			Contract:		se 3 - Conta	act 1			
75	100	COBBLES		BH:	BH3/33					
63	91			Sample No.	AA48865	Lab. Samp	ple No.	A16/0969		
50	73			Sample Type:	В					
37.5	62			Depth (m)	2.00	Customer:	: Galway Co.Co).		
28	57			Date Received	12-02-16		ing started	14-03-16		
20	53			Description:	Light brown	n silty, sandy	y, GRAVEL with s	some cobbles		
14	49	GRAVEL								
10	46	OTTAL		Remarks						
6.3	42						5 5	8 22	25	ιĊ
5	40						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 20 20 20 80	37. 530. 53
3.35	37		100							
2	33		90							
1.18	29		<u> </u>	+ + + + + + + + + + + + + + + + + + + +						
0.6	26		× 70	+						
0.425	25	SAND	iss 60							
0.3	23		8e 50							
0.15	20		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.063	16		Sent 40							
			20							
		SILT/CLAY	10	+ + + + + + + + + + + + + + + + + + + +						
		SIL I/CLAY	0					<u> </u>		
			0.	0001 0.0	001	0.01	0.1	1	10	100
				CLA	Y	SILT S	ieve size (mm)	SAND	GRAVEL	
·							Approved by:		Date:	Page no:
		IGSL Lt	a Mater	ials Laborat	ory		AB	Jane	01-04-16	1 of 1
						Persons author	orised to approve rep	ort: J Barrett (De	p. Quality Manager) H Byr	ne (Quality Mana

Determination of Particle Size Distribution





particle	%		Co	ontract No:	18963	Report	No. R710	83			<u>-</u>				
size	passing		Co	ontract:	GCTP Pha	se 3 - Co	ontact 1								
75	100	COBBLES	BI	H:	BH3/34										
63	100	0000000	Sa	ample No.	AA48866	Lab. Sa	ample No.		A16/	0970					
50	95		Sa	ample Type:	В										
37.5	93		Do	epth (m)	0.50	Custom	ner: Galwa	ay Co.C	Co.						
28	90		Da	ate Received	12-02-16		esting starte			4-03-1	6				
20	75		Do	escription:	Light brown	n slightly s	sandy, grav	elly, SII	LT						
14	72	GRAVEL													
10	70	OIVAVEE	Re	emarks											
6.3	66							2	22		5			2	
5	64						0.063	0.15	0.3	1.18	3.3	6.3	10 14 20	28 37.5 50 63	72
3.35	61		100 T												
2	56		90 +												
1.18	53		80 +						+					++++	
0.6	48		» 70 						+H+					++++	
0.425	46	SAND	ig 60												\mathbb{H}
0.3	43		50						$\perp \! \! \perp \! \! \perp \! \! \perp$		111				
0.15	39		%) 70 — 60 — 60 — 60 — 60 — 60 — 60 — 60 —												
0.063	32		Ceu 40												
0.036	28														
0.026	26		20 +											++++	
0.017	23	SILT/CLAY	10												
0.010	20	OIL 17OL7(1	0 ←					+							ШЦ
0.007	19		0.000	0.00)1	0.01	(0.1		1		,	10		100
0.005	17			CLAY		SILT	Sieve size	e (mm)	SANE)		GR	4 <i>VEL</i>		
0.002	10														
		IGGL L+	d Matorial	ls Laborato	r\/		Approved by:				Date:			Page	no:
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	Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)														

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report No.				
size	passing			Contract:		se 3 - Conta	ct 1			
75	100	COBBLES		BH:	BH3/34					
63	100			Sample No.	AA48867	Lab. Samp	le No.	A16/0971		
50	100			Sample Type:	В					
37.5	97			Depth (m)	1.00	Customer:	Galway Co.C	Co.		
28	89			Date Received	12-02-16	Date Testin	-	14-03-16		
20	77			Description:	Light brown	n slightly san	dy, gravelly, SII	_T		
14	73	GRAVEL								
10	71	0.0		Remarks						
6.3	68						63	3 3 18	35	5.
5	67		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 14 20	37.8 530.37.8
3.35	63		100							
2	60		90						 	/
1.18	57		80							
0.6	54			+						
0.425	53	SAND	issing 60							
0.3	51		50 bas							
0.15	49		Percentage passing (%) 80 00 00 00 00 00 00 00 00 00 00 00 00							
0.063	46		cent							
0.036	43									
0.026	39		20							
0.017	36	SILT/CLAY	10							
0.010	33	GIL I / OLAT	0							
0.007	31		0.	0001 0.0	001	0.01	0.1	1	10	100
0.005	28			CLA	Υ	SILT Si	eve size (mm)	SAND	GRAVEL	
0.001	19									
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						Persons autho	rised to approve re	port: J Barrett (De	p. Quality Manager) H By	rne (Quality Manag

Determination of Particle Size Distribution





particle	%		Contr	ract No:	18963	Report	t No. R71085				
size	passing		Contr	ract:	GCTP Pha	se 3 - Co	Contact 1				
75	100	COBBLES	BH:		BH3/34						
63	100		Samլ	ole No.	AA48868	Lab. Sa	ample No. A16/0972				
50	100		Samլ	ole Type:	В						
37.5	95		Dept	h (m)	2.00	Custom	mer: Galway Co.Co.				
28	90		Date		12-02-16		esting started 14-03-16				
20	87		Desc	ription:	Light brown	n slightly s	sandy, gravelly, SILT				
14	84	GRAVEL									
10	79		Rema	arks							
6.3	74						0.063 0.15 0.3 0.425 0.6 1.18 2 2 3.35 6.3 1.4 1.4 1.4 1.4 2.0 2.0 2.0 3.37.5 5.0 6.3 6.3 6.3 7.5 7.5 7.5 7.5 7.5 7.5 7.5 7.5 7.5 7.5				
5	71		100 —				0.0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	<u>'</u>			
3.35	65										
2	59		90								
1.18	54		€ 80 								
0.6	49	0.4115	°) 70 +					H			
0.425	47	SAND	issi 60 					\mathbb{H}			
0.3	44		<u>8</u> 50 +					\mathbb{H}			
0.15	37		40 					\mathbb{H}			
0.063	31		90								
0.037 0.026	29 27		20					Щ			
0.026	2 <i>1</i> 24		10					Ш			
0.017	21	SILT/CLAY	0								
0.010	20		0.0001	0.00	1	0.01	0.1 1 10	100			
0.007	18		0.0001	CLAY		SILT	Sieve size (mm) SAND GRAVEL				
0.002	12			OLAT		SILT	OICTO SIZE (IIIII) OAND ONAVEL				
0.002					Approved by: Date: Page n	10:					
		IGSL Ltd	d Materials	Laborato	ry		1 of 1				
	Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)										

Naas Co.Kildare 045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R71512 Contract GCTP Phase 3 - Contract 1

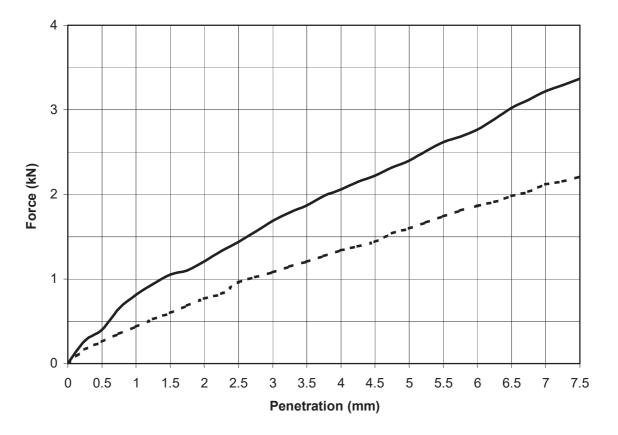
Contract No. 18963 Customer

Galway Co.Co.

Date received 12-02-16 **Date Tested** 14-04-16

BH/TP No. Sample No. В BH3/23 AA32640 Type:

Depth (m) 1.00 Lab sample No. A16/0952



Key: Top

Description: Dark brown silty, very sandy, GRAVEL Initial Condition: Unsoaked Bulk Density (Mg/m³): Moisture Content (%): 11 2.27 Dry Density (Mg/m³): Surcharge (kg): 4 2.04 % Material >20mm: 26

R71512.BH3.23@1.00m.CBR

Method of compaction: Static Compaction Method 2

Test Result	Тор	Base
CBR %	12	8
Moisture	11	12
Content %	l ''	12

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

Approved by Date Page No. 15-04-16 1 of 1

TEST REPORT Determination of California Bearing Ratio (CBR)



Naas Co.Kildare 045 899324

Tested in accordance with BS1377:Part 4:1990, clause 7



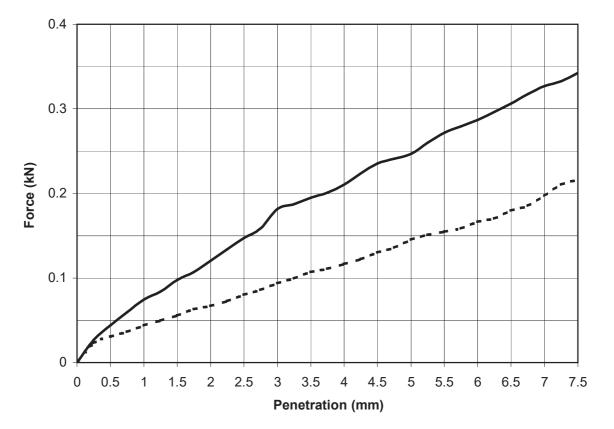
Contract No. 18963 Customer

Galway Co.Co.

Date received 12-02-16 Date Tested 06-04-16

BH/TP No. BH3/32 Sample No. AA48852 Type: B

Depth (m) 1.00 Lab sample No. A16/0956



Key: ----- Base

Description: Mottled light brown slightly sandy, gravelly, SILT with some cobbles			
Initial Condition:	Unsoaked		
Moisture Content (%):	8	Bulk Density (Mg/m ³):	2.22
Surcharge (kg):	4	Dry Density (Mg/m ³):	2.06
% Material >20mm:	16		
Method of compaction:	Static Con	npaction Method 2	

Test Result	Тор	Base
CBR %	1.2	0.7
Moisture	8	8
Content %		

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

IGSL Ltd Materials Laboratory

Approved by
Date
12-04-16

Page No.

1 of 1

Naas Co.Kildare

045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No.	R71420	Contract	GCTP Phase 3 - Contract 1
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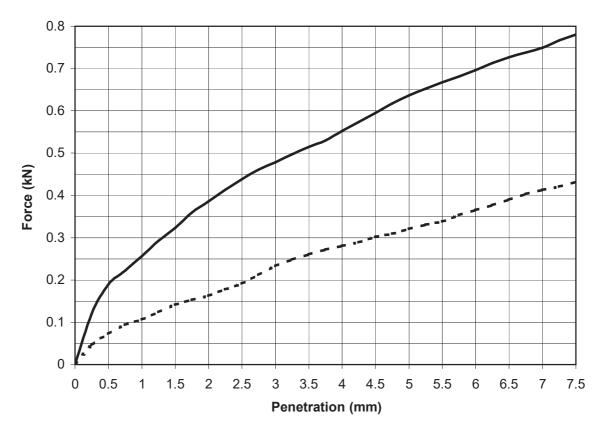
Contract No. 18963 Customer

Galway Co.Co.

Date received 12-02-16 Date Tested 06-04-16

BH/TP No. BH3/32 Sample No. AA48859 Type: B

Depth (m) 7.00 Lab sample No. A16/0963



Key: ----- Base

Description: Dark brov	vn/grey sligh	tly sandy, slightly gravelly,	SILT	
Initial Condition:	Unsoaked			
Moisture Content (%):	29	Bulk Density (Mg/m ³):	1.91	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.48	
% Material >20mm:	4.9			
Method of compaction:	Static Con	npaction Method 2		

Test Result	Тор	Base
CBR %	3.3	1.6
Moisture	28	31
Content %	20	01

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

	Approved by	Date	Page No.
IGSL Ltd Materials Laboratory	A Begane	12-04-16	1 of 1

IGSL Ltd Materials Laboratory

Unit J5,M7 Business Park

Naas Co.Kildare

045 899324

TEST REPORT Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No. R71514 Contract GCTP Phase 3 - Contract 1

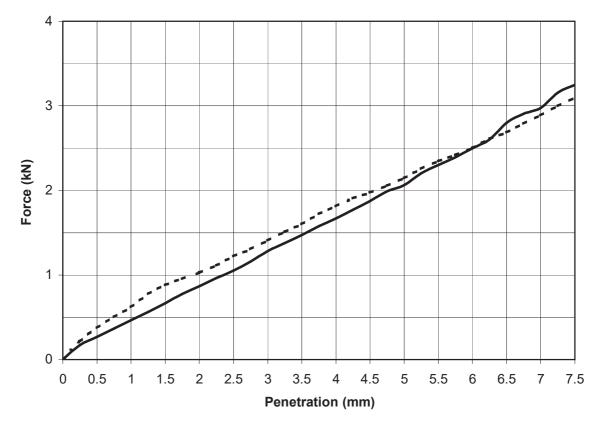
Contract No. 18963 Customer

Galway Co.Co.

Date received 12-02-16 Date Tested 14-04-16

BH/TP No. BH3/33 Sample No. AA48863 Type: B

Depth (m) 0.50 Lab sample No. A16/0967



Key: ----- Base

Description: Light brow	vn/grey sligh	tly sandy, gravelly, SILT		
Initial Condition:	Unsoaked			
Moisture Content (%):	14	Bulk Density (Mg/m ³):	2.31	
Surcharge (kg):	4	Dry Density (Mg/m ³):	2.02	
% Material >20mm:	37			
Method of compaction:	Static Con	npaction Method 2		

R71514.BH3.33@0.50m.CBR

Test Result	Тор	Base
CBR %	10	11
Moisture	14	15
Content %	17	10

Persons authorized to approve reports

J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

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TEST REPORT Determination of MCV / moisture content Relation of a soil

Tested in accordance with BS1377-4:1990, clause 5.5

Report No. R71513 Contract GCTP Phase 3 - Contract 1 GI

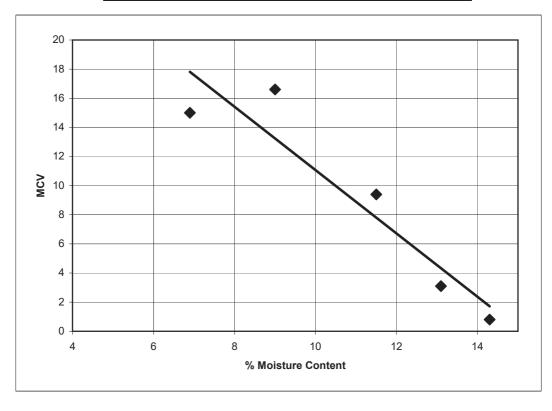
Contract No. 18963 Customer Galway Co.Co.

Date received 12-02-16 Date Tested 06-04-16

BH/TP No. BH3/32 Sample No. AA48854 Type: B

Depth (m) 3.00 Lab sample No. A16/0958

MC% 12 6.9 9.0 13 14 MCV 9.4 15.0 16.6 3.1 0.8



% material >20mm 39

Persons authorized to approve reports

J Barrett (Deputy Quality Manager) H Byrne (Quality Manager)

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TEST REPORT Determination of MCV / moisture content Relation of a soil

Tested in accordance with BS1377-4:1990, clause 5.5

Report No. R71515 Contract GCTP Phase 3 - Contract 1 GI

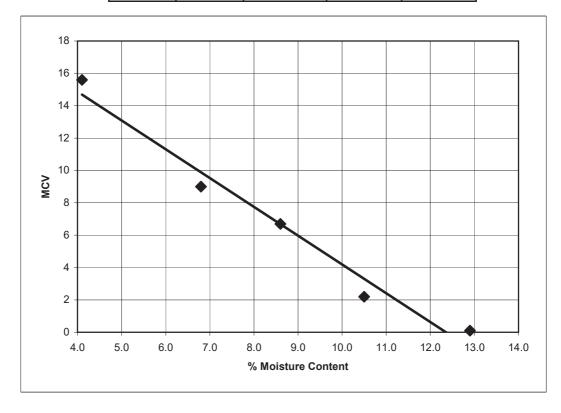
Contract No. 18963 Customer Galway Co.Co.

Date received 12-02-16 Date Tested 05-04-16

BH/TP No. BH3/33 Sample No. AA48864 Type: B

Depth (m) 1.00 Lab sample No. A16/0968

MC% 8.6 4.1 6.8 11 13 MCV 6.7 15.6 9.0 2.2 0.1



% material >20mm 26

Persons authorized to approve reports

J Barrett (Deputy Quality Manager) H Byrne (Quality Manager)

Approved by	Date	Page No.
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TEST REPORT Determination of MCV / moisture content Relation of a soil

Tested in accordance with BS1377-4:1990, clause 5.5

Report No. R71583 Contract GCTP Phase 3 - Contract 1 GI

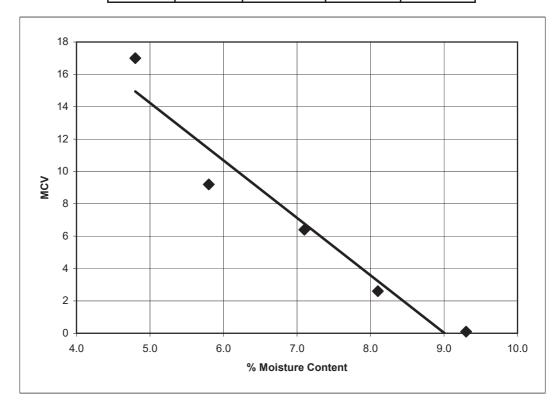
Contract No. 18963 Customer Galway Co.Co.

Date received 12-02-16 Date Tested 13-04-16

BH/TP No. BH3/33 Sample No. AA48865 Type: B

Depth (m) 2.00 Lab sample No. A16/0969

MC% 4.8 8.1 5.8 9.3 7.1 MCV 17 2.6 9.2 0.1 6.4



% material >20mm 16

Persons authorized to approve reports

J Barrett (Deputy Quality Manager) H Byrne (Quality Manager)

Approved by	Date	Page No.
A Byone	19-04-16	1 of 1

TEST REPORT Determination of MCV / moisture content Relation of a soil

Tested in accordance with BS1377-4:1990, clause 5.5

Report No. R71517 Contract GCTP Phase 3 - Contract 1 GI

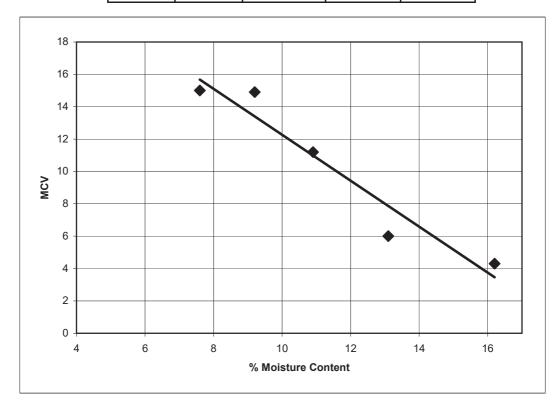
Contract No. 18963 Customer Galway Co.Co.

Date received 12-02-16 Date Tested 12-04-16

BH/TP No. BH3/34 Sample No. AA48867 Type: B

Depth (m) 1.00 Lab sample No. A16/0971

MC% 13 11 9.2 7.6 16 MCV 6 11.2 14.9 15 4.3



% material >20mm 6.6

Persons authorized to approve reports

J Barrett (Deputy Quality Manager) H Byrne (Quality Manager)

Approved by	Date	Page No.
A Begane	15-04-16	1 of 1

TEST REPORT Determination of MCV / moisture content Relation of a soil

Tested in accordance with BS1377-4:1990, clause 5.5

Report No. R71516 Contract GCTP Phase 3 - Contract 1 GI

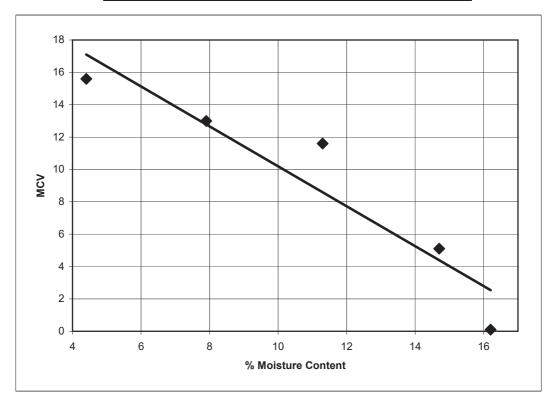
Contract No. 18963 Customer Galway Co.Co.

Date received 12-02-16 Date Tested 14-04-16

BH/TP No. BH3/34 Sample No. AA48868 Type: B

Depth (m) 1.00 Lab sample No. A16/0972

MC% 16 11 7.9 4.4 15 MCV 0 11.6 13 15.6 5.1



% material >20mm 33

Persons authorized to approve reports

J Barrett (Deputy Quality Manager) H Byrne (Quality Manager)

Approved by	Date	Page No.
A Begane	15-04-16	1 of 1



One dimensional Consolidation

BS1377:Part 5:1990

Report No. R71371

Contract: GCTP Phase 3 Contract number: 18963

BH: 3/32 Sample number: AA48857 Depth (m): 5.0

Description Grey sandy SILT

Specimen Height (mm) 20.0 Specimen diameter (mm) 75.0

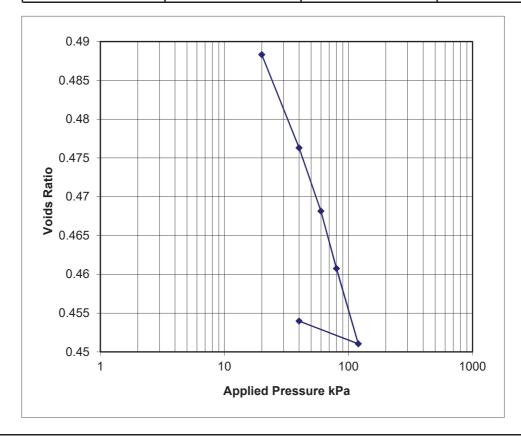
Moisture content % Bulk density Mg/m³ Dry density Mg/m³ Void ratio

Initial	Final
24	20
2.13	2.21
1.72	1.84
0.541	0.454

Assumed Particle density Mg/m³

2.65

Applied Pressure (kPa)	$m_v (m^2/MN)$	c _v (m²/year)	Voids Ratio
0 - 20	1.695	9.752	0.48832
20 - 40	0.404	12.846	0.47631
40 - 60	0.277	20.275	0.46814
60 - 80	0.252	11.145	0.46075
80 - 120	0.166	13.674	0.45104
120 - 40	0.025	32.892	0.45397







Contract Number: 30319

Client's Reference: **18963 PO 8443** Report Date: **03-04-2016**

Client Irish Geotechnical Services Limited

M7 Business Park

Naas

Co. Kildare Ireland

Contract Title: G.C.T.P

For the attention of: Hugh Byrne

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

Test Description Qty

Immediate Shear Strength - set of 3 60 x 60 mm Shear Box Specimens by Direct Shearing (note suitable for free draining material only)

4

Non Accredited Test - @ Non Accredited Test

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

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)

GEO Site & Testing Services Ltd

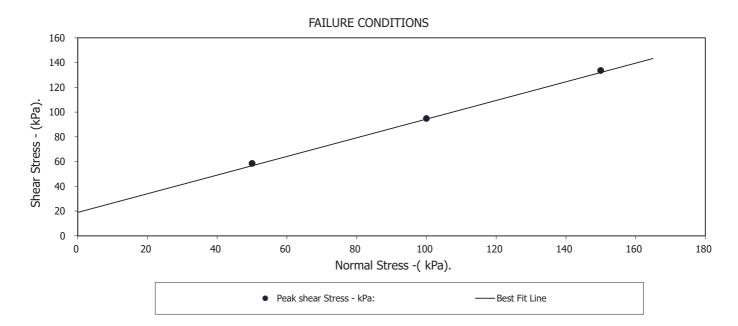
Unit 4, Heol Aur, Dafen Ind Estate, Dafen, Llanelli, Carmarthenshire SA14 8QN

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

BH3/22 A16/0986 Depth (m) from: 0.30 Borehole: Sample Number: Depth (m) to: 0.00

Sample Type:	D			
Particle Density - Mg/m3:	2.65	(Assumed)		
Specimen Tested:	Submerged, Remoulded	material above 2.00mm	removed	
Sample Description:	-			
Brown silty clayey sandy (fine-coarse) GRAVEL (f	fine-coarse/angular-su	ıbangular)		
STAGE		1	2	3
Initial Conditions				
Height - mm:		24.50	24.50	24.50
Length - mm:		59.90	59.90	59.90
Moisture Content - %:		13	13	13
Bulk Density - Mg/m3:		1.95	1.95	1.95
Dry Density - Mg/m3:		1.73	1.73	1.73
Voids Ratio:		0.5346	0.5344	0.5340
Normal Pressure- kPa		50	100	150
Consolidation				
Consolidated Height - mm:		23.95	23.58	23.21
Shear				
Rate of Strain (mm/min)		1.250	1.250	1.250
Strain at peak shear stress (mm)		10.11	9.85	9.58
Peak shear Stress - kPa:		59	95	134

PEAK	
Angle of Shearing Resistance:(0)	37.0
Effective Cohesion - kPa:	19



DP GIONS

01/04/16

Checked Page 1 by:

Date

2 P Granz

01/04/16 Date

Approved Page 1 by:

Contract No.: 30319

Client Ref Number: **8443**

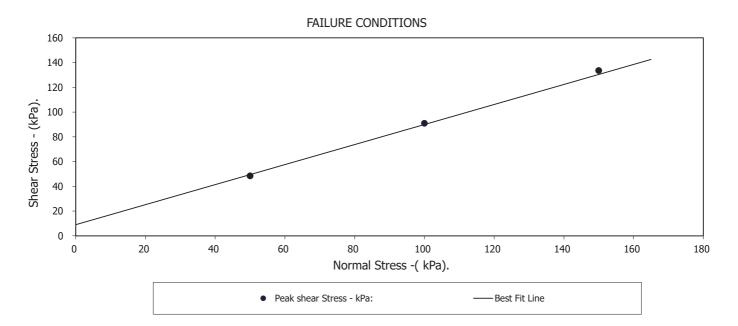


G.C.T.P

BH3/23 A16/0954 Depth (m) from: Borehole: 3.50 Sample Number: Depth (m) to: 0.00

Sample Type:	D			
Particle Density - Mg/m3:	2.65	(Assumed)		
Specimen Tested:	Submerged, Remoulde	d material above 2.00mm re	emoved	
Sample Description:				
Light brown sandy (fine-medium) silty	GRAVEL (fine-coarse/subangul	ar-subrounded)		
STAGE		1	2	3
Initial Conditions				
Height - mm:		24.50	24.50	24.50
Length - mm:		59.90	59.90	59.90
Moisture Content - %:		14	14	14
Bulk Density - Mg/m3:		2.20	2.20	2.20
Dry Density - Mg/m3:		1.94	1.93	1.93
Voids Ratio:		0.3694	0.3709	0.3726
Normal Pressure- kPa		50	100	150
Consolidation				
Consolidated Height - mm:		24.11	23.86	23.60
Shear				
Rate of Strain (mm/min)		1.250	1.250	1.250
Strain at peak shear stress (mm)		10.20	10.06	9.92
Peak shear Stress - kPa:		48	91	134

PEAK	
Angle of Shearing Resistance:(0)	39.0
Effective Cohesion - kPa:	9



DP GIONS

01/04/16

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01/04/16 Date

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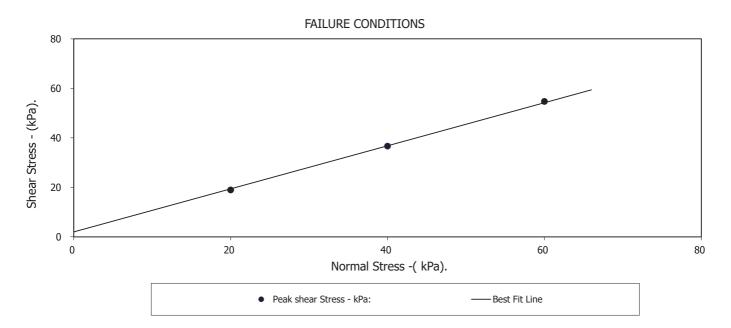
G.C.T.P

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BH3/32 A16/0957 Depth (m) from: 2.00 Borehole: Sample Number: Depth (m) to: 0.00

Sample Type:	D			
Particle Density - Mg/m3:	2.65	(Assumed)		
Specimen Tested:	Submerged, Remoulded	l material above 2.00mm	n removed	
Sample Description:				
Light brown grey sandy (fine-medium) gravelly (fine-coarse/subangula	ar-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 - %:		12	12	12
Bulk Density - Mg/m3:		2.22	2.22	2.22
Dry Density - Mg/m3:		1.97	1.97	1.98
Voids Ratio:		0.3432	0.3425	0.3407
Normal Pressure- kPa		20	40	60
Consolidation				
Consolidated Height - mm:		24.46	24.24	24.03
Shear				
Rate of Strain (mm/min)		1.250	1.250	1.250
Strain at peak shear stress (mm)		10.87	10.49	10.10
Peak shear Stress - kPa:		19	37	55

PEAK	
Angle of Shearing Resistance:(0)	41.0
Effective Cohesion - kPa:	2



2 P Granz

01/04/16

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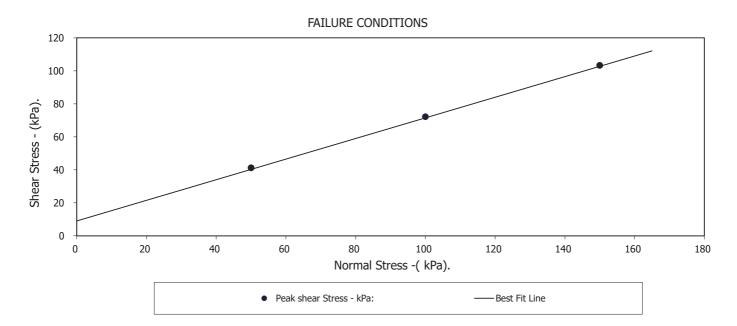
G.C.T.P

1 of 1

BH3/35 A16/0991 Depth (m) from: 1.00 Borehole: Sample Number: Depth (m) to: 0.00

Sample Type:	D			
Particle Density - Mg/m3:	2.65	(Assumed)		
Specimen Tested:	Submerged, Remoulded r	Submerged, Remoulded material above 2.00mm removed		
Sample Description:				
Light brown grey gravelly (fine-coars	se/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 - %:		11	11	11
Bulk Density - Mg/m3:		2.22	2.22	2.22
Dry Density - Mg/m3:		1.99	2.00	2.00
Voids Ratio:		0.3289	0.3276	0.3264
Normal Pressure- kPa		50	100	150
Consolidation				
Consolidated Height - mm:		24.20	23.82	23.44
Shear				
Rate of Strain (mm/min)		1.250	1.250	1.250
Strain at peak shear stress (mm)		10.38	9.95	9.51
Peak shear Stress - kPa:		41	72	103

PEAK	
Angle of Shearing Resistance:(0)	32.0
Effective Cohesion - kPa:	9



DP GIONS

01/04/16

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01/04/16

Approved Page 1 by: Date

Contract No.: **30319**

Client Ref Number: **8443**

G.C.T.P

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