Appendix A.5.1.4

Phase 3 Contract 1

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

January to April 2016

Appendix 13

Geotechnical Laboratory Testing

Lab Schedule 5

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



1 of 1

Report No. R70975 Contract No. 18963

Contract Name: GCTP Phase 3 Contract 1 GL

Customer Galway Co.Co.

Samples Received: 22-02-16 Date Tested: 14-03-16

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
BH3/03	AA49473	0.5	A16/0973	D	472								Dark brown very fibrous PEAT
BH3/03	AA49474	0.5	A16/0974	D	476								Dark brown very fibrous PEAT
BH3/03	AA49475	0.5	A16/0975	В	270								Dark brown very fibrous PEAT
BH3/07	AA49476	0.1	A16/0976	D	261								Dark brown/blackvery fibrous PEAT
BH3/07	AA49477	0.1	A16/0977	D	214								Dark brown/blackvery fibrous PEAT
BH3/07	AA49478	0.1	A16/0978	В	246								Dark brown/blackvery fibrous PEAT
BH3/14	AA39959	0.1	A16/0979	В	18								Dark brown clayey/silty, very sandy, GRAVEL
BH3/15	AA39960	0.2	A16/0980	В	13								Dark brown clayey/silty, sandy, GRAVEL with many cobbles
BH3/15	AA39961	0.4	A16/0981	В	13								Brown silty/clayey sandy GRAVEL
BH3/15	AA39962	0.8	A16/0982	В	8.5								Dark brown slightly clayey/silty, very sandy, GRAVEL
BH3/21	N/A	0.5	A16/0983	В	458	523	NP	NP	N/A	AR	4.4		Dark brown sandy, very gravelly PEAT
BH3/21	N/A	1.0	A16/0984	В	33	62	NP	NP	28	WS	4.4		Light brown silty, sandy, GRAVEL with many cobbles
BH3/21	N/A	1.7	A16/0985	В	14	24	NP	NP	15	WS	4.4		Reddish/brown slightly silty, very sandy, GRAVEL
BH3/22	AA49472	0.5	A16/0986	В	11								Brown slightly clayey/silty, sandy, GRAVEL with many cobbles
BH3/27	AA48872	0.5	A16/0987	В	19	34	18	16	65	WS	4.4	CL	Brown slightly sandy, slightly gravelly, CLAY
Notes:	Preparation:	WS - Wet sie	ved		Sample Type:	B - bulk distu	rbed	Remarks:	•	•			•

U - Undisturbed

AR - As received

H Byrne (Quality Manager)

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NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014 Opinions and interpretations are outside the scope of accreditation.

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

Approved by Page Date 20-04-16

R70975.PIA Tmp: Pl.II Rev 02/10

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. R70976 Contract No. 18963 Contract Name: GCTP Phase 3 Contract 1 GL

Customer Galway Co.Co.

Samples Received: 22-02-16 Date Tested: 14-03-16

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample	Moisture	Liquid	Plastic	Plasticity	% <425m	Preparation	Liquid Limit	Classification (BS5930)	Description
				Туре	Content %	Limit %	Limit %	Index	<425μm		Clause		
BH3/27	AA48873	1.0	A16/0988	В	12	34	18	16	53	WS	4.4	CL	Brown slightly sandy, gravelly, CLAY
BH3/28	AA39957	0.2	A16/0989	В	19	34	NP	NP	51	WS	4.4		Brown slightly sandy, gravelly, SILT
BH3/35	AA39963	0.5	A16/0990	В	13	20	NP	NP	66	WS	4.4		Mottled brown slightly sandy, slightly gravelly, SILT
BH3/35	AA39964	1.0	A16/0991	В	11	23	15	8	62	WS	4.4	CL	Mottled brown slightly sandy, gravelly, CLAY
BH3/36	AA49479	0.1	A16/0992	В	31	48	NP	NP	64	WS	4.4		Brown sandy, slightly gravelly, SILT with some cobbles
BH3/40	AA49469	0.2	A16/0993	В	12	29	16	13	62	WS	4.4	CL	Brown slightly sandy, gravelly, CLAY
BH3/40	AA49470	0.5	A16/0994	В	25	42	NP	NP	46	WS	4.4		Brown slightly sandy, gravelly, SILT with some cobbles
BH3/48	AA49471	0.1	A16/0995	В	29	40	26	14	73	WS	4.4	МΙ	Light brown slightly sandy, slightly gravelly, SILT

WS - Wet sieved Notes: Preparation:

AR - As received

NP - Non plastic

4.3 Cone Penetrometer definitive method

Liquid Limit Clause:

4.4 Cone Penetrometer one point method

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

Sample Type: B - bulk disturbed

H Byrne (Quality Manager)

Approved by Date Page 20-04-16 1 of 1

R70976.PIB Tmp: Pl.II Rev 02/10

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R71741			
size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1			
75	100	COBBLES		BH:	BH3/14					
63	100	OODDELO		Sample No.	AA39959	Lab. Sa	ample No.	A16/0979		
50	89			Sample Type:	В					
37.5	80			Depth (m)	0.10	Custon	ner: Galway Co.C	0.		
28	77			Date Received	22-02-16	Date To	esting started	30-03-16		
20	70			Description:	Dark brown	n clayey/s	silty, very sandy, Gl	RAVEL		
14	64	GRAVEL								
10	60	OIVAVEE		Remarks	Sample size did not meet the re	equirements of BS1377				
6.3	55						5 5	8 22	ις.	ιū
5	53						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20 20	37.5 93 93 93
3.35	48		100							
2	42		90							
1.18	35		80							
0.6	28		% 70 ·	+						
0.425	25	SAND	sins 60							
0.3	21		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.15	16		1tage							
0.063	13		arcen 30							
			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		AB	ejene	28-04-16	1 of 1
						Persons a	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. R71578			
size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1			
75	87	COBBLES		BH:	BH3/15					
63	72	OODDELO		Sample No.	AA39960	Lab. Sa	ample No.	A16/0980		
50	65			Sample Type:	В					
37.5	56			Depth (m)	0.20	Custon	ner: Galway Co.C	0.		
28	49			Date Received	22-02-16	Date To	esting started	30-03-16		
20	42			Description:	Dark brown	n clayey/s	silty, sandy, GRAVE	L with many co	obbles	
14	37	GRAVEL								
10	32	GIVAVLL		Remarks	Sample size did not meet the re	equirements of BS1377	7			
6.3	27						5 53	8 8	ις.	2
5	25						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	21		100							
2	17		90							
1.18	13		80							
0.6	10		% 70 ·							
0.425	9	SAND	sinis 60							
0.3	8		6 50 ·							
0.15	7		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.063	6		ceni							
			20							
		SILT/CLAY	10							
		OIL 170L7 (1	0							
			0.0	0.0	01	0.01	0.1	1	10	100
				CLA	1	SILT	Sieve size (mm)	SAND	GRAVEL	
							Approved by:		Date:	Page no:
		IGSL Lt	d Materi	als Laborate	ory		110	you	19-04-16	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





particle	%			Contract No:	18963	Report	No. R71492	•		
size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1			
75	100	COBBLES		BH:	BH3/15					
63	100	OODDELO		Sample No.	AA39962	Lab. Sa	ample No. A16/0	982		
50	92			Sample Type:	В					
37.5	89			Depth (m)	0.80	Custom	ner: Galway Co.Co.			
28	84			Date Received	22-02-16	Date Te	esting started 30)-03-16		
20	77			Description:	Dark brown	slightly (clayey/silty, very sandy, GI	RAVEL		
14	68	GRAVEL								
10	59	OIVAVEE		Remarks						
6.3	46						5 5 5	- ω	ις	ιū
5	40						0.063 0.15 0.3 0.425	1.18	3.35 6.3 10 14 20 28	37.5 50 63 63
3.35	35		100							ПИШП
2	27		90							
1.18	20		80							
0.6	14		<u> </u>	 						
0.425	11	SAND	ils 60							
0.3	8		6 50 ·							
0.15	4		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.063	3		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	
		1001 : 1					Approved by:	Da	ate:	Page no:
		IGSL Lt	d Materi	als Laborato	ory		A Regene		13-04-16	1 of 1
						Persons a	authorised to approve report: JB	arrett (Dep. 0	Quality Manager) H Byrn	e (Quality Manager

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report N	o. R71127			
size	passing			Contract:	GCTP Pha	se 3 - Con	tact 1			
75	100	COBBLES		BH:	BH3/21					
63	100	OODBLLO		Sample No.	N/A	Lab. Sam	ple No.	A16/0983		
50	100			Sample Type:	В					
37.5	100			Depth (m)	0.50	Custome	: Galway Co.0	Co.		
28	100			Date Received	22-02-16		ting started	15-03-16		
20	100			Description:	Dark brow	n sandy, GF	RAVEL			
14	100	GRAVEL								
10	97	0.0.0		Remarks	Peat					
6.3	58						0.15	3 25 3 18	35	5.
5	45		100				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	3 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
3.35	27		100							
2	14		90							
1.18	7		® 80	† 					 	
0.6	2		Percentage passing (%) 80 90 90 90 90 90 90 90 90 90 90 90 90 90	+ + + + + + + + + + + + + + + + + + + +					 	
0.425	1	SAND	iss 60	+ + + + + + + + + + + + + + + + + + + +					 	
0.3	1		<u>8</u> 50	 					 	
0.15	0		ob 1tage							
0.063	0		90 arcen							
			و 30 20							
									7	
		SILT/CLAY	10	1						
			0 0.0	0001 0.0	001	0.01	0.1	1	10	100
				CLA			Sieve size (mm)	SAND	GRAVEL	
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Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R71178									
size	passing			Contract:	GCTP Ph	nase 3 - Co	ontact 1									
75	73	COBBLES		BH:	BH03/21											
63	73	OODDLLO		Sample No.	N/A	Lab. Sa	ample No.	A16/0984								
50	61			Sample Type:	В											
37.5	56			Depth (m)	1.00	Custom	ner: Galway Co.0	Co.								
28	50			Date Received	22-02-16	Date Te	esting started	14-03-16	ı							
20	44			Description:	Light brov	wn silty, sai	indy, GRAVEL with	many cobbles								
14	39	GRAVEL														
10	36	GIVAVLL		Remarks	PEAT Sample size did no	ot meet the requirements of B	BS1377									
6.3	32						5 5	8 22	ري	ις						
5	31			_			0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 14 20 20	920 37 0						
3.35	26		100													
2	22		90	P 												
1.18	19		80) 												
0.6	14		% 70	o 												
0.425	11	SAND	ssin 60	o 												
0.3	10		6 50 6 50	o												
0.15	9		Percentage passing (%) 20 90 90 90 90 90 90 90 90 90 90 90 90 90													
0.063	8		cen 7													
			20													
		SILT/CLAY	10) 												
			1) +						 						
			C		0.001	0.01	0.1	1	10	100						
				C	LAY	SILT	Sieve size (mm)	SAND	GRAVEL							
	1		d Mata	riolo I ober			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. R71179			
size	passing			Contract:	GCTP Pha	se 3 - Co	ontact 1			
75	100	COBBLES		BH:	BH03/21					
63	100	OODDEEO		Sample No.	N/A	Lab. Sa	ample No. A	16/0985		
50	100			Sample Type:	В					
37.5	100			Depth (m)	1.70	Custom	ner: Galway Co.Co.			
28	98			Date Received	22-02-16		esting started	14-03-16		
20	95			Description:	Reddish/br	own sligh	tly silty, very sandy, G	RAVEL		
14	89	GRAVEL								
10	83	OIVWLL		Remarks						
6.3	75						5 5	8 8		rō.
5	71		400				0.063	0.425	2 3.35 6.3 20 20	930 930 930 930
3.35	61		100							
2	49		90							
1.18	36		© 80							
0.6	18		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00	+ + + + + + + + + + + + + + + + + + + +						
0.425	11	SAND	iss 60	-						
0.3	6		<u>8</u> 50	1						
0.15	4) tage 40							
0.063	2		ace 30							
			20							
		SILT/CLAY	10					1111111		
			0							
			0.	.0001 0.0		0.01	0.1	1	10	100
				CLA	<i>(</i>	SILT	Sieve size (mm) S.	AND	GRAVEL	
				iala Labausts			Approved by:		Date:	Page no:
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						Persons a	authorised to approve report	: J Barrett (De	o. Quality Manager) H Byr	ne (Quality Manager

Determination of Particle Size Distribution





	I	I								
particle	%			Contract No:	18963	Report No.				
size	passing			Contract:	GCTP Pha	se 3 - Conta	ct 1			
75	72	COBBLES		BH:	BH03/22					
63	68			Sample No.	AA49472	Lab. Samp	le No.	A16/0986		
50	62			Sample Type:	В					
37.5	59			Depth (m)	0.30	Customer:	Galway Co.Co	D.		
28	50			Date Received	22-02-16	Date Testir	-	15-03-16		
20	44			Description:	Brown sligh	htly clayey/sil	ty, sandy, GRA\	/EL with many	cobbles	
14	40	GRAVEL								
10	37	OTTAL		Remarks	Sample size did not meet the	requirements of BS1377				
6.3	33						53	8 25		τċ
5	31		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 20 20 80 80 80 80 80 80 80 80 80 80 80 80 80	37. 530. 53
3.35	27		100							
2	21		90							
1.18	17		80							
0.6	12		8) 70	+						
0.425	10	SAND	iss 60	+ + + + + + + + + + + + + + + + + + + +						
0.3	9		e 50							
0.15	6		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.063	3		cen							
			20						1	
		SILT/CLAY	10	+ + + + + + + + + + + + + + + + + + + +						
			0		 					
			0.		001	0.01	0.1	1	10	100
				CLA	Υ	SILT Si	eve size (mm)	SAND	GRAVEL	
			d Matar	iala Labarat			Approved by:		Date:	Page no:
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						Persons autho	orised to approve rep	ort: J Barrett (De	p. Quality Manager) H Byr	ne (Quality Mana

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R71493			
size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1			
75	100	COBBLES		BH:	BH3/27					
63	100	OODDELO		Sample No.	AA48872	Lab. Sa	ample No.	A16/0987		
50	100			Sample Type:	В					
37.5	97			Depth (m)	0.50	Custon	ner: Galway Co.C	co.		
28	93			Date Received	22-02-16	Date To	esting started	05-04-16		
20	90			Description:	Brown sligh	tly sandy	, slightly gravelly, 0	CLAY		
14	87	GRAVEL								
10	84	OIVAVEE		Remarks						
6.3	80						5 53	8 25		3.
5	78						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20 20	37.5 37.5 63 63
3.35	75		100							
2	71		90 -							
1.18	67		80 -							
0.6	62		% 70 ·							
0.425	59	SAND	sing 60 -							
0.3	57		50 - ba					1		
0.15	51		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.063	44		cen							
0.037	38									
0.026	36		20 -							
0.017	34	SILT/CLAY	10 -							
0.010	29	OIL 170L7(1	0 -							
0.007	27		0.0	0.0	01	0.01	0.1	1	10	100
0.005	23			CLA	/	SILT	Sieve size (mm)	SAND	GRAVEL	
0.001	17									
		IGSL I +	d Matori	als 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	ne (Quality Manager

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R71579		•	
size	passing			Contract:	GCTP Pha	se 3 - Co	ontact 1			
75	100	COBBLES		BH:	BH3/27					
63	100			Sample No.	AA48873	Lab. Sa	ample No.	A16/0988		
50	100			Sample Type:	В					
37.5	93			Depth (m)	1.00	Custon	ner: Galway Co.	Co.		
28	84			Date Received	22-02-16		esting started	05-04-16		
20	74			Description:	Brown sligi	htly sandy	v, gravelly, CLAY			
14	71	GRAVEL								
10	68	OIGWEE		Remarks						
6.3	63						63	0.3 1.425 0.6 1.18	35	ιċ
5	61		100				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	7630
3.35	57		100							
2	53		90							
1.18	49		80 ©						 	
0.6	45		_{စ်} 70	+ + + + + + + + + + + + + + + + + + + +						
0.425	44	SAND	issiu 60							
0.3	42		<u>α</u> 50							
0.15	37		Percentage passing (%) 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0							
0.063	29		90 ace							
0.036	26		س 20 20							
0.026	25									
0.017	23	SILT/CLAY	10							
0.010	20		0	0001 0.0	01	0.01	0.1	1	10	100
0.007	18		0.0					'		100
0.005	16			CLA	,	SILT	Sieve size (mm)	SAND	GRAVEL	
0.001	11						Approved by	/:	Date:	Page no:
		IGSL Ltd	d Materi	ials Laborato	ory		7 6	Sejene	20-04-16	1 of 1
						Persons a	authorised to approve r	eport: J Barrett (De	p. Quality Manager) H By	ne (Quality Manage

Determination of Particle Size Distribution





									<u> </u>	
particle	%			Contract No:	18963	Report No.				
size	passing		ı	Contract:	GCTP Pha	se 3 - Conta	ct 1			
75	100	COBBLES	ı	BH:	BH3/28					
63	100		ı	Sample No.	AA39957	Lab. Samp	le No.	A16/0989		
50	100		ı	Sample Type:	В					
37.5	84		ı	Depth (m)	0.20	Customer:	Galway Co.0	Co.		
28	79		ı	Date Received	22-02-16	Date Testir	•	30-03-16		
20	77		ı	Description:	Brown sligh	ntly sandy, gr	avelly, SILT			
14	72	GRAVEL	ı							
10	70	OTTAL	ı	Remarks	Sample size did not meet the	requirements of BS1377				
6.3	68						63 15	3 25 3 18	3. 35	rč.
5	66		100				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20 20	930.7
3.35	64		100							
2	61		90							
1.18	58		<u>\$</u>	+ + + + + + + + + + + + + + + + + + + +						
0.6	52		°) 70	+ + + + + + + + + + + + + + + + + + + +						
0.425	50	SAND	ssin 60	+ + + + + + + + + + + + + + + + + + + +						
0.3	47		ed 50							
0.15	41		14ag							
0.063	34		Percentage passing (%) 80 00 00 00 00 00 00 00 00 00 00 00 00							
0.038	27		ص ع 20							
0.027	24									
0.017	22	SILT/CLAY	10							
0.010	19		0		1 1 1 1		0.4		10	''
0.007	15		0.		001	0.01	0.1	1	10	100
0.005	13			CLA	Υ	SILT Sie	eve size (mm)	SAND	GRAVEL	
0.002	7						Approved by		Date:	Page no:
		IGSL Lt	d Mater	ials Laborat	ory		* *	Signe	19-04-16	
							17.8		p. Quality Manager) H Byr	1 of 1

Determination of Particle Size Distribution





particle	%		(Contract No:	18963	Report	t No. R71582
size	passing		(Contract:	GCTP Phas	se 3 - Co	Contact 1
75	100	COBBLES	I	BH:	BH3/35		
63	100		;	Sample No.	AA39963	Lab. Sa	ample No. A16/0990
50	95		;	Sample Type:	В		
37.5	90		I	Depth (m)	0.50	Custom	mer: Galway Co.Co.
28	87		I	Date Received	22-02-16		esting started 05-04-16
20	85		I	Description:	Mottled bro	wn slight	itly sandy, slightly gravelly, SILT
14	82	GRAVEL					
10	80			Remarks			
6.3	77						0.063 0.15 0.425 0.6 1.18 1.18 2 2 3.35 6.3 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0
5	75		100 т				0.0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
3.35	72						
2	68		90 -				
1.18	64		€ 80 € 80 +	-			
0.6	60	0.4115	_{စိ}) 70 -	-			
0.425	58	SAND	388ir				
0.3	56		<u>8</u> 50 -				
0.15	50		ntag				
0.063	39		Percentage passing (%) 80 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0				
0.036	34		ق 20 -				
0.026 0.017	33 29		10 -				
0.017	29 25	SILT/CLAY	0				
0.010	22		0.00	0.00)1	0.01	0.1 1 10 100
0.007	20		0.00	CLAY		SILT	Sieve size (mm) SAND GRAVEL
0.003	13			CLAT		SIL I	Oleve Size (IIIII) SAND SIMVEL
0.002							Approved by: Date: Page no:
		IGSL Ltd	d Materia	als Laborato	ry		# Eyane 20-04-16 1 of 1
	Persons authorised to approve report: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)						

Determination of Particle Size Distribution





	T	1							
particle	%		Contra	ct No: 18963	Report !	No. R71496			
size	passing		Contra	ct: GCTP F	Phase 3 - Co	ntact 1			
75	100	COBBLES	BH:	BH3/35					
63	100	OODDELC	Sample	e No. AA3996	4 Lab. Sa	mple No.	A16/0991		
50	92		Sample	е Туре: В					
37.5	87		Depth	(m) 1.00	Custom	er: Galway Co.Co.			
28	78		Date R	eceived 22-02-1		sting started	05-04-16		
20	75		Descri	otion: Mottled	brown slightly	y sandy, gravelly, CL	_AY		
14	72	GRAVEL							
10	68	OIVWLL	Remar	ks					
6.3	65					5 33	8 8	22	rċ
5	64		400			0.063	0.425 0.6 1.18	2 3.35 6.3 14 20	93.0 93.0 93.0 93.0
3.35	60		100						
2	56		90						
1.18	53		<u> </u>						
0.6	49		× 70 + + +						
0.425	48	SAND	ig 60 +						
0.3	45		50					1	
0.15	40		90				1111111		
0.063	32		ceu						
0.037	28								
0.026	26		20						
0.017	24	SILT/CLAY	10						++++
0.010	21	0.21702711	0 +						
0.007	19		0.0001	0.001	0.01	0.1	1	10	100
0.005	16			CLAY	SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	12								
		IGSL I to	d Materials L	ahoratory		Approved by:		Date:	Page no:
		IOOL LU	u materiais L	aboratory		4B	ique_	20-04-16	1 of 1
·					Persons a	uthorised to approve repo	rt: J Barrett (De	p. Quality Manager) H By	rne (Quality Manage

Determination of Particle Size Distribution





	0.1									
particle	%			Contract No:	18963	Report No.				
size	passing		ı	Contract:		se 3 - Conta	ct 1			
75	100	COBBLES	ı	BH:	BH3/36					
63	88		ı	Sample No.	AA49749	Lab. Samp	le No.	A16/0992		
50	88		ı	Sample Type:	В					
37.5	88		ı	Depth (m)	0.10	Customer:	Galway Co.C	Co.		
28	87		ı	Date Received	22-02-16	Date Testir	•	15-03-16		
20	83		ı	Description:	Brown san	dy, slightly gr	avelly, SILT wi	th some cobble	S	
14	81	GRAVEL	ı							
10	79		ı	Remarks	Sample size did not meet the	requirements of BS1377				
6.3	77						63	3 25 3 18	35	5.
5	76		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	28 37. 53 63
3.35	72		100							
2	70		90							
1.18	68		<u> </u>							
0.6	66		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00	+						
0.425	64	SAND	ils 60							
0.3	61		05 pa					<u> </u>		<u> </u>
0.15	44		tage 40	1						
0.063	32		Cen.							
0.039	25			1						
0.028	21		20							
0.018	19	SILT/CLAY	10							+++++++
0.010	16	OIL 170LA1	0							
0.007	13		0.	0001 0.0	001	0.01	0.1	1	10	100
0.005	11			CLA	Y	SILT Sie	eve size (mm)	SAND	GRAVEL	
0.002	7									
		1001 14	d Matar	iala Labarat	O.K.) /		Approved by	:	Date:	Page no:
		IGSL LI	u water	ials Laborat	ory		A B	Ejene	01-04-16	1 of 1
						Persons autho	rised to approve re	port: J Barrett (De	p. Quality Manager) H By	rne (Quality Manac

Determination of Particle Size Distribution





particle	%		Со	ntract No:	18963	Report	No. R71497		•	
size	passing		Co	ontract:	GCTP Phas	se 3 - Co	ontact 1			
75	100	COBBLES	BH	l :	BH3/40					
63	100		Sa	mple No.	AA49469	Lab. Sa	ample No.	A16/0993		
50	100		Sa	mple Type:	В					
37.5	98		De	epth (m)	0.15	Custom	ner: Galway Co	.Co.		
28	91		Da		22-02-16		esting started	05-04-16	;	
20	81		De	escription:	Brown sligh	ntly sandy	, gravelly, CLAY			
14	79	GRAVEL								
10	76	OIVIVEE	Re	emarks						
6.3	73						63	25	35	rč.
5	71		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	238 230 230 230 248
3.35	66		100							
2	61		90							1
1.18	57		80							
0.6	52		8 70 							
0.425	50	SAND	.ig 60 							
0.3	48		<u>8</u> 50 —							
0.15	43		Percentage passing (%) 80 - 20 - 20 - 20 - 20 - 20 - 20 - 20 -							
0.063	38		9 30 							
0.036	36									
0.026	34		20							
0.016	32	SILT/CLAY	10							
0.010	28		0 +			1111				
0.007	26		0.000	1 0.00	1	0.01	0.1	1	10	100
0.005	25			CLAY		SILT	Sieve size (mm	n) SAND	GRAVEL	
0.001	16									
		IGSL Ltd	d Material	s Laborato	rv		Approved b		Date:	Page no:
					· y		43	Eyene	20-04-16	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	t No. R71188	
size	passing			Contract:	GCTP Pha	se 3 - Co	Contact 1	
75	91	COBBLES		BH:	BH3/40			
63	91			Sample No.	AA49469	Lab. Sa	ample No. A16/0994	
50	91			Sample Type:	В			
37.5	86			Depth (m)	0.50	Custom	mer: Galway Co.Co.	
28	83			Date Received	22-02-16		esting started 05-04-16	
20	80			Description:	Brown sligh	htly sandy	y, gravelly, SILT with some cobbles	
14	77	GRAVEL						
10	76	OIGNEE		Remarks				
6.3	70						0.15 0.15 0.3 0.3 0.6 1.18 2.2 5.3 5.3 5.3 5.3 5.3 7.5 5.5 6.3	
5	68		100	_			0.063 0.15 0.3 0.425 0.6 1.18 2 3.35 5.3 10 14 14 20 28 3.35 5.3 6.3 7.5 6.3	
3.35	60							
2	55		90					
1.18	52		80 ©					
0.6	47		<u>ိ</u> 70	† 				
0.425	44	SAND	assir 09					
0.3	40		<u>\delta} 50</u>	1				
0.15	31		04 uta	 				
0.063	22		Percentage passing (%) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	 				
0.040	19		<u>مّ</u> 20					
0.028 0.018	17 17		10					
0.018	17	SILT/CLAY	0					
0.010	13		_	0001 0.0	 01	0.01	0.1 1 10 10	0
0.007	11		0.0	CLA		SILT	Sieve size (mm) SAND GRAVEL	
0.002	8			OLA		OIL I	OICTE SIZE (IIIII) OAND OICTE	
3.002							Approved by: Date: Page no:	
		IGSL Ltd	d Materi	als Laborato	ory		1 of	
	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. R71618			
size	passing			Contract:	GCTP Pha	se 3 - Co	ontact 1			
75	100	COBBLES		BH:	BH3/48					
63	100	0055220		Sample No.	AA49471	Lab. Sa	ample No.	A16/0995		
50	100			Sample Type:	В					
37.5	95			Depth (m)	0.10	Custom	ner: Galway Co.C	o.		
28	84			Date Received	22-02-16		esting started	05-04-16		
20	80			Description:	Light brown	n slightly s	sandy, slightly grav	elly, SILT		
14	79	GRAVEL								
10	77	OTTALL		Remarks						
6.3	75						53	3 3 8	35	rċ.
5	74		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 14 20	37.5 50 53 63
3.35	72		100							
2	70		90							
1.18	68		80	† 						
0.6	65		Nercentage passing (%) 20 09 09 30 09 09 09 09 09 09 09 09 09 09 09 09 09	+						
0.425	64	SAND	iss 60							
0.3	61		ο 50							
0.15	53		40							
0.063	42		30 scen							
0.037	36									
0.026	33		20							
0.017	32	SILT/CLAY	10							
0.010	27		0							
0.007	24		0.0	0.0	01	0.01	0.1	1	10	100
0.005	22			CLA	<i>(</i>	SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	13								T= .	
		IGSL Lt	d Materi	als Laborate	orv		Approved by:		Date:	Page no:
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						Persons a	authorised to approve re	port: J Barrett (De	p. Quality Manager) H Byr	ne (Quality Manag

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. R71414 Contract GCTP Phase 3 - Contract 1

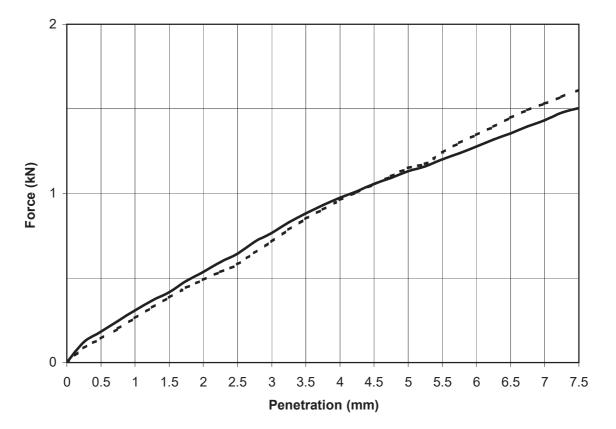
Contract No. 18963 Customer

Galway Co.Co.

Date received 22-02-16 Date Tested 08-04-16

BH/TP No. BH3/14 Sample No. AA39959 Type: B

Depth (m) 0.10 Lab sample No. A16/0979



Key: ----- Base

Description: Dark brown clayey/silty, very sandy, GRAVEL						
Initial Condition: Soaked 4 Days						
Moisture Content (%):	28	Bulk Density (Mg/m ³):	1.84			
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.44			
% Material >20mm:	29					
Method of compaction: Static Compaction Method 2						

Test Result	Тор	Base	
CBR %	5.7	5.8	
Moisture	28	27	
Content %	20	21	

Persons authorized to approve reports

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

IGSL Ltd Materials Laboratory

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IGSL Ltd

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. R71415 Contract GCTP Phase 3 - Contract 1

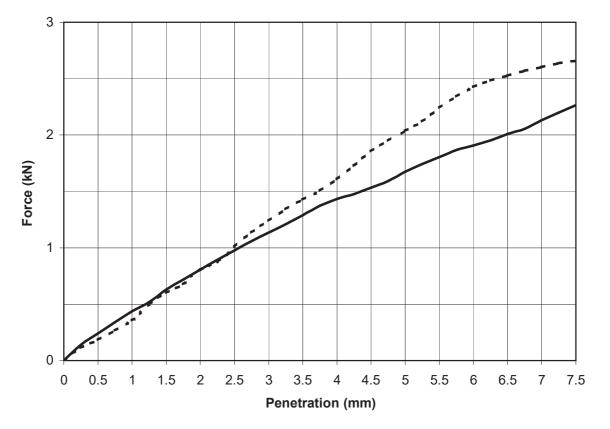
Contract No. 18963 Customer

Galway Co.Co.

Date received 22-02-16 **Date Tested** 08-04-16

BH/TP No. Sample No. В BH3/15 AA39961

Depth (m) 0.40 Lab sample No. A16/0981



Key: Top

Description: Brown silty/clayey sandy GRAVEL Initial Condition: Soaked 4 Days Bulk Density (Mg/m³): Moisture Content (%): 19 1.97 Dry Density (Mg/m³): Surcharge (kg): 4 1.66 % Material >20mm: 23 Method of compaction: Static Compaction Method 2

R71415.BH3.15@0.40m.CBR

Test Result	Тор	Base	
CBR %	8	10	
Moisture	19	18	
Content %	10		

Persons authorized to approve reports

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

11-04-16

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Approved by Date Page No. 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. R71416 Contract GCTP Phase 3 - Contract 1

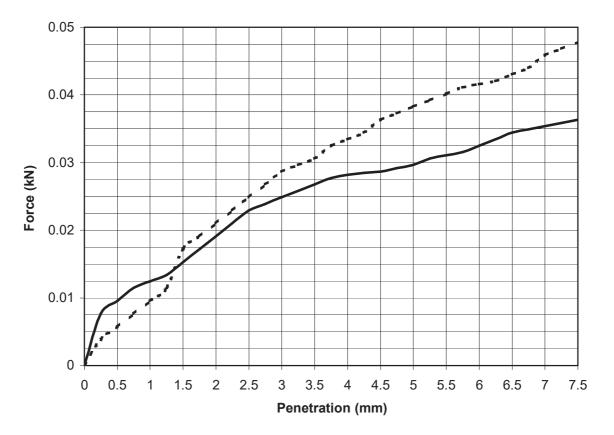
Contract No. 18963 Customer

Galway Co.Co.

Date received 22-02-16 Date Tested 08-04-16

BH/TP No. BH3/21 Sample No. N/A Type: B

Depth (m) 0.50 Lab sample No. A16/0983



Key: ----- Base

Description: Dark brown sandy, very gravelly PEAT						
Initial Condition:	Unsoaked					
Moisture Content (%):	275	Bulk Density (Mg/m ³):	1.08			
Surcharge (kg):	4	Dry Density (Mg/m ³):	0.29			
% Material >20mm:	16					
Method of compaction:	Static Cor	npaction Method 2				

Test Result	Тор	Base
CBR %	0.2	0.2
Moisture	278	272
Content %	210	212

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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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. R7	1417 Contrac	act GCTP Phase 3 - Contract 1
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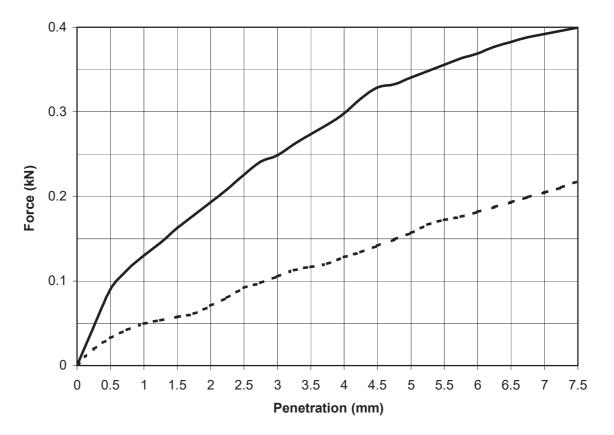
Contract No. 18963 Customer

Galway Co.Co.

Date received 22-02-16 Date Tested 08-04-16

BH/TP No. BH3/27 Sample No. AA48873 Type: B

Depth (m) 1.00 Lab sample No. A16/0988



Key: ----- Base

Description: Brown sli	ghtly sandy	, gravelly, CLAY		
Initial Condition:	Soaked 4	1 Days		
Moisture Content (%):	12	Bulk Density (Mg/m ³):	2.24	
Surcharge (kg):	4	Dry Density (Mg/m ³):	2.01	
% Material >20mm:	25			
Method of compaction:	Static Co	mpaction Method 2		

Test Result	Тор	Base
CBR %	1.7	0.8
Moisture	12	12
Content %	12	12

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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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.	R71418	Contract	GCTP Phase 3 - Contract 1
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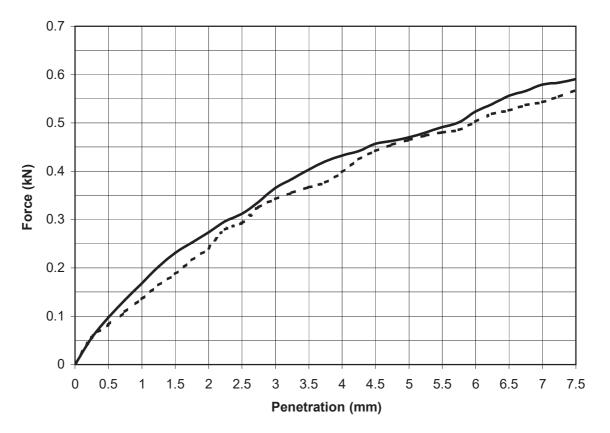
18963 Contract No. Customer

Galway Co.Co.

Date received 22-02-16 Date Tested 08-04-16

BH/TP No. BH3/28 Sample No. AA39957 Type: В

Depth (m) 0.20 A16/39957 Lab sample No.



Key: - Top ----- Base

Description: Brown slightly sandy, gravelly, SILT				
Initial Condition:	Soaked 4	Days		
Moisture Content (%):	25	Bulk Density (Mg/m ³):	1.88	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.51	
% Material >20mm:	16			
Method of compaction:	Static Co	mpaction Method 2		

Test Result	Тор	Base
CBR %	2.4	2.3
Moisture	24	26
Content %	27	20

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. R71421 Contract GCTP Phase 3 - Contract 1

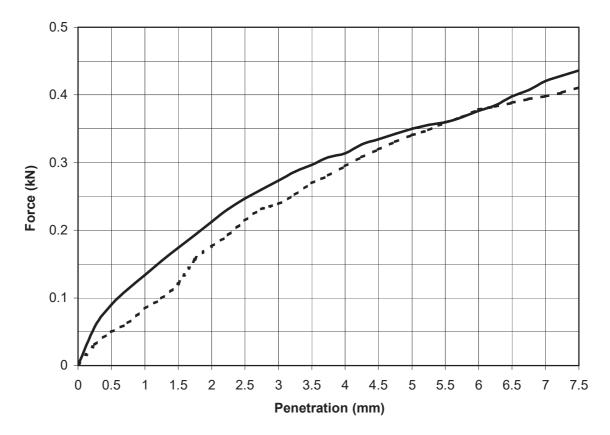
Contract No. 18963 Customer

Galway Co.Co.

Date received 22-02-16 Date Tested 08-04-16

BH/TP No. BH3/40 Sample No. AA49469 Type: B

Depth (m) 0.15 Lab sample No. A16/0993



Key: ——Top ------ Base

Description: Brown sli	ghtly sandy	, gravelly, CLAY		
Initial Condition:	Soaked 4	l Days		
Moisture Content (%):	28	Bulk Density (Mg/m ³):	1.82	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.43	
% Material >20mm:	17			
Method of compaction:	Static Co	mpaction Method 2		

Test Result	Тор	Base
CBR %	1.9	1.7
Moisture	28	27
Content %	20	21

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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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.	R71422	Contract	GCTP Phase 3 - Contract 1
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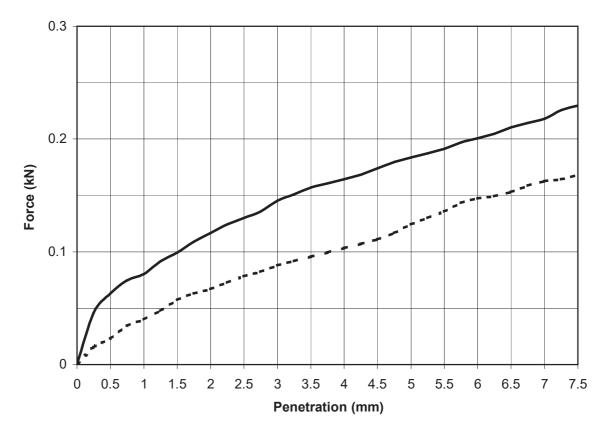
Contract No. 18963 Customer

Galway Co.Co.

Date received 22-02-16 Date Tested 08-04-16

BH/TP No. BH3/48 Sample No. AA49471 Type: B

Depth (m) 0.15 Lab sample No. A16/49471



Key: ----- Base

Description: Light brow	wn slightly s	sandy, slightly gravelly, SILT		
Initial Condition:	Soaked 1	I4 Day		
Moisture Content (%):	33	Bulk Density (Mg/m ³):	1.80	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.35	
% Material >20mm:	8.8			
Method of compaction:	Static Co	mpaction Method 2		

Test Result	Тор	Base
CBR %	1.0	0.6
Moisture	33	34
Content %		04

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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IGSL Ltd Materials Laboratory M7 Business Park Naas Co.Kildare 045 846176

TEST REPORT Determination of MCV / moisture content Relation of a soil

Tested in accordance with BS1377-4:1990, clause 5.5

Report No. R71518 Contract GCTP Phase 3 - Contract 1 GI

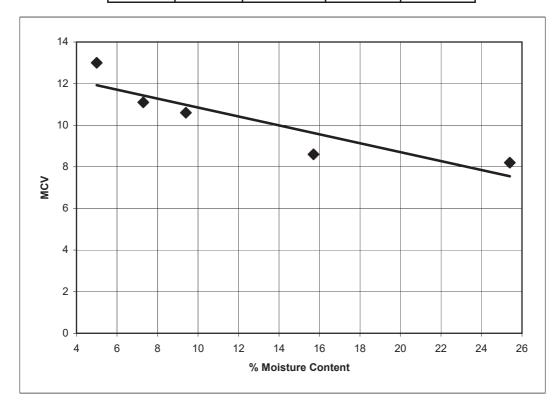
Contract No. 18963 Customer Galway Co.Co.

Date received 22-02-16 Date Tested 05-04-16

BH/TP No. BH3/36 Sample No. AA49479 Type: B

Depth (m) 0.10 Lab sample No. A16/0992

MC% 25 16 9.4 7.3 5.0 MCV 8.2 8.6 10.6 11.1 13



% material >20mm 4.7

Persons authorized to approve reports

J Barrett (Deputy 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 Moisture Condition Value at Natural Moisture Content



Tested in accordance with BS1377:Part 4:1990, clause 5.4

Report No.	R71423
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Contract No. 18963

Contract Name: GCTP Phase 3 - Contract 1

Customer: Galway Co.Co.

BH/TP BH3/40

Sample No. AA49470

Depth (m) 0.50

Sample Type: B

Lab Sample No. A16/0994

Source (if applicable) unknown

Material Type (if applicable):

Sample Received: 12-02-16

Date Tested: 08-04-16

Sample Cert: N/A

Moisture Content (%): 28

% Particles > 20mm 22

(By dry mass):

MCV: 5.1

Interpretation of Plot: Steepest Straight Line

Description of Soil: Dark brown sandy gravelly SILT with roothairs

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)

IGSL Ltd Materials Laboratory

Approved by	Date	Page
A Byane	12-04-16	1 of 1





Contract Number: 30537

Client's Reference: **18963 PO: 8576** Report Date: **26-04-2016**

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: **07-04-2016**Date Commenced: **07-04-2016**Date Completed: **26-04-2016**

Test Description

CUD 100mm Consolidated undrained triaxial compression test on a Single Specimen with
Multistage Loading with the measurement of pore water pressure including saturation and consolidation, test duration FOUR days.

BS1377: Part 8: Clause 7: 1990 - @ Non Accredited Test

Remoulding Specimen
- @ Non Accredited Test

Extra over items for test duration in excess of four days.

17

Disposal of Samples on Project

Notes: Observations and Interpretations are outside the UKAS Accreditation

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

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

Approved Signatories:

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

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

BS 1377: Part 8: 1990

Specimen Details

Borehole		BH3/27
Sample No.		A16/0987
Depth	from(m)	0.5
Depth	to(m)	0.50
Date		26/04/2016
Disturbed / Undisturbed		2.5kg Recompacted

Description of Specimen

Light greyish brown sl fine sub-angular gravelly sl fine sandy silty soft CLAY

Initial Specimen Conditions

Height	mm	205.00
Diameter	mm	102.00
Area	mm^2	8171.28
Volume	cm ³	1675.11
Mass	g	4162.90
Dry Mass	g	3564.60
Density	Mg/m ³	2.49
Dry Density	Mg/m ³	2.13
Moisture Content	%	17
Specific Gravity	kN/m ³	2.65
(assumed	/measured)	assumed

Final Specimen Conditions

Moisture Content	%	9
Density	Mg/m ³	2.51
Dry Density	Mg/m³	2.31

DP GovS Checked and Approved By

26/04/16 Date

> Client Ref 18963 Contract No

> > 30537

Г.Р



G.C.T.P

BS 1377: Part 8: 1990

Specimen Details

Borehole		BH3/27
Sample No.		A16/0987
Depth Depth	from(m)	0.5
Depth	to(m)	0.50

Test Setup

Date started	14/04/2016
Date Finished	25/04/2016
Top Drain Used	У
Base Drain Used	y
Side Drains Used	У
Pressure System Number	P2
Cell Number	C2

Saturation

Cell Pressure Incr.	kPa	100.00
Back Pressure Incr.	kPa	95.00
Differential Pressure	kPa	5.00
Final Cell Pressure	kPa	400.00
Final Pore Pressure	kPa	399.00
Final B Value		1.04

Consolidation

Effective Pressure	kPa	50.00	100.00	150.00
Cell Pressure	kPa	400.00	400.00	400.00
Back Pressure	kPa	350.00	300.00	250.00
Excess Pore Pressure	kPa	49.00	80.00	105.00
Pore Pressure at End	kPa	350.00	300.00	250.00
Consolidated Volume	cm ³	1584.21	1562.01	1544.41
Consolidated Height	mm	201.29	194.57	186.46
Consolidated Area	mm ²	7875.67	8028.51	8282.87
Vol. Compressibility	m ² /MN	0.15504	0.04671	0.04507
Consolidation Coef.	m²/yr.	0.11726	0.12759	0.18629

DP Grows Checked and Approved By

26/04/16 Date

Client Ref 18963 Contract No

G.C.T.P

30537

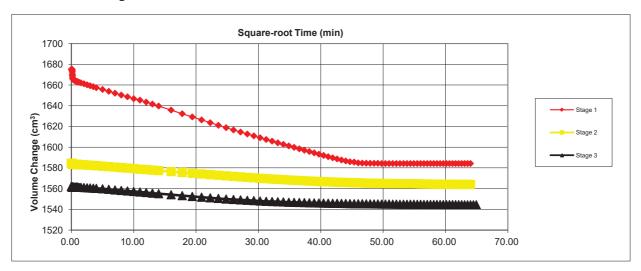


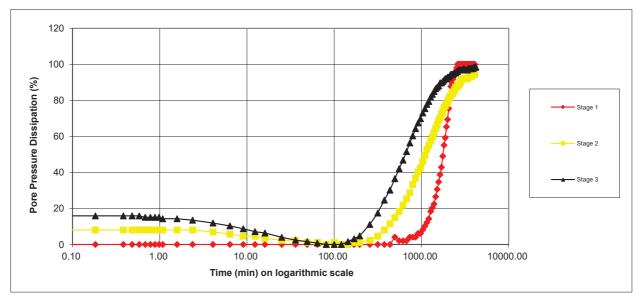
BS 1377: Part 8: 1990

Specimen Details

Borehole		BH3/27
Sample No.		A16/0987
Depth	from(m)	0.5
Depth	to(m)	0.50

Consolidation Stage







26/04/16 Date

> Client Ref 18963 Contract No

G.C.T.P



30537

BS 1377: Part 8: 1990

Specimen Details

Borehole		BH3/27
Sample No.		A16/0987
Depth	from(m)	0.5
Depth	to(m)	0.50

Shearing

Initial Cell Pressure	kPa	400	400	400	
Initial Pore Pressure	kPa	350	300	250	
Rate of Strain	mm/min	0.0024	0.0025	0.0035	
Max Deviator Stress					
Axial Strain		4.203	9.036	12.078	
Axial Stress	kPa	149.978	356.74	633.61	
Cor. Deviator stress	kPa	147.008	352.28	629.07	
Effective Major Stress	kPa	177.008	435.28	823.07	
Effective Minor Stress	kPa	31.000	83.00	194.00	
Effective Stress Ratio		5.710	5.244	4.24	
s'	kPa	104.004	259.14	508.53	
t'	kPa	73.004	176.14	314.53	
Max Effective Priciple Stress Ratio					
Axial Strain		4.054	8.887	9.702	
Axial Stress	kPa	147.897	355.625	590.393	
Cor. Deviator stress	kPa	143.938	351.181	585.990	
Effective Major Stress	kPa	173.938	433.181	726.990	
Effective Minor Stress	kPa	30.000	82.000	141.000	
Effective Stress Ratio		5.798	5.283	5.156	
s'	kPa	101.969	257.590	433.995	
t'	kPa	71.969	175.590	292.995	
Shear Resistance Angle	degs			41.6	
Cohesion c'	kPa			7	

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26/04/16 Date

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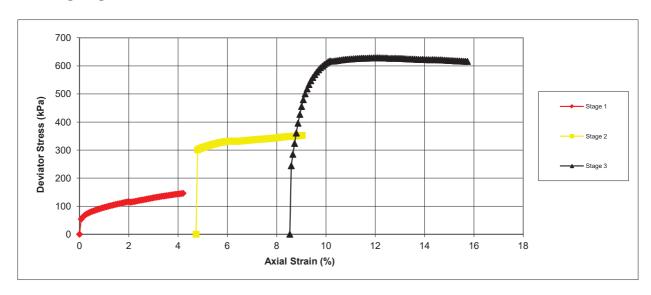


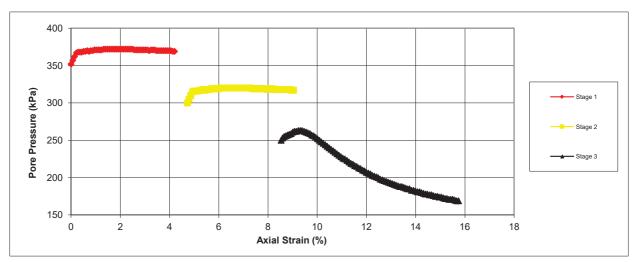
BS 1377: Part 8: 1990

Specimen Details

Borehole		BH3/27	
Sample No.		A16/0987	
Depth	from(m)	0.5	
Depth	to(m)	0.50	

Shearing Stage





DP Gronz **Checked and Approved By**

26/04/16 **Date**

> **Client Ref** 18963 **Contract No**

> > 30537

G.C.T.P

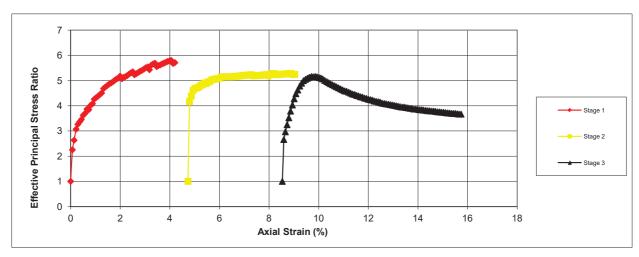


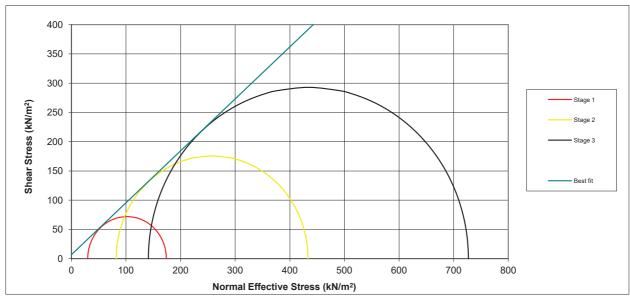
BS 1377: Part 8: 1990

Specimen Details

Borehole		BH3/27
Sample No.		A16/0987
Depth	from(m)	0.5
Depth	to(m)	0.50

Shearing Stage







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26/04/16 Date

> Client Ref 18963 Contract No

G.C.T.P

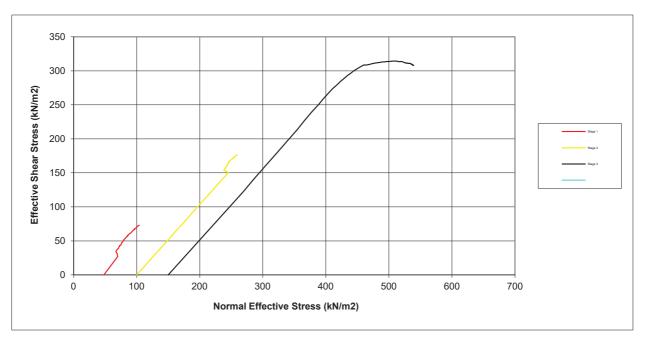


BS 1377: Part 8: 1990

Specimen Details

Borehole		BH3/27
Sample No.		A16/0987
Depth	from(m)	0.5
Depth	to(m)	0.50

Shearing Stage





26/04/16 Date

> Client Ref 18963 Contract No

G.C.T.P



BS 1377: Part 8: 1990

Specimen Details

Borehole		BH3/27
Sample No.		A16/0987
Depth	from(m)	0.5
Depth	to(m)	0.50





DP GronS Checked and Approved By

26/04/16 Date

G.C.T.P

Client Ref 18963 Contract No 30537



BS 1377: Part 8: 1990

Specimen Details

•		
Borehole		BH3/35
Sample No.		A16/0990
Depth	from(m)	0.5
Depth	to(m)	0.50
Date		26/04/2016
Disturbed / Undisturbed		2.5kg Recompacted

Description of Specimen

Light greyish brown sl fine sub-angular gravelly sl fine sandy silty soft CLAY

Initial Specimen Conditions

Height	mm	215.00		
Diameter	mm	98.00		
Area	mm^2	7542.96		
Volume	cm ³	1621.74		
Mass	g	3967.60		
Dry Mass	g	3386.20		
Density	Mg/m ³	2.45		
Dry Density	Mg/m ³	2.09		
Moisture Content	%	17		
Specific Gravity	kN/m³	2.65		
(assumed/measured)		assumed		

Final Specimen Conditions

Moisture Content	%	10
Density	Mg/m ³	2.43
Dry Density	Mg/m³	2.22

DP GovS Checked and Approved By

26/04/16 Date

> Client Ref 18963 Contract No

> > 30537



G.C.T.P

BS 1377: Part 8: 1990

Specimen Details

Borehole		BH3/35
Sample No.		A16/0990
Depth	from(m)	0.5
Depth Depth	to(m)	0.50

Test Setup

Date started	14/04/2016
Date Finished	25/04/2016
Top Drain Used	у
Base Drain Used	У
Side Drains Used	y
Pressure System Number	P3
Cell Number	C3

Saturation

Cell Pressure Incr.	kPa	100.00
Back Pressure Incr.	kPa	95.00
Differential Pressure	kPa	5.00
Final Cell Pressure	kPa	400.00
Final Pore Pressure	kPa	394.00
Final B Value		0.99

Consolidation

Effective Pressure	kPa	50.00	100.00	150.00
Cell Pressure	kPa	400.00	400.00	400.00
Back Pressure	kPa	350.00	300.00	250.00
Excess Pore Pressure	kPa	44.00	81.00	98.00
Pore Pressure at End	kPa	350.00	300.00	350.00
Consolidated Volume	cm^3	1555.14	1538.74	1524.24
Consolidated Height	mm	212.06	205.95	199.19
Consolidated Area	mm^2	7336.45	7471.47	7652.49
Vol. Compressibility	m^2/MN	0.11733	0.03515	0.02692
Consolidation Coef.	m²/yr.	0.15669	0.18841	0.27855

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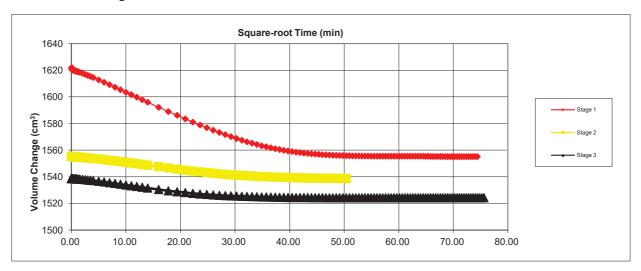


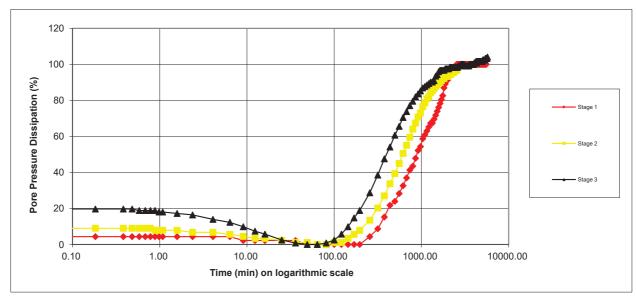
BS 1377: Part 8: 1990

Specimen Details

Borehole		BH3/35
Sample No.		A16/0990
Depth	from(m)	0.5
Depth	to(m)	0.50

Consolidation Stage







26/04/16 Date

Client Ref 18963 Contract No

G.C.T.P



BS 1377: Part 8: 1990

Specimen Details

Borehole		BH3/35
Sample No.		A16/0990
Depth	from(m)	0.5
Depth	to(m)	0.50

Shearing

Initial Cell Pressure	kPa	400	400	400
Initial Pore Pressure	kPa	350	300	350
Rate of Strain	mm/min	0.0036	0.0043	0.0061
Max Deviator Stress				
Axial Strain		4.395	7.502	11.915
Axial Stress	kPa	209.025	467.30	854.26
Cor. Deviator stress	kPa	206.020	462.97	849.68
Effective Major Stress	kPa	233.020	586.97	1188.68
Effective Minor Stress	kPa	28.000	124.00	339.00
Effective Stress Ratio		8.322	4.734	3.51
s'	kPa	130.510	355.49	763.84
t'	kPa	102.510	231.49	424.84
Max Effective Priciple	Stress F	Ratio		
Axial Strain		2.084	5.069	8.737
Axial Stress	kPa	153.885	353.926	762.379
Cor. Deviator stress	kPa	150.063	349.866	757.999
Effective Major Stress	kPa	158.063	427.866	1020.999
Effective Minor Stress	kPa	8.000	78.000	263.000
Effective Stress Ratio		19.758	5.485	3.882
s'	kPa	83.032	252.933	642.000
t'	kPa	75.032	174.933	379.000
Shear Resistance Angle	degs			32.8
Cohesion c'	kPa			38
		=-		

DP Grons
Checked and Approved By

26/04/16 Date

> Client Ref 18963 Contract No

G.C.T.P

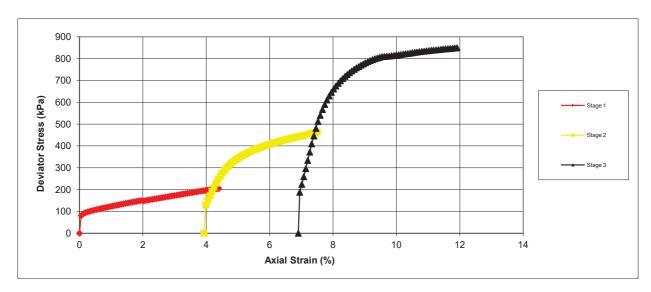


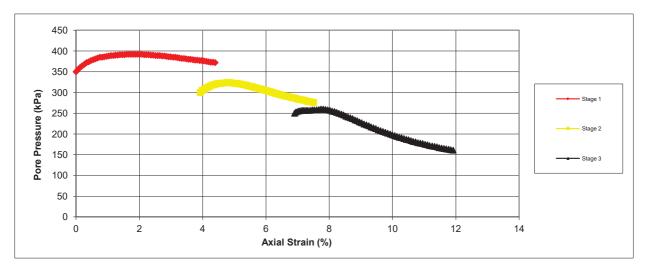
BS 1377: Part 8: 1990

Specimen Details

Borehole		BH3/35
Sample No.		A16/0990
Depth	from(m)	0.5
Depth	to(m)	0.50

Shearing Stage





DP Gronz **Checked and Approved By**

26/04/16 **Date**

> **Client Ref** 18963 **Contract No**

> > 30537

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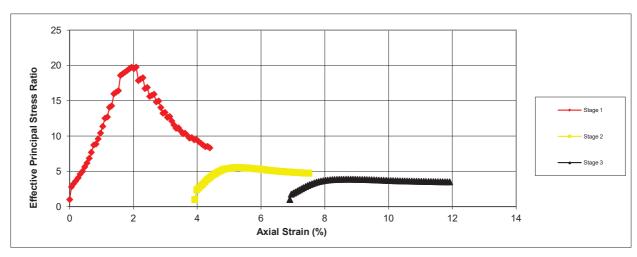


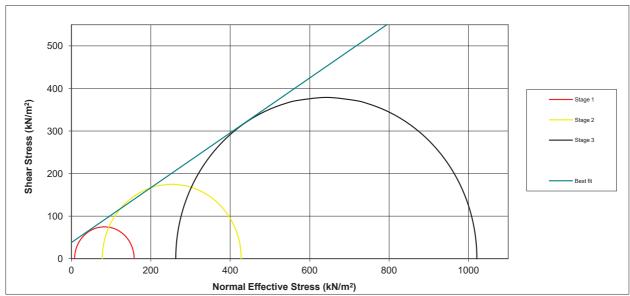
BS 1377: Part 8: 1990

Specimen Details

Borehole		BH3/35
Sample No.		A16/0990
Depth	from(m)	0.5
Depth	to(m)	0.50

Shearing Stage







Checked and Approved By

26/04/16 Date

> Client Ref 18963 Contract No



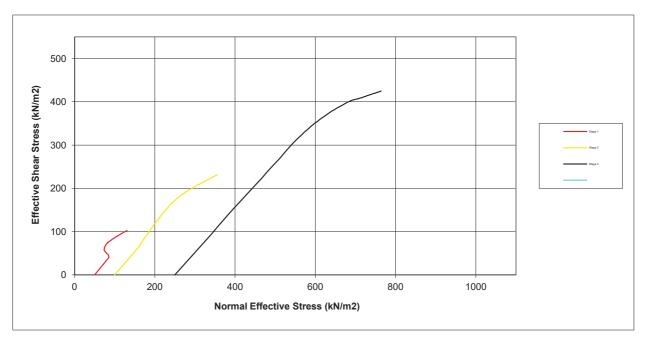


BS 1377: Part 8: 1990

Specimen Details

Borehole		BH3/35
Sample No.		A16/0990
Depth Depth	from(m)	0.5
Depth	to(m)	0.50

Shearing Stage





26/04/16 Date

> Client Ref 18963 Contract No

G.C.T.P



BS 1377: Part 8: 1990

Specimen Details

Borehole		BH3/35
Sample No.		A16/0990
Depth	from(m)	0.5
Depth	to(m)	0.50







26/04/16 Date

G.C.T.P

Client Ref 18963 Contract No



Appendix 13

Geotechnical Laboratory Testing

Lab Schedule 6

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. R70977 Contract No.

Contract Name:

GCTP Phase 3 Contract 1 GL

Customer Galway Co.Co.

Samples Received: 26-02-16 Date Tested: 30-03-16

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	(,	
BH3/18	AA39965	0.5	A16/0998	В	15								Dark brown clayey/silty, sandy, GRAVEL
BH3/30	AA39968	0.2	A16/0999	В	18								Dark brown clayey/silty, very sandy, GRAVEL(Red Brick and Plastic)
BH3/31	AA39971	0.3	A16/1002	В	59	46	NP	NP	84	WS	4.4		Dark brown slightly sandy, slightly gravelly, SILT
BH3/31	AA39972	0.6	A16/1003	В	19	32	NP	NP	43	WS	4.4		Mottled brown slightly sandy, gravelly, SILT with some cobbles
BH3/43	AA39966	0.2	A16/1004	В	16	30	NP	NP	52	WS	4.4		Brown slightly sandy, gravelly, SILT with some cobbles
BH3/43	AA39967	0.3	A16/1005	В	22	31	NP	NP	69	WS	4.4		Dark brown slightly sandy, slightly gravelly, SILT
TP3/43	AA39973	0.2	A16/1006	В	64								Dark brown sandy gravelly SILT/CLAY rootlets
TP3/43	AA39974	0.2	A16/1007	В	94								Dark brown sandy gravelly SILT/CLAY with organics
TP3/43	AA39976	0.2	A16/1008	В	61								Dark brown sandy gravelly SILT/CLAY with rootlet
TP3/43	AA39975	0.5	A16/1009	В	18								Dark brown clayey/silty, sandy, GRAVEL
Notes:	Preparation:	WS - Wet sie	ved	-	Sample Type:	B - bulk distu	rbed	Remarks:	-	-			

18963

U - Undisturbed

AR - As received

H Byrne (Laboratory Manager)

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

Date Page 05-01-16 1 of 1

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



particle	%			Contract No:	18963	Report I	No. R71792			
size	passing				GCTP Phas					
75	100				BH3/18					
63	100	COBBLES			AA39965	Lab. Sa	mple No.	A16/0998		
50	92			•	В		'			
37.5	79				0.50	Custome	er: Galway Co.C	0.		
28	61			,	26-02-16		esting started	30-03-16		
20	57			Description:	Dark brown		ilty, sandy, GRAVE			
14	51	0DA)//EI		•						
10	46	GRAVEL		Remarks						
6.3	41						2 3	8 57	22	٠
5	39						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	37. 50. 53. 53.
3.35	34		100							
2	30		90	1	+++					
1.18	26		80	+ + + + + + + + + + + + + + + + + + + +						
0.6	22		× 70	+ + + + + + + + + + + + + + + + + + + +	-					 /
0.425	20	SAND	ils 60	1	-					44444
0.3	18		<u>8</u> 50		\perp					
0.15	14		Percentage passing (%) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0							
0.063	11		Cen 40							
			20							
		SILT/CLAY	10	† 						
			0	 						
			0.0	0.00		0.01	0.1	1	10	100
				CLAY		SILT	Sieve size (mm)	SAND	GRAVEL	
			d M.c.t:	ala I abawata			Approved by:		Date:	Page no:
		IGSL Lt	u wateri	als Laborato	г у		A Rejen	-	28-04-16	1 of 1

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



<u> </u>	1									
particle	%			Contract No:	18963		No. R71494			
	passing			Contract:	GCTP Phas	se 3 - Co	ntact 1			
75	100	COBBLES		BH:	BH3/30					
63	100			Sample No.	AA39968	Lab. Sa	mple No.	A16/0999		
50	100			Sample Type:	В					
37.5	87			Depth (m)	0.15	Custom	er: Galway Co.C	co.		
28	81			Date Received	26-02-16	Date Te	sting started	30-03-16		
20	73			Description:	Dark brown	n clayey/si	lty, very sandy, Gl	RAVEL		
14	67	GRAVEL								
10	61	GRAVEL		Remarks	Sample size did not meet the re	equirements of BS1377.	Red brick and plastic in sample			
6.3	53						5 33	8 32	22	2
5	51						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	730.7.
3.35	46		100							
2	40		90							
1.18	35		<u> </u>							
0.6	29		Percentage passing (%) 80 00 00 00 00 00 00 00 00 00 00 00 00	+						
0.425	28	SAND	ssing 60							
0.3	25		sed e 50							
0.15	20		age							
0.063	15		senta 0							
			Per 30	†						
			20							
			10							
		SILT/CLAY	0							
			0.	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	ials Laborato	ory		# Byen		13-04-16	1 of 1
						Persons	authorised to approve r	eport: J Barrett (Q	uality Manager) H Byrne (Laboratory Manage

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



particle	%			Contract No:		•	. R71992			
size	passing	<u> </u>		Contract:	GCTP Phase 3	- Conta	act 1			
75	100	COBBLES		BH:	BH3/31					
63	100			Sample No.	AA39971 La	ıb. Samp	ole No.	A16/1002		
50	100			Sample Type:	В					
37.5	91			Depth (m)	0.30 Cu	ıstomer:	Galway Co.C	0.		
28	91			Date Received			ng started	30-03-16	3	
20	91			Description:	Dark brown slig	htly san	dy, slightly grave	elly, SILT		
14	90	GRAVEL								
10	89	0.0		Remarks						
6.3	88						63	3 25 18	35	75.
5	87		400				0.063	0.3 0.425 0.6 1.18	2 3.35 5.3 6.3 20	28 37.5 50 63
3.35	86		100							
2	85		90							
1.18	83		80							
0.6	80		S 70	+						
0.425	79	SAND	iss 60							
0.3	76		Oercentage passing (%) 20 20 30 30 30 30 30 30 30 30 30 30 30 30 30							
0.15	69		1tage							
0.063	58		cen							
0.035	49									
0.025	47		20							
0.016	42	SILT/CLAY	10							
0.010	36		0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1	+ + +				
0.007	31		0.0	0.00	01 0.	01	0.1	1	10	100
0.005	27			CLAY	s	ILT Si	eve size (mm)	SAND	GRAVEL	
0.002	16									
		IGSL L+	d Matori	als Laborato	rv.		Approved by:		Date:	Page no:
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Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



particle	%			Contract No:	18963	Report	No. R71495			
size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1			
75	100	COBBLES		BH:	BH3/31					
63	92	OODDELO		Sample No.	AA39972	Lab. Sa	imple No.	A16/1003		
50	92			Sample Type:	В					
37.5	87			Depth (m)	0.60	Custom	er: Galway Co.C	ю.		
28	85			Date Received	26-02-16		esting started	30-03-16		
20	82			Description:	Mottled bro	wn slightl	ly sandy, gravelly,	SILT with some	cobbles	
14	78	GRAVEL								
10	76	OIVWLL		Remarks						
6.3	71						53	8 8		rċ.
5	68		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 14 20	93.05.05
3.35	61		100							
2	54		90							
1.18	49		80	1						
0.6	43		§ 70	+						
0.425	41	SAND	Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00	 						
0.3	39		0 50						 	
0.15	35		40							
0.063	30		acen 30							
0.037	27									
0.027	26		20	1						
0.017	23	SILT/CLAY	10	† 						
0.010	20	0.21702711	0	 			<u> </u>			
0.007	17		0.0	0.0	01	0.01	0.1	1	10	100
0.005	15			CLAY	/	SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	10						-		T= .	1_
		IGSL Ltd	d Materi	als Laborato	rv		Approved by:		Date:	Page no:
			u Materi		, i y		A Byen	-	13-04-16	1 of 1
						Persons	authorised to approve r	eport: J Barrett (Q	uality Manager) H Byrne ((Laboratory Mana

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



particle	%			Contract No:	18963	Report	No. R71333	
size	passing			Contract:	GCTP Pha	ise 3 - Co	ontact 1	
75	100	COBBLES		BH:	BH3/43			
63	88	OODDLLO		Sample No.	AA39966	Lab. Sa	ample No. A16/1004	
50	84			Sample Type:	В			
37.5	80			Depth (m)	0.20	Custom	ner: Galway Co.Co.	
28	79			Date Received	12-02-16		esting started 30-03-16	
20	74			Description:	Brown sligi	htly sandy	y, gravelly, SILT with some cobbles	
14	71	GRAVEL						
10	68	0.0		Remarks	Sample size did not meet the	sample requirements of I	f BS1377	
6.3	65						0.063 0.15 0.3 0.3 0.6 0.6 0.6 1.18 2 2 2 2 2 3.35 6.3 3.35 6.3 4 4 4 4 4 5 6 6 6 6 7 7 7 8 7 8 7 8 7 8 7 8 7 8 7 8	
5	63		100	_			0.063 0.425 0.6 0.6 1.18 2 2 3.35 5.3 10 14 20 28 37.5 963	
3.35	60							
2	56		90					1
1.18	53		80 ©					1
0.6	49) 70 g	+ + + + + + + + + + + + + + + + + + + +				1
0.425	47	SAND	issii 60	+ + + + + + + + + + + + + + + + + + + +				1
0.3	44		<u>ω</u> 50					-
0.15	38							-
0.063	31		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00					
0.038	25		20					
0.027 0.018	23 20		10					
0.018	20 16	SILT/CLAY	0					
0.010	13			0001 0.0	01	0.01	0.1 1 10 10	00
0.007	11		0.	CLA`		SILT	Sieve size (mm) SAND GRAVEL	
0.003	6			CLA		GIL I	GIVAVEL	
3.002							Approved by: Date: Page no):
		IGSL Ltd	d Mater	ials Laborato	ory		100-04-16 1 o	
						Persons	s authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory N	Managei

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



			`			<u> </u>				
particle	%			Contract No:	18963	Report N	No. R71740			
size	passing		1	Contract:	GCTP Phas	e 3 - Co	ntact 1			
75	100	COBBLES		BH:	BH3/43					
63	100	OOBBEEG		Sample No.	AA39967	Lab. Sa	mple No.	A16/1005		
50	100			Sample Type:	В					
37.5	92			Depth (m)	0.30	Custome	er: Galway Co.C	0.		
28	87			Date Received	26-02-16	Date Te	sting started	30-03-16		
20	84			Description:	Dark brown	slightly s	andy, slightly grave	elly, SILT		
14	82	GRAVEL								
10	79	OIVAVEE		Remarks						
6.3	75						5 5	8 822	22	
5	74						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	28 37.5 53 63
3.35	71		100							
2	68		90							
1.18	66		<u> </u>							
0.6	62		% 70	+						
0.425	60	SAND	iss 60							
0.3	57		05 pg					1		
0.15	49		Percentage passing (%) 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0							
0.063	36		cen							
0.039	30									
0.028	28		20							
0.018	25	SILT/CLAY	10							
0.010	21	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					1 111 1 11111	
0.007	18		0.0	0.0	01	0.01	0.1	1	10	100
0.005	16			CLAY	/	SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	11									
		IGSL I to	d Materi	ials Laborato	\r\/		Approved by:		Date:	Page no:
		IOOL LU	u materi	ais Laborall	'ı y		A Rejon	-	28-04-16	1 of 1

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



particle	%			Contract No:	18963	Report	No. R71403			
size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1			
75	100	COBBLES		TP:	TP3/43					
63	100	OOBBEEG		Sample No.	AA39975	Lab. Sa	ımple No.	A16/1009		
50	100			Sample Type:	В					
37.5	86			Depth (m)	0.45	Custom	er: Galway Co.0	Co.		
28	74			Date Received	26-02-16		esting started	30-03-16		
20	67			Description:	Dark brown	n clayey/s	ilty, sandy, GRAV	EL		
14	59	GRAVEL								
10	54	ONAVEL		Remarks	Sample size did not meet the r	requirements of BS1377				
6.3	47						5 5	8 252	22	5.
5	43		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	28 37. 50 53
3.35	34		100							
2	23		90							
1.18	16		80							 /
0.6	9		§ 70	+ + + + + + + + + + + + + + + + + + + +						
0.425	8	SAND	Ssin 60							
0.3	7		<u>a</u> 50							
0.15	6		Percentage passing (%) 80 00 00 00 00 00 00 00 00 00 00 00 00							
0.063	5		and							
									/	
			20							
		SILT/CLAY	10							
			0							
			0.0	0.00		0.01	0.1	1	10	100
				CLAY	,	SILT	Sieve size (mm)	SAND	GRAVEL	
	<u> </u>		d Matar	iala Labarata			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.	R71511	Contract	GCTP Phase 3 - Contract 1
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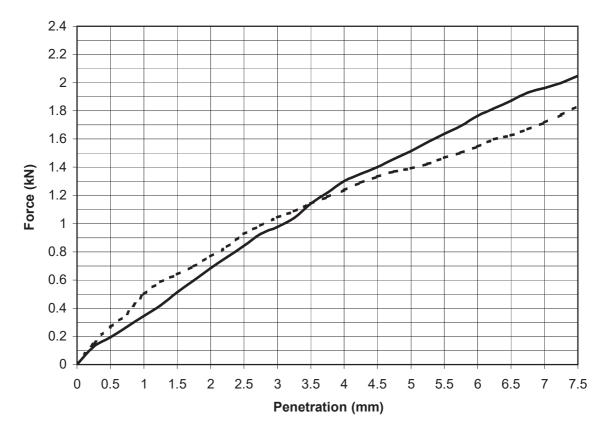
Contract No. 18963 Customer

Galway Co.Co.

Date received 26-02-16 Date Tested 06-04-16

BH/TP No. BH3/18 Sample No. AA39965 Type: B

Depth (m) 0.50 Lab sample No. A16/0998



Key: ----- Base

Description: Dark brow	vn clayey/s	ilty, sandy, GRAVEL		
Initial Condition:	Unsoake	d Point 1 of 5		
Moisture Content (%):	28	Bulk Density (Mg/m ³):	1.80	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.40	
% Material >20mm:	35			
Method of compaction: Static Compaction Method 2				

Test Result	Тор	Base
CBR %	8	7
Moisture	29	28
Content %	29	20

Persons authorized to approve reports

J Barrett (Quality Manager)

H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory

Approved by

Date

15-04-16

Page No.

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. R71510 Contract GCTP Phase 3 - Contract 1

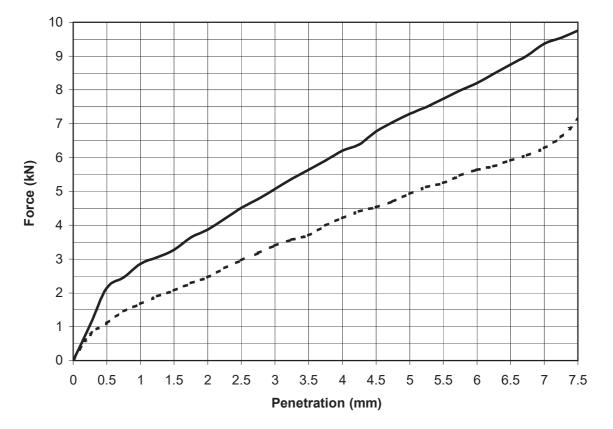
Contract No. 18963 Customer

Galway Co.Co.

Date received 26-02-16 Date Tested 12-04-16

BH/TP No. BH3/18 Sample No. AA39965 Type: B

Depth (m) 0.50 Lab sample No. A16/0998



Key: ----- Base

Description: Dark brow	vn clayey/s	ilty, sandy, GRAVEL		
Initial Condition:	Unsoake	d Point 2 of 5		
Moisture Content (%):	5	Bulk Density (Mg/m ³):	1.67	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.59	
% Material >20mm:	35			
Method of compaction: Static Compaction Method 2				

Test Result	Тор	Base
CBR %	37	25
Moisture	5.0	5.2
Content %	0.0	0.2

Persons authorized to approve reports

J Barrett (Quality Manager)

H Byrne (Laboratory Manager)

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Date Page No.
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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. R71509 Contract GCTP Phase 3 - Contract 1

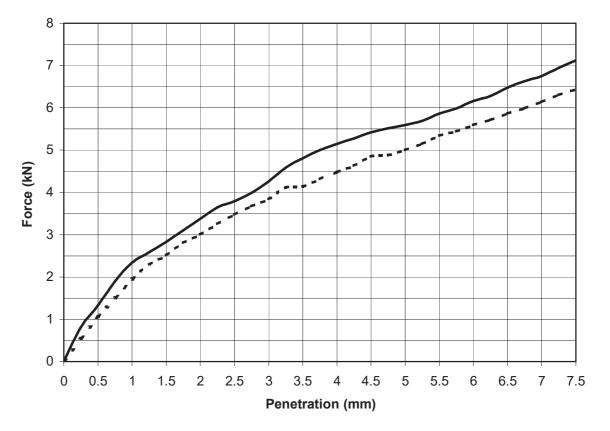
Contract No. 18963 Customer

Galway Co.Co.

Date received 26-02-16 Date Tested 11-04-16

BH/TP No. BH3/18 Sample No. AA39965 Type: B

Depth (m) 0.50 Lab sample No. A16/0998



Key: ----- Base

Description: Dark brown clayey/silty, sandy, GRAVEL					
Initial Condition:	Unsoake	d Point 3 of 5			
Moisture Content (%):	9	Bulk Density (Mg/m ³):	1.74		
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.59		
% Material >20mm:	35				
Method of compaction: Static Compaction Method 2					

Test Result	Тор	Base
CBR %	29	26
Moisture	9	10
Content %	l	10

Persons authorized to approve reports

J Barrett (Quality Manager)

H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory

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.	R71508	Contract	GCTP Phase 3 - Contract 1
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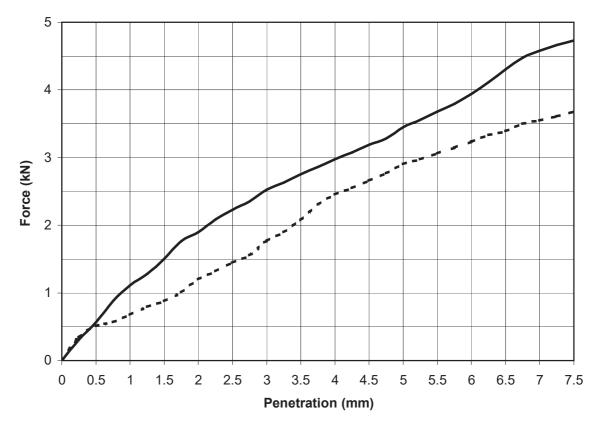
Contract No. 18963 Customer

Galway Co.Co.

Date received 26-02-16 Date Tested 12-04-16

BH/TP No. BH3/18 Sample No. AA39965 Type: B

Depth (m) 0.50 Lab sample No. A16/0998



Key: ----- Base

Description: Dark brow	vn clayey/s	ilty, sandy, GRAVEL		
Initial Condition:	Unsoake	d Point 4 of 5		
Moisture Content (%):	12	Bulk Density (Mg/m ³):	1.80	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.61	
% Material >20mm:	35			
Method of compaction:	Static Co	mpaction Method 2		

Test Result	Тор	Base
CBR %	17	15
Moisture	11	13
Content %	''	10

Persons authorized to approve reports

J Barrett (Quality Manager)

H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory

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Date Page No.
15-04-16 4 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.	R71507	Contract	GCTP Phase 3 - Contract 1
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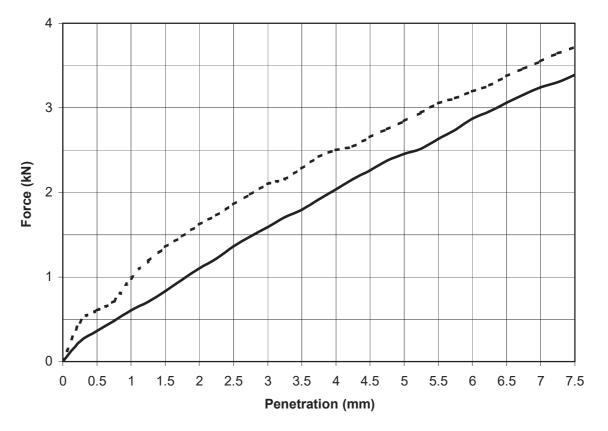
Contract No. 18963 Customer

Galway Co.Co.

Date received 26-02-16 Date Tested 11-04-16

BH/TP No. BH3/18 Sample No. AA39965 Type: B

Depth (m) 0.50 Lab sample No. A16/0998



Key: ----- Base

Description: Dark brov	vn clayey/s	ilty, sandy, GRAVEL		
Initial Condition:	Unsoake	d Point 5 of 5		
Moisture Content (%):	16	Bulk Density (Mg/m ³):	1.79	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.54	
% Material >20mm:	35			
Method of compaction:	Static Co	mpaction Method 2		

Test Result	Тор	Base
CBR %	12	14
Moisture	16	16
Content %	10	10

Persons authorized to approve reports

J Barrett (Quality Manager)

H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory

Approved by
Date Page No.
15-04-16 5 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. R71376 Contract GCTP Phase 3 - Contract 1

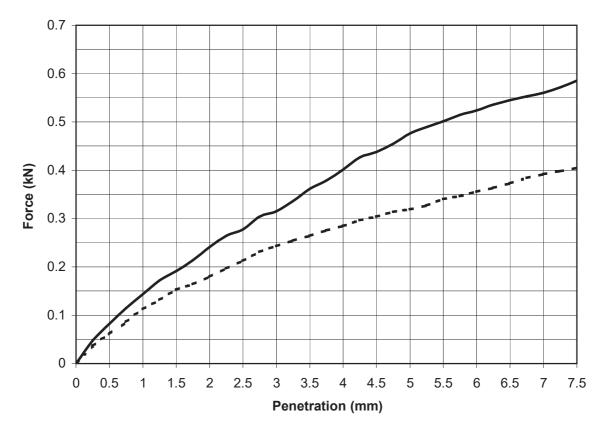
Contract No. 18963 Customer

Galway Co.Co.

Date received 26-02-16 Date Tested 05-04-16

BH/TP No. BH3/43 Sample No. AA39966 Type: B

Depth (m) 0.20 Lab sample No. A16/1008



Key: ----- Base

Description: Brown slig	ghtly sandy,	gravelly, SILT with some o	cobbles
Initial Condition:	Unsoaked		
Moisture Content (%):	22	Bulk Density (Mg/m ³):	2.01
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.65
% Material >20mm:	13		
Method of compaction:	Static Con	npaction Method 2	

Test Result	Тор	Base
CBR %	2.4	1.6
Moisture	22	22
Content %		22

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

045 899324

TEST REPORT Determination of California Bearing Ratio (CBR) Unit J5,M7 Business Park Naas Co.Kildare



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

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7	

R71375 Report No. Contract GCTP Phase 3 - Contract 1

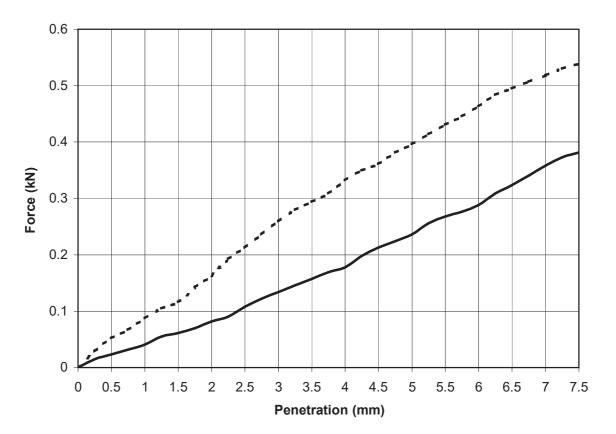
Contract No. 18963 Customer

Galway Co.Co.

Date received 26-02-16 **Date Tested** 05-04-16

BH/TP No. TP3/43 Sample No. AA39975 Type: В

A16/1009 Depth (m) 0.45 Lab sample No.



Key: -Top ----- Base

Description: Dark brow	vn clayey/sil	ty, sandy, GRAVEL		
Initial Condition:	Unsoaked			
Moisture Content (%):	24	Bulk Density (Mg/m ³):	0.78	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.30	
% Material >20mm:	25			
Method of compaction:	Static Con	npaction Method 2		

Test Result	Тор	Base
CBR %	1.2	2.0
Moisture	24	23
Content %		20

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

Approved by Date Page No. **IGSL Ltd Materials Laboratory** 08-04-16 1 of 1

IGSL Ltd Materials Laboratory M7 Business Park Naas Co.Kildare 045 846176

TEST REPORT Determination of MCV / moisture content Relation of a soil

Tested in accordance with BS1377-4:1990, clause 5.5

Report No. R71440 Contract GCTP Phase 3 - Contract 1

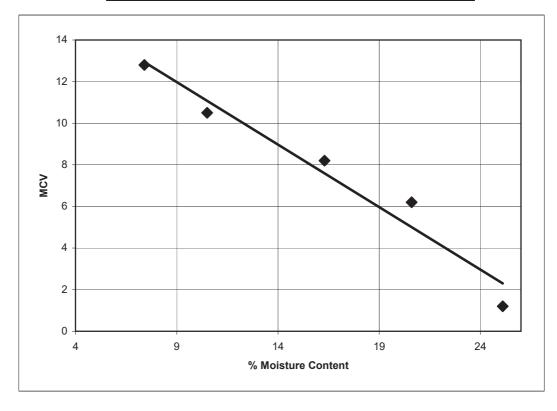
Contract No. 18963 Customer Galway Co.Co.

Date received 26-02-16 Date Tested 05-04-16

BH/TP No. BH3/43 Sample No. AA39967 Type: B

Depth (m) 0.30 Lab sample No. A16/1005

MC% 25 21 16 11 7.4 MCV 1.2 6.2 8.2 10.5 12.8



% material >20mm 13

Persons authorized to approve reports

J Barrett (Quality Manager) H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory

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Appendix 13

Geotechnical Laboratory Testing

Lab Schedule 7

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. R71366 Contract No.

18963

Contract Name:

GCTP Phase 3 - Contract 1

Customer Galway Co.Co.

Samples Received: 29-03-16 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	(033930)	
TP3/30	AA49484	0.1	A16/1314	В	14	40	NP	NP	46	WS	4.4		Brown slightly sandy, gravelly, SILT
BH3/15	AA48883	0.5	A16/1315	В	2.3								Brown slightly clayey/silty, slightly sandy, GRAVEL with many cobbles
BH3/17	AA48880	0.5	A16/1316	В	11	54	NP	NP	17	WS	4.4		Dark brown silty, sandy, GRAVEL with some cobbles
BH3/17	AA48881	1.0	A16/1317	В	9.6	39	NP	NP	30	WS	4.4		Brown silty, sandy, GRAVEL with some cobbles
BH3/17	AA48882	2.0	A16/1318	В	4.3	26	NP	NP	19	WS	4.4		Brown silty, sandy, GRAVEL with many cobbles
BH3/19	AA39978	0.3	A16/1319	В	18								Dark brown clayey/silty, very sandy, GRAVEL
BH3/19	AA39979	0.5	A16/1320	В	13	47	NP	NP	65	WS	4.4		Dark brown silty, sandy, GRAVEL with some cobbles
BH3/20	AA49485	0.1	A16/1321	В	21								Dark brown clayey/silty, very sandy, GRAVEL
BH3/20	AA49486	0.5	A16/1322	В	8.5								Orange/Brown slightly clayey/silty, sandy, GRAVEL with many cobbles
BH3/20	AA49487	0.8	A16/1323	В	5.3								Brown slightly clayey/silty, very sandy, GRAVEL with some cobbles
BH3/31CR	AA48875	0.5	A16/1324	В	14	19	NP	NP	62	WS	4.4		Light brown/grey sandy, slightly gravelly, SILT
BH3/31CR	AA48876	1.0	A16/1325	В	11	30	15	15	51	WS	4.4	CL	Light brown/grey slightly sandy, gravelly, CLAY with some cobbles
BH3/31CR	AA48877	2.0	A16/1326	В	13	25	NP	NP	55	WS	4.4		Light brown slightly sandy, gravelly, SILT with some cobbles
Notes:	Preparation:	WS - Wet sie	ved	•	Sample Type:	B - bulk distu	rbed	Remarks:		•	•		

U - Undisturbed

AR - As received 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.

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 (Laboratory Manager)

Approved by # Bypene

Date Page 14-06-16

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. R71367 Contract No.

18963

Contract Name:

GCTP Phase 3 - Contract 1

Customer Galway Co.Co.

Samples Received:

29-03-16

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		
H3/31 CF	AA48878	3.0	A16/1327	В	14.1	21	NP	NP	54	WS	4.4		Mottled light brown slightly sandy, slightly gravelly, SILT
H3/31 CF	AA48879	4.0	A16/1328	В	13.6	19	12	7	64	WS	4.4	CL	Light brown/grey slightly sandy, slightly gravelly, CLAY
BH3/47	AA48890	0.5	A16/1629	В	12.2	24	NP	NP	60	WS	4.4		Mottled brown slightly sandy, slightly gravelly, SILT with some cobbles
BH3/47	AA48891	1.0	A16/1630	В	9.1	20	NP	NP	69	WS	4.4		Light brown slightly sandy, slightly gravelly, SILT
BH3/47	AA48892	2.0	A16/1631	В	9.9	23	13	10	23	WS	4.4	CL	Mottled brown slightly sandy, slightly gravelly, CLAY
BH3/47	AA48893	3.0	A16/1632	В	10.4	24	13	11	75	WS	4.4	CL	Light brown/grey slightly sandy, slightly gravelly, CLAY
BH3/52	AA48884	0.5	A16/1633	В	5.6	19	11	8	36	WS	4.4	CL	Light brown/grey slightly sandy, gravelly, CLAY with some cobbles
BH3/52	AA48885	1.0	A16/1634	В	13.6	24	14	10	58	WS	4.4	CL	Light brown sandy gravelly CLAY
BH3/52	AA48886	2.0	A16/1635	В	9.3	21	NP	NP	69	WS	4.4		Light brown/grey slightly sandy, slightly gravelly, SILT
BH3/52	AA48887	3.0	A16/1636	В	10.8	20	11	9	70	WS	4.4	CL	Light brown/grey slightly sandy, slightly gravelly, CLAY
BH3/53	AA48888	0.5	A16/1637	В	5.7	19	NP	NP	22	WS	4.4		Light brown/grey silty, sandy, GRAVEL
BH3/53	AA48889	1.0	A16/1638	В	4.6	20	NP	NP	32	WS	4.4		Light brown/grey silty, sandy, GRAVEL with some cobbles
Notes:	Preparation:	WS - Wet sie	ved		Sample Type:	B - bulk distui	bed	Remarks:		•	•		•

Clause:

AR - As received

U - Undisturbed

NP - Non plastic

H Byrne (Laboratory Manager)

Liquid Limit 4.3 Cone Penetrometer definitive method

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. Approved by Page

IGSL Ltd Materials Laboratory

Persons authorized to approve reports

Date 14-06-16

1 of 1

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



			` .			,										
particle	%			Contract No:	18963	Report	No. R721	91			-					
size	passing		ı	Contract:	GCTP Phas	se 3 - Co	ontact 1									
75	100	COBBLES		TP:	TP3/30											
63	100	OODDELC		Sample No.	AA49484	Lab. Sa	mple No.		A16/	1314						
50	90			Sample Type:	В											
37.5	80			Depth (m)	0.10	Custom	er: Galw	ay Co.C	Co.							
28	72			Date Received	05-04-16	Date Te	esting starte	ed	0	3-05-16	6					
20	67			Description:	Brown sligh	ntly sandy	, gravelly, 🤄	SILT								
14	63	GRAVEL														
10	58	GIVAVLL		Remarks												
6.3	54						33	2	25		S			-5		
5	52						0.063	0.15	0.3	1.18	3.3	6.3	10 14 20	28 37.	50 93	
3.35	48		100]
2	44		90											+++/	/ 	1
1.18	41		80											+		1
0.6	37		<u>%</u> 70											4#		-
0.425	36	SAND	ilss 60								+	$\sqcup \sqcup \sqcup$		$+\!\!\!+\!\!\!\!+$		-
0.3	34		96 pa											$\perp \!\!\! \perp \!\!\! \perp$		
0.15	29		Percentage passing (%) 30 00 00 00 00 00 00 00 00 00 00 00 00													
0.063	23		cen													
0.036	20															
0.026	19		20											+		1
0.017	16	SILT/CLAY	10													1
0.010	14	JIL I / OL/ (I	0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	,			 							<u> </u>	1
0.007	12		0.0	0001 0.0	01	0.01		0.1		1			10		10	00
0.005	11			CLA	Y	SILT	Sieve size	e (mm)	SANE)		GR	AVEL			
0.002	7															
		IGSL LE	d Matori	ials Laborat	orv			ved by			Date:	1		Pa	ge no	
		IOOL LU	A	A Byene				23-05	-16		1 o	ıf 1				

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



28 30 20 21 14 15 10 13 6.3 10 5 9 3.35 7 2 6 1.118 5 0.6 4 0.425 3 0.31 3 0.15 2 0.063 2 SILT/CLAY SILT/CLAY SILT/CLAY SILT/CLAY SILT/CLAY Date Received 05-04-16 Date Testing started 29-04-16 Description: Brown slightly clayey/sity, slightly sandy, GRAVEL with many cobbles Remarks Date Received 05-04-16 Date Testing started 29-04-16 Description: Brown slightly clayey/sity, slightly sandy, GRAVEL with many cobbles Remarks Date Received 05-04-16 Date Testing started 29-04-16 Description: Brown slightly clayey/sity, slightly sandy, GRAVEL with many cobbles Remarks Date Received 05-04-16 Date Testing started 29-04-16 Description: Brown slightly clayey/sity, slightly sandy, GRAVEL with many cobbles Remarks Date Received 05-04-16 Date Testing started 29-04-16 Description: Brown slightly clayey/sity, slightly sandy, GRAVEL with many cobbles Remarks Date Received 05-04-16 Date Testing started 29-04-16 Description: Brown slightly clayey/sity, slightly sandy, GRAVEL with many cobbles Remarks Date Received 05-04-16 Date Testing started 29-04-16 Description: Brown slightly clayey/sity, slightly sandy, GRAVEL with many cobbles Remarks Date Received 05-04-16 Date Testing started 29-04-16 Date Testing started 2	particle	%			Contract No:			o. R72068				
Sample No. AA48883 Lab. Sample No. A16/1315 Sample Type: B Depth (m) 0.50 Customer: Galway Co.Co. Date Received 05-04-16 Date Testing started 29-04-16 Description: Brown slightly clayey/silty, slightly sandy, GRAVEL with many cobbles Remarks Remarks Remarks Sample No. A48883 Lab. Sample No. A16/1315 Sample No. A16/1315 Sample No. A48883 Lab. Sample No. A16/1315 Sample No. A16/1315 Sample No. A48883 Lab. Sample No. A16/1315 Sample No. A16/1315 Sample No. A48883 Lab. Sample No. A16/1315 Sample No. A16/1315 Sample No. A48883 Lab. Sample No. A16/1315 Sample No. A16/1315 Sample No. A48883 Lab. Sample No. A16/1315 Sample No. A16/1315 Sample No. A48883 Lab. Sample No. A16/1315 Sample No. A16/1315 Sample No. A48883 Lab. Sample No. A16/1315 Sample No. A16/1315 Sample No. A48883 Lab. Sample No. A16/1315 Sample No. A16/1315 Sample No. A48883 Lab. Sample No. A16/1315 Sample No. A16/1315 Sample No. A48883 Lab. Sample No. A16/1315 Sample No. A16/1315 Sample No. A48883 Lab. Sample No. A16/1315 Sample No. A16/1315 Sample No. A48883 Lab. Sample No. A16/1315 Sample No.			ļ,				3 - Con	act 1				
Sample No. A448883 Lab. Sample No. A16/1315 Sample Type: B Depth (m) 0.50 Customer: Galway Co.Co. Date Received 05-04-16 Date Testing started 29-04-16 Description: Brown slightly clayey/silty, slightly sandy, GRAVEL with many cobbles Remarks Service and received 205-07-10 Date Received 205-07-10 Date Received 205-04-16 Description: Brown slightly clayey/silty, slightly sandy, GRAVEL with many cobbles Remarks Service and received 205-07-10 Date Page no: Page			COBBLES		BH:	BH3/15						
Depth (m) 0.50 Customer: Galway Co.Co.	63	79			Sample No.	AA48883 L	_ab. San	ple No. A16/1315				
28 30 20 21 14 15 10 13 6.3 10 5 9 3.35 7 2 6 1.18 5 0.6 4 0.425 3 0.015 2 0.015 2 0.0063 2 SILT/CLAY SILT/CLAY SILT/CLAY Date Received 05-04-16 Date Testing started 29-04-16 Description: Brown slightly clayey/sity, slightly sandy, GRAVEL with many cobbles Remarks Date Received 05-04-16 Date Testing started 29-04-16 Description: Brown slightly clayey/sity, slightly sandy, GRAVEL with many cobbles Remarks Date Received 05-04-16 Date Testing started 29-04-16 Description: Brown slightly clayey/sity, slightly sandy, GRAVEL with many cobbles Remarks Description: Brown slightly clayey/sity, slightly sandy, GRAVEL with many cobbles Remarks Description: Brown slightly clayey/sity, slightly sandy, GRAVEL with many cobbles Remarks Description: Brown slightly clayey/sity, slightly sandy, GRAVEL with many cobbles Remarks Description: Brown slightly clayey/sity, slightly sandy, GRAVEL with many cobbles Remarks Description: Brown slightly clayey/sity, slightly sandy, GRAVEL with many cobbles Remarks Date Received 05-04-16 Date Service of the sandy slightly sandy, GRAVEL with many cobbles Remarks Description: Brown slightly clayey/sity, slightly sandy, GRAVEL with many cobbles Remarks Date Received 05-04-16 Date Service of the sandy slightly sandy, GRAVEL with many cobbles Remarks Description: Brown slightly clayey/sity, slightly sandy, GRAVEL with many cobbles Remarks Description: Brown slightly clayey/sity, slightly sandy, GRAVEL with many cobbles Remarks Description: Brown slightly clayey/sity, slightly sandy, GRAVEL with many cobbles Remarks Description: Brown slightly clayey/sity, slightly sandy, GRAVEL with many cobbles Remarks Date Received of the sandy slightly clayey/sity, slightly sandy, GRAVEL with many cobbles Remarks Date Received of the sandy slightly clayey/sity, slightly sandy, GRAVEL with many cobbles Remarks Date Received of the sandy slightly clayey/sity, slightly sandy of the sandy slightly clayey/sity, slightly clayey/sity, slightly clayey/sity, slightly sandy of the	50	66			Sample Type:	В						
20 21 14 15 10 13 6.3 10 5 9 3.35 7 2 6 1.118 5 0.6 4 0.425 3 0.15 2 0.063 2 SILT/CLAY SILT/CLAY Description: Brown slightly clayey/slity, slightly sandy, GRAVEL with many cobbles Brown slightly clayey/slity, slightly sandy, GRAVEL with many cobbles Remarks Sequence of the requirement of 601077 Brown slightly clayey/slity, slightly sandy, GRAVEL with many cobbles Remarks Sequence of the requirement of 601077 Silt of the re	37.5	39			Depth (m)	0.50	Custome	: Galway Co.Co.				
14	28	30			Date Received	05-04-16	Date Tes	ting started 29-04-16				
10 13 6.3 10 5 9 3.35 7 2 6 1.118 5 0.64 4 SAND	20	21			Description: Brown slightly clayey/silty, slightly sandy, GRAVEL with many co							
10	14	15	CDAV/EI									
5 9 9 3.35 7 2 6 1.18 5 0.6 4 9.0 9.0 9.0 9.0 9.0 9.0 9.0 9.0 9.0 9.0	10	13	GIVAVLL		Remarks	Sample size did not meet the require	ements of BS1377					
3.35	6.3	10						8 55 53		2		
3.35	5	9						0.06 0.15 0.45 0.66 0.66	3.33 6.3 7 7 8 7 8 8 8 8 8 8 8 8 8	37.0 50.0 53.0		
1.18	3.35	7										
0.6	2	6		90								
SILT/CLAY 10	1.18	5		_ 80	+ + + + + + + + + + + + + + + + + + + +							
SILT/CLAY 10	0.6	4		<u>%</u> 70	+ + + + + + + + + + + + + + + + + + + +							
SILT/CLAY 10	0.425	3	SAND	isi 60	<u> </u>							
SILT/CLAY 10	0.3	3		bas 50								
SILT/CLAY 10	0.15	2		age 40								
SILT/CLAY 10	0.063	2		eut 40								
SILT/CLAY 10				F 30	†							
SILT/CLAY 0				20								
0				10	1							
CLAY SILT Sieve size (mm) SAND GRAVEL Approved by: Date: Page no:			SIL1/CLAY	0								
IGSL Ltd Materials Laboratory Approved by: Date: Page no:				0.0	0.00	01	0.01	0.1 1	10	100		
IGSL 1td Materials Laboratory					CLAY	•	SILT \$	Sieve size (mm) SAND	GRAVEL			
1GSL Ltd Materials Laboratory 17-05-16 1 of 1					-1-1-1-4			Approved by:	Date:	Page no:		
			IGSL Ltd	d Materi	ais Laborato	ory		A Byene	17-05-16	1 of 1		

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



	ī										
particle	%			Contract No:	18963	Report	No. R71993				
size	passing			Contract:	GCTP Phas	se 3 - C	ontact 1				
75	86	COBBLES		BH:	BH3/17						
63	86	OODDELEO		Sample No.	AA48880	Lab. Sa	ample No.	A16/1316			
50	75			Sample Type:	В						
37.5	67			Depth (m)	0.50	Custon	ner: Galway Co.Co	ο.			
28	58			Date Received	05-04-16	Date T	esting started	27-04-16			
20	51			Description:	Dark brown	Dark brown silty, sandy, GRAVEL with some cobbles					
14	43	GRAVEL									
10	37	OIVWLL		Remarks	Sample size did not meet the r	requirements of BS1377					
6.3	31						55	8 8	55	ر ن	
5	28		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 14 20	37.0 20.0 20.0 20.0 20.0	
3.35	22		100								
2	17		90							 	
1.18	13		© 80	+ + + + + + + + + + + + + + + + + + + +						 	
0.6	10		Nercentage passing (%) 20 60 80 30 30 30	+ + + + + + + + + + + + + + + + + + + +						 	
0.425	9	SAND	ssin 60							 	
0.3	8		<u>8</u> 50								
0.15	6) 36 40								
0.063	6		acen 30								
		SILT/CLAY	20								
			10							 	
			0	 					1-11-1-11-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-		
			0.0	0.00		0.01	0.1	1	10	100	
				CLAY	,	SILT	Sieve size (mm)	SAND	GRAVEL		
			d Matari	als Laborato			Approved by:		Date:	Page no:	
		13-05-16	1 of 1								

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



particle	%			Contract No:	18963	Report	No. R72192				
size	passing			Contract:	GCTP Phas	•					
75	100	CORRIES		BH:	BH3/17						
63	83	COBBLES	Sample No. A		AA48881	Lab. Sa	ample No. A16/1317				
50	65			Sample Type:	В						
37.5	55			Depth (m)	1.00	Custom	er: Galway Co.Co.				
28	44			Date Received	05-04-16	Date Te	esting started 26-04-16				
20	38			Description:	Brown silty	Brown silty, sandy, GRAVEL with some cobbles					
14	35	GRAVEL									
10	32	OIV.WLL		Remarks	Sample size did not meet the re	equirements of BS1377					
6.3	29						.55 15 53 35 18 35 55 55 55 55 55 55 55 55 55 55 55 55				
5	27		400				0.063 0.425 0.6 1.18 1.18 1.0 1.0 1.0 5.3 5.3 5.3 5.3 5.3 6.3 7.5 6.3 6.3				
3.35	25		100								
2	23		90								
1.18	21		<u>@</u> 80	† 							
0.6	18		Percentage passing (%) 20	+ + + + + + + + + + + + + + + + + + + +			 				
0.425	16	SAND		1							
0.3	14		в о 50								
0.15	11		40 40								
0.063	8		arcen 30								
				20							
		SILT/CLAY	10	1							
			0	 							
			0.0	0.001 0.001		0.01	0.1 1 10 100				
				CLAY	•	SILT	Sieve size (mm) SAND GRAVEL				
		ICSL 1 to	d Matori	als Laborato	rv		Approved by: Date: Page no:				
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Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



particle	%			Contract No:	18963	Report	No. R71923		.!	
size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1			
75	60	COBBLES		BH:	BH03/17					
63	60	OODDELO		Sample No.	AA48882	Lab. Sa	ample No.	A16/1318		
50	50			Sample Type:	В					
37.5	39			Depth (m)	2.00	Custom	er: Galway Co	.Co.		
28	35			Date Received	05-04-16	Date Te	esting started	26-04-16	6	
20	32			Description:	Brown silty					
14	29	GRAVEL								
10	26	OIVWLL		Remarks						
6.3	23						53	8 222	2	5:
5	21		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	28 37. 530. 53
3.35	18		100							
2	15		90							
1.18	13		80	 						
0.6	11		Percentage passing (%) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	+						
0.425	9	SAND								
0.3	9		<u>8</u> 50							<u> </u>
0.15	7		eget 40							
0.063	6		acen 30							
			20							
		SILT/CLAY	10	 						
			0							
			0.0	0.0		0.01	0.1 1		10	100
				CLA	Y	SILT	Sieve size (mn	n) SAND	GRAVEL	
							Approved b	by:	Date:	Page no:
		IGSL Lt	d Materi	als Laborate	ory		4 Bys	ine-	10-05-16	1 of 1
·						Persons	authorised to approv	e report: J Barrett (C	Quality Manager) H Byrne	(Laboratory Manag

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



particle	%			Contract No:	18963	Report	No. R71994	<u>!</u>	
size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1		
75	100	COBBLES		BH:	BH3/19				
63	100	CODDLLO		Sample No.	AA39978	Lab. Sa	mple No. A16/1319		
50	67			Sample Type:	В				
37.5	63			Depth (m)	0.30	Custom	er: Galway Co.Co.		
28	56			Date Received	05-04-16	Date Te	esting started 27-04-1	6	
20	52			Description:	Dark brown	r clayey/s	ilty, very sandy, GRAVEL		
14	47	GRAVEL							
10	44	OIVAVEE		Remarks	Sample size did not meet the re	equirements of BS1377			
6.3	38						8 55 83	τὸ	5
5	36		400				0.063 0.3 0.425 0.6 1.18	2 3.35 6.3 10 14 20	7 2 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5
3.35	33		100						
2	28		90						
1.18	24		80						
0.6	18		>° 70	+ + + + + + + + + + + + + + + + + + + +					
0.425	16	SAND	is 60	 					
0.3	13		86 50						
0.15	8		Percentage passing (%) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0						
0.063	6		ceni						
			20						
		SILT/CLAY	10						
		,	0	 					
			0.0	0.0	01	0.01	0.1 1	10	100
				CLA	Y	SILT	Sieve size (mm) SAND	GRAVEL	
							Approved by:	Date:	Page no:
ı		IGSL Lt	d Materi	als Laborato	ory		A Byene	13-05-16	1 of 1
						Persons	authorised to approve report: J Barrett	(Quality Manager) H Byrne (Laboratory Manage

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



particle	%			Contract No:	18963	Report	No. R71995		•	
size	passing			Contract:	GCTP Pha	ase 3 - C	ontact 1			
75	90	COBBLES		BH:	BH3/19					
63	90	0000000		Sample No.	AA39979	Lab. S	ample No.	A16/1320		
50	77			Sample Type:	В					
37.5	60			Depth (m)	0.50	Custon	ner: Galway Co.C	Co.		
28	54			Date Received			esting started	27-04-16	;	
20	48			Description:	Dark brow	n silty, sa	indy, GRAVEL with	some cobbles		
14	43	GRAVEL								
10	38	OTTAL		Remarks						
6.3	32						53	25	35	3.
5	31		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 14 20	97.0
3.35	28		100							
2	24		90							
1.18	21		<u>@</u> 80	† 						
0.6	16		§ 70	+ + + + + + + + + + + + + + + + + + + +						
0.425	14	SAND	Percentage passing (%) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0							
0.3	12		ed 50							1
0.15	8) tage							
0.063	6		arcen 30							
			20							
		SILT/CLAY	10	1						
			0	1004					40	400
			0.0		0.001	0.01	0.1	1	10	100
				CL	AY	SILT	Sieve size (mm)	SAND	GRAVEL	
	l	1001.11	al Mata :	د د داد ا داد	4		Approved by:		Date:	Page no:
		IGSL Lt	a wateri	als Labora	itory		A Bejon	-	13-05-16	1 of 1
						Persons	s authorised to approve r	report: J Barrett (C	Quality Manager) H Byrne (Laboratory Manag

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



particle	%			Contract No:	18963	•	No. R72069			
size	passing	<u> </u>		Contract:	GCTP Pha	se 3 - Co	ontact 1			
75	100	COBBLES		BH:	BH3/20					
63	100			Sample No.	AA49485	Lab. Sa	ample No. A16/132	21		
50	100			Sample Type:	В					
37.5	98			Depth (m)	0.10	Custom	ner: Galway Co.Co.			
28	80			Date Received	05-04-16		S	04-16		
20	73			Description:	Dark brown	n clayey/s	silty, very sandy, GRAVEL			
14	68	GRAVEL								
10	63	0.0.0.22		Remarks						
6.3	59						53	8 5 2		τċ.
5	56		400				0.063 0.15 0.3 0.425	1.18 2 3.35 6.3	14 20 28	37 50 53 93
3.35	50		100							
2	44		90							/
1.18	37		80	1						
0.6	30		8 70 ·	+					\mathcal{A}	
0.425	27	SAND	ils 60							
0.3	24		Oercentage passing (%) 20 20 30 30 30 30 30 30 30 30 30 30 30 30 30							
0.15	18		tage 40							
0.063	11		Cen 40							
				T						
			20							
		SILT/CLAY	10	1						
		OIL1/OL/(I	0	 				 		
			0.0	0.00)1	0.01	0.1	1 10)	100
				CLAY	•	SILT	Sieve size (mm) SAND	GRA	VEL	
		100: 11		-1-1-1-4	_		Approved by:	Date:		Page no:
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Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



particle	%			Contract No:	18963	Report	No. R71996		1	
size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1			
75	87	COBBLES		BH:	BH3/20					
63	75	OODDELEO		Sample No.	AA49486	Lab. Sa	ample No.	A16/1322		
50	64			Sample Type:	В					
37.5	57			Depth (m)	0.50	Custom	ner: Galway Co.C	ю.		
28	51			Date Received	05-04-16		esting started	27-04-16		
20	47			Description:	Orange/Bro	own sligh	tly clayey/silty, sand	dy, GRAVEL w	ith many cobbles	
14	42	GRAVEL								
10	38	0101022		Remarks	Sample size did not meet the re	requirements of BS1377				
6.3	34						53 15	3 25 3 18	3 35	ī.
5	32		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	28 37. 53 53 53
3.35	27		100							
2	22		90							
1.18	18		80	+ + + + + + + + + + + + + + + + + + + +						
0.6	12		S 70	+ + + + + + + + + + + + + + + + + + + +	-+++					
0.425	11	SAND	Percentage passing (%) 80 00 00 00 00 00 00 00 00 00 00 00 00		-+++					
0.3	9		ed 50		-					
0.15	6) tage 40							
0.063	5		ercen 30							
			20							
		SILT/CLAY	10							
			0						10	400
			0.0	0.00		0.01	0.1	1	10	100
				CLAY	,	SILT	Sieve size (mm)	SAND	GRAVEL	
	<u> </u>		d Matari	iale Laboreta			Approved by:		Date:	Page no:
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Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



particle	%			Contract No:	18963	Report	No. R71997		_	
size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1			
75	92	COBBLES		BH:	BH3/20					
63	92	OODDELO		Sample No.	AA49487	Lab. Sa	imple No.	A16/1323		
50	86			Sample Type:	В					
37.5	76			Depth (m)	0.80	Custom	er: Galway Co.Co	ο.		
28	65			Date Received	05-04-16		esting started	26-04-16		
20	57			Description:	Brown sligh	tly clayey	//silty, very sandy, 0	GRAVEL with s	some cobbles	
14	51	GRAVEL								
10	46	OTTAL		Remarks						
6.3	40						53	3 25 3 18	35	ιζ
5	37		100				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20 20	37. 50. 53. 53.
3.35	32		100							
2	24		90	1						
1.18	17		© 80	† 						
0.6	11		<u>\$</u> 70	+ + + + + + + + + + + + + + + + + + + +						/
0.425	9	SAND	.ig 60							
0.3	7		Percentage passing (%) 80 20 40 30							
0.15	5) tage							
0.063	4		90 arcen							
			20							
		SILT/CLAY	10	1						
			0	 						
			0.0	0.0		0.01	0.1	1	10	100
				CLA	,	SILT	Sieve size (mm)	SAND	GRAVEL	
	I						Approved by:		Date:	Page no:
		IGSL Lt	d Materi	als Laborato	ory		A Byen	_	13-05-16	1 of 1
· ·	_		•	·		Persons	authorised to approve re	eport: J Barrett (Q	uality Manager) H Byrne (l	Laboratory Manage

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



particle	%		Contract No:	18963 Report	No. R72734		
size	passing		Contract:	GCTP Phase 3 - Co	ontact 1		
75	100	COBBLES	BH:	BH3/31CF			
63	100	OODDELO	Sample No.	AA48875 Lab. Sa	ample No. A16/1324		
50	100		Sample Type:	В			
37.5	100		Depth (m)	0.50 Custom	ner: Galway Co.Co.		
28	96		Date Received	05-04-16 Date To	esting started 09-06-10	3	
20	93		Description:	Light brown/grey sa	ndy, slightly gravelly, SILT		
14	93	GRAVEL					
10	92	JIVAVLL	Remarks				
6.3	89				8 . 55 . 83	- Cr	ιζi
5	88				0.063 0.15 0.3 0.425 0.6	2 3.35 6.3 10 14 20	782 37 8
3.35	85		100				
2	83		90 +		 		
1.18	79		80			1 	
0.6	77		8 70 				
0.425	73	SAND	ig 60				
0.3	69		8 50				
0.15	58		tage 40 +				
0.063	45		%) 70				
0.037	38						
0.026	36		20				
0.017	32	SILT/CLAY	10 + + + + + + + + + + + + + + + + + + +				
0.010	29		0 +		 		
0.007	27		0.0001 0.0	0.01	0.1 1	10	100
0.005	26		CLA	Y SILT	Sieve size (mm) SAND	GRAVEL	
0.002	16						
		IGSL Ltd	d Materials Laborate	orv	Approved by:	Date:	Page no:
		.552 20			A Regare	17-06-16	1 of 1

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



particle	%			Contract No:	18963	•	No. R72735			
size	passing	<u> </u>		Contract:	GCTP Pha		ontact 1			
75	100	COBBLES		BH:	BH3/31CF					
63	91			Sample No.	AA48876	Lab. Sa	ample No.	A16/1325		
50	78			Sample Type:	В					
37.5	71			Depth (m)	1.00	Custom	ner: Galway Co.C	0.		
28	70			Date Received	05-04-16		esting started	09-06-16		
20	65			Description:	Light brown	n/grey slig	ghtly sandy, gravelly	v, CLAY with s	ome cobbles	
14	57	GRAVEL								
10	52	OIVAVEE		Remarks						
6.3	46						5 5	82	ις.	ις
5	44						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 14 20	37. 530. 53.
3.35	40		100							
2	37		90	+ + + + + + + + + + + + + + + + + + + +						
1.18	34		<u> </u>	+ + + + + + + + + + + + + + + + + + + +						
0.6	31		% 70	+						
0.425	30	SAND	ssing 60							
0.3	28		Dercentage passing (%) 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0							
0.15	25		age							
0.063	20		centa 04							
0.040	17			1						
0.028	17		20	+ + + + + + + + + + + + + + + + + + + +						
0.018	15	SILT/CLAY	10	+ + + + + + + + + + + + + + + + + + + +						
0.010	14	SIL I / CLAY	0							
0.007	13		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 Mata=	ala Labarata			Approved by:		Date:	Page no:
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Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



			(11011)	e. Ocumentation stage	not accreated)			WAGE REGING. 13	1947
particle	%			Contract No:	•	ort No. R72070			
size	passing	<u> </u>	Ì	Contract:	GCTP Phase 3 -	Contact 1			
75	100	COBBLES	1	BH:	BH3/31CR				
63	90		1	Sample No.	AA48877 Lab.	Sample No.	A16/1326		
50	90		1	Sample Type:	В				
37.5	88		1	Depth (m)	2.00 Cust	omer: Galway Co.C	co.		
28	82		1	Date Received		Testing started	29-04-16		
20	77		1	Description:	Light brown slight	y sandy, gravelly, SII	_T with some co	obbles	
14	71	GRAVEL	1						
10	68	GRAVEL	1	Remarks					
6.3	64					5 3	8 ک <u>ت</u>	22	2
5	62					0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 14 20	228 337.5 63 63
3.35	59		100) 					
2	55		90) 			- 		
1.18	51		_ 80) 					{
0.6	46		<u>%</u> 70) 					++++++++++++++++++++++++++++++++++++
0.425	43	SAND	iss 60	, 📙 📗 📗					
0.3	41		sed 50						
0.15	36		ğ						
0.063	31		enta 40						
0.039	26		Pe 30) † 					
0.028	23		20) 					
0.018	21	SILT/CLAY	10) 			- 		
0.010	19	SIL I / CLAY	0	,					
0.007	18		0.	.0001 0.0	01 0.01	0.1	1	10	100
0.005	16			CLAY	/ SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	10								
		1001 14				Approved by:		Date:	Page no:
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Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



particle	%			Contract No:	18963	Report	No. R71922		!	
size	passing			Contract:	GCTP Phas					
75	100			BH:	BH03/31CF					
63	100	COBBLES		Sample No.	AA48875		ample No.	A16/1327		
50	100			Sample Type:	В		·			
37.5	100			Depth (m)	3.00	Custom	ner: Galway Co.C	0.		
28	100			Date Received	05-04-16	Date Te	esting started	27-04-16		
20	98			Description:	Mottled ligh	nt brown :	slightly sandy, slight	tly gravelly, SIL	.T	
14	95	GRAVEL								
10	91	GRAVEL		Remarks						
6.3	86						53	8 8	. 35	τċ
5	83		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	77		100							
2	70		90							
1.18	63		80							
0.6	56		S 70						/ 	
0.425	54	SAND	Nercentage passing (%) 20 00 00 00 00 00 00 00 00 00 00 00 00							
0.3	50		<u>α</u> 50							
0.15	44		gatr 40							
0.063	38		90 30 E							
0.036	32		20							
0.026	29		10							
0.017	24	SILT/CLAY								
0.010 0.007	20 17		0	0001 0.0	01	0.01	0.1	1	10	100
0.007	17 15		0.0	CLA				•	GRAVEL	100
0.005	8			CLA	,	SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	U						Approved by:		Date:	Page no:
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	_					Persons	authorised to approve re	eport: J Barrett (C	Quality Manager) H Byrne (Laboratory Mana

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



particle	%			Contract No:	18963	Report	No. R72686			
size	passing			Contract:	GCTP Phas	se 3 - Co	ntact 1			
75	100	COBBLES		BH:	BH3/31CF					
63	100			Sample No.	AA48879	Lab. Sa	mple No.	A16/1328		
50	100			Sample Type:	В					
37.5	97			Depth (m)	4.00	Custom	er: Galway Co.C	0.		
28	92			Date Received	05-04-16		esting started	09-06-16		
20	87			Description:	Light brown	n/grey slig	htly sandy, slightly	gravelly, CLAY	,	
14	85	GRAVEL								
10	82	OIVWLL		Remarks						
6.3	78						5 5	8 8	rð.	3
5	76		405				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 20 20	28 37.5 50 63
3.35	73		100							
2	69		90							
1.18	65		<u> </u>	+ + + + + + + + + + + + + + + + + + + +						
0.6	61		× 70	+						
0.425	58	SAND	iss 60							
0.3	55		Percentage passing (%) 80 00 00 00 00 00 00 00 00 00 00 00 00							
0.15	47		ob 40							
0.063	38		cent							
0.037	34									
0.027	31		20							
0.017	28	SILT/CLAY	10		-1++					
0.010	24	OIL I /OLAT	0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						
0.007	22		0.0	0.0	01	0.01	0.1	1	10	100
0.005	19			CLA	1	SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	11									
		ICSL 14	d Matar	ala Labarat			Approved by:		Date:	Page no:
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Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



particle	%			Contract No:	18963	•	No. R71928			
size	passing	<u> </u>		Contract:	GCTP Phase	e 3 - Co	ontact 1			
75	100	COBBLES		BH:	BH03/47					
63	92			Sample No.	AA48890	Lab. Sa	ample No.	A16/1629		
50	92			Sample Type:	В					
37.5	92			Depth (m)	0.50	Custom	er: Galway Co.C	0.		
28	90			Date Received	29-03-16		esting started	27-04-16		
20	87			Description:	Mottled brov	wn slight	ly sandy, slightly gr	avelly, SILT wi	th some cobbles	
14	83	GRAVEL								
10	81	0101022		Remarks						
6.3	77						53	8 22 2		5.
5	76		405				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 14 20	28 37.5 53 63 63
3.35	72		100							
2	68		90							
1.18	65		<u> </u>	+ + + + + + + + + + + + + + + + + + + +						
0.6	61		§ 70	+ + + + + + + + + + + + + + + + + + + +						
0.425	58	SAND	isi 60							
0.3	56		Dercentage passing (%) 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0							
0.15	48		eget 40							
0.063	40		cent							
0.037	35			†						
0.027	32		20							
0.017	29	SILT/CLAY	10	+ + + + + + + + + + + + + + + + + + + +	1					
0.010	25	GIL I / GLAT	0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						
0.007	22		0.0	0.00)1	0.01	0.1	1	10	100
0.005	19			CLAY		SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	12									
		1001 14	d Matar	ala Labarata			Approved by:		Date:	Page no:
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Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



			`			<u> </u>				
particle	%			Contract No:	18963	Report I	No. R71929			
size	passing		1	Contract:	GCTP Phase	e 3 - Co	ntact 1			
75	100	COBBLES		BH:	BH03/47					
63	100	OODDELC		Sample No.	AA48891	Lab. Sa	mple No.	A16/1630		
50	91			Sample Type:	В					
37.5	91			Depth (m)	1.00	Custome	er: Galway Co.	Co.		
28	90			Date Received	29-03-16	Date Te	sting started	27-04-16	;	
20	88			Description:	Light brown	slightly s	andy, slightly gra	velly, SILT		
14	85	GRAVEL								
10	83	OI V WLL		Remarks						
6.3	80						55	8 8 8		
5	78		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	28 37.5 50 63 63
3.35	75		100							
2	72		90							
1.18	69		<u> </u>							
0.6	64		% 70	+						
0.425	62	SAND	ssine 60							
0.3	59		Percentage passing (%) 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0							
0.15	51		ob 11age							
0.063	45		cen c							
0.037	38									
0.026	36		20							
0.017	33	SILT/CLAY	10	+ + + + + + + + + + + + + + + + + + + +						
0.010	29	S.E.I / O.E. (I	0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						
0.007	27		0.0	0.0	01	0.01	0.1	1	10	100
0.005	24			CLA	1	SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	15									
		IGSL LE	d Matori	ials Laborate)r\/		Approved by		Date:	Page no:
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Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



	T								
particle	%			Contract No:	18963	Report	No. R72127		
size	passing		ı	Contract:	GCTP Phas	se 3 - Co	ontact 1		
75	100	COBBLES		BH:	BH3/47				
63	100	OODDELO		Sample No.	AA48892	Lab. Sa	ample No. A16/1631		
50	94			Sample Type:	В				
37.5	92			Depth (m)	2.00	Custon	ner: Galway Co.Co.		
28	92			Date Received	05-04-16	Date To	esting started 27-04-16		
20	91			Description:	Mottled bro	own slight	ly sandy, slightly gravelly, CLAY		
14	89	GRAVEL							
10	87	JIVAVLL		Remarks					
6.3	83						8 : 52 : 8		ιĊ
5	81						0.063 0.425 0.6 1.18	23 3.35 6.3 70 70 70 70 70 70 70 70 70 70 70 70 70	37.5 37.5 63 63
3.35	77		100 -						
2	74		90 -						
1.18	71		80 -						
0.6	66		% 70 -	 					
0.425	65	SAND	ils 60 -						
0.3	62		Percentage passing (%) 80 - 00 - 00 - 00 - 00 - 00 - 00 - 00						
0.15	55		40 -						
0.063	45		cen c						
0.037	40								
0.026	37		20 -						
0.017	35	SILT/CLAY	10 -						
0.010	32	0.21,02,11	0 -	 			 		
0.007	29		0.0	0.0	01	0.01	0.1 1	10	100
0.005	26			CLAY	/	SILT	Sieve size (mm) SAND	GRAVEL	
0.002	18								
		IGSL Ltd	d Materia	als Laborato	rv		1.4	Date:	Page no:
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Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



	T						
particle	%			Contract No:	18963	Report	No. R71998
size	passing		ı	Contract:	GCTP Phas	se 3 - Co	ontact 1
75	100	COBBLES		BH:	BH3/47		
63	100	OODDELO		Sample No.	AA48893	Lab. Sa	ample No. A16/1632
50	91			Sample Type:	В		
37.5	89			Depth (m)	3.00	Custom	ner: Galway Co.Co.
28	87			Date Received	05-04-16	Date Te	esting started 27-04-16
20	85			Description:	Light brown	n/grey slig	ghtly sandy, slightly gravelly, CLAY
14	84	GRAVEL					
10	80	JIVAVLL		Remarks			
6.3	77						5 8 5 5 3
5	76						0.063 0.425 0.425 0.6 1.18 1.18 2 3.35 5.3 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0
3.35	72		100				
2	68		90				
1.18	64		<u> </u>	+ + + + + + + + + + + + + + + + + + + +			
0.6	59		% 70	+ + + + + + + + + + + + + + + + + + + +			
0.425	57	SAND	issing 60	 			
0.3	55		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00				
0.15	50		ob 40				
0.063	45		cen cen				
0.036	41						
0.026	39		20				
0.016	36	SILT/CLAY	10	+ + + + + + + + + + + + + + + + + + + +			
0.010	33	3.21,02,11	0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			
0.007	31		0.0	0.0	01	0.01	0.1 1 10 100
0.005	28			CLAY	/	SILT	Sieve size (mm) SAND GRAVEL
0.001	20						
		IGSL Ltd	d Materi	als Laborato	\r\/		Approved by: Date: Page no:
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Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



		<u> </u>								
particle	%			Contract No:	18963	•	No. R72071			
size	passing			Contract:	GCTP Pha	se 3 - Co	ontact 1			
75	87	COBBLES		BH:	BH3/52					
63	87			Sample No.	AA48884	Lab. Sa	ımple No.	A16/1633		
50	79			Sample Type:	В					
37.5	74			Depth (m)	0.50	Custom	er: Galway Co.	Co.		
28	71			Date Received	05-04-16	Date Te	esting started	29-04-16	6	
20	69			Description:	Light brown	n/grey slig	ıhtly sandy, grave	lly, CLAY with s	ome cobbles	
14	65	GRAVEL								
10	62	GIVAVLL		Remarks	Sample size did not meet the	requirements of BS1377				
6.3	59						5 5	8 52	ω	2
5	57						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 10 20	28 37. 53 63
3.35	53		100							
2	48		90							
1.18	43		80	+ + + + + + + + + + + + + + + + + + + +						
0.6	38		∞ 70 × 70	+ + + + + + + + + + + + + + + + + + + +						
0.425	36	SAND	Percentage passing (%) 80 00 00 00 00 00 00 00 00 00 00 00 00	 						
0.3	34		05 g							
0.15	30		tage 40						1	
0.063	27		cent							
0.036	24									
0.026	23		20							
0.016	22	SILT/CLAY	10	+ + + + + + + + + + + + + + + + + + + +						
0.010	20	SIL I / CLAT	0							
0.007	18		0.0	0.0	001	0.01	0.1	1	10	100
0.005	17			CLA	Y	SILT	Sieve size (mm)	SAND	GRAVEL	
0.001	11									
		1001 14	d Matar	ala I abarat	O.K.) /		Approved by	/:	Date:	Page no:
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						Persons	authorised to approve	report: J Barrett (C	Quality Manager) H Byrne	(Laboratory Mana

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



particle	%		Co	ontract No:	18963	Report	No. R72737			
size	passing			ontract:	GCTP Phas					
75	100	0000155	BI		BH3/52					
63	100	COBBLES		ample No.	AA48886	Lab. Sa	ample No.	A16/1634		
50	100			ample Type:	В		•			
37.5	96			epth (m)	1.00	Custon	ner: Galway Co.0	Co.		
28	95			ate Received	05-04-16		esting started	09-06-16		
20	91		De	escription:	Brown sand	dy, slightl	y gravelly, CLAY			
14	88	GRAVEL								
10	85	GRAVEL	Re	emarks						
6.3	82						5 53	8 822		τύ
5	80		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 20 20	37.5 93 93 93
3.35	78		¹⁰⁰ T							
2	75		90 +							
1.18	72		80 +							
0.6	68		% 70 -							
0.425	65	SAND	is 60 							
0.3	62		ο 50 							
0.15	52		Percentage passing (%) 70							
0.063	40		30 							
0.036	32						T 			
0.026	30		20 —							
0.017	28	SILT/CLAY	10							
0.010	25		0 +							
0.007	22		0.000			0.01	0.1	1	10	100
0.005	19			CLAY		SILT	Sieve size (mm)	SAND	GRAVEL	
0.001	14						Approved by		Date:	Daga pa:
		IGSL Ltd	d Material	s Laborato	ry		Approved by		17-06-16	Page no: 1 of 1
						Persons	authorised to approve	report: J Barrett (Q	uality Manager) H Byrne (Laboratory Manag

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



Description: Particle % Contract No: 18963 Report No. R72072										
T5										
63 100 Sample No. AA48886 Lab. Sample No. A16/1635 50 88 Sample Type: B 37.5 87 Depth (m) 2.00 Customer: Galway Co.Co. 28 87 Date Received 05-04-16 Date Testing started 29-04-16 20 84 Description: Light brown/grey slightly sandy, slightly gravelly, SILT										
Sample No. AA48886 Lab. Sample No. A16/1635 Sample Type: B 37.5 87 Depth (m) 2.00 Customer: Galway Co.Co. 28 87 Date Received 05-04-16 Date Testing started 29-04-16 Description: Light brown/grey slightly sandy, slightly gravelly, SILT										
37.5 87 Depth (m) 2.00 Customer: Galway Co.Co. 28 87 Date Received 05-04-16 Date Testing started 29-04-16 20 84 Description: Light brown/grey slightly sandy, slightly gravelly, SILT 14 82 GRAVEL										
28 87 Date Received 05-04-16 Date Testing started 29-04-16 20 84 Description: Light brown/grey slightly sandy, slightly gravelly, SILT 14 82 GRAVEL										
20 84 Description: Light brown/grey slightly sandy, slightly gravelly, SILT 14 82 GRAVEL										
14 82 GRAVEL										
l I GRAVEL I										
10 79 Remarks Sample size did not meet the requirements of BS1377										
6.3 77 87 80 80 80 80 80 80 80 80 80 80 80 80 80	ις									
	14 20 28 37.5 50 63									
3.35 73 100 100 100 100 100 100 100 100 100 10										
2 71 90 + + + + + + + + + + + + + + + + + +										
1.18 68										
0.6 64 8 70 70 70 70 70 70 70										
0.425 62 SAND 5 60 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1										
0.6 64 0.425 62 0.3 59 0.15 52 0.063 45 0.035 39										
0.15 52 g 40										
0.063 45										
0.025 38 20 20										
0.016 36 SILT/CLAY 10 10 11 11 11 11 11 11 11 11 11 11 11										
0.009 32 0 1 0 + + + + + + + + + + + + + + + + +										
0.007 29 0.0001 0.001 0.01 1 10	100									
0.005 27 CLAY SILT Sieve size (mm) SAND GRAV	VEL									
0.001 19										
IGSL Ltd Materials Laboratory Approved by: Date:	Approved by: Date: Page no:									
18-05-10										

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



particle	%			Contract No:	18963	Report	t No. R71999
size	passing		1	Contract:	GCTP Phas	se 3 - Co	Contact 1
75	100	COBBLES		BH:	BH3/52		
63	100	OOBBLLO		Sample No.	AA48887	Lab. Sa	Sample No. A16/1636
50	100			Sample Type:	В		
37.5	98			Depth (m)	3.00	Custom	mer: Galway Co.Co.
28	96			Date Received	05-04-16	Date Te	Testing started 27-04-16
20	96			Description:	Light brown	/grey slig	ightly sandy, slightly gravelly, CLAY
14	95	GRAVEL					
10	93	JIVAVLL		Remarks			
6.3	89						5 5 8 5 5
5	88						0.063 0.425 0.6 1.18 1.18 1.0 1.0 1.0 6.3 1.0 1.0 6.3 1.0 1.0 6.3 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0
3.35	84		100				
2	78		90				
1.18	75		<u> </u>	+ + + + + + + + + + + + + + + + + + + +			
0.6	70		<u>%</u> 70	+			
0.425	68	SAND	issing 60				
0.3	65		05 g				
0.15	58		eget 40				
0.063	52		<u>ā</u>				
0.035	46						
0.025	44		20				
0.016	41	SILT/CLAY	10				
0.009	38	0.21,02,11	0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			
0.007	35		0.0	0.0	31	0.01	0.1 1 10 100
0.005	32			CLAY	,	SILT	Sieve size (mm) SAND GRAVEL
0.001	23						
		IGSL Ltd	d Materi	als Laborato)rv		Approved by: Date: Page no:
		18-05-16 1 of 1					

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



	T									
particle	%			Contract No:	18963	•	No. R71930			
size	passing	<u> </u>		Contract:	GCTP Pha	se 3 - Co	ontact 1			
75	88	COBBLES		BH:	BH03/53					
63	82			Sample No.	AA48889	Lab. Sa	ample No.	A16/1638		
50	67			Sample Type:	В					
37.5	57			Depth (m)	1.00	Custon	ner: Galway Co.C	0.		
28	50			Date Received	29-03-16		esting started	27-04-16		
20	44			Description:	Light brown	n/grey silt	y, sandy, GRAVEL	with some cob	obles	
14	40	GRAVEL								
10	37	GIVAVLL		Remarks	Sample size did not meet the	requirements of BS1377				
6.3	34						5 5	8 8	2	2
5	32						0.063	0.3 0.425 0.6 1.18	2 3.35 5.3 10 14 20	23.0 23.0 23.0 25.0
3.35	28		100							
2	23		90	+ + + + + + + + + + + + + + + + + + + +						
1.18	20		_ 80	+ + + + + + + + + + + + + + + + + + + +						
0.6	17		<u>%</u> 70	+ + + + + + + + + + + + + + + + + + + +						
0.425	15	SAND	sinis 60							
0.3	14		sed 50							
0.15	12		Ď							
0.063	10		Senta 04							
				†						
			20	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						
			10	+ + + + + + + + + + + + + + + + + + + +						
		SILT/CLAY	0							
			0.0	0.00	01	0.01	0.1	1	10	100
				CLAY	,	SILT	Sieve size (mm)	SAND	GRAVEL	
		1001 11	-1 BA - 1 - 1	Sala I alversa			Approved by:		Date:	Page no:
		IGSL Lt	d Wateri	ials Laborato	ory		A Ryan	_	18-05-16	1 of 1

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



			(,					
particle	%			Contract No:	18963	Report	No. R72073				
size	passing		ī	Contract:	GCTP Phas	e 3 - C	ontact 1				
75	100	COBBLES		BH:	BH3/53						
63	100	OODDELO		Sample No.	AA48888	Lab. Sa	ample No. A16/1637				
50	100			Sample Type:	В						
37.5	84			Depth (m)	0.50	Custon	ner: Galway Co.Co.				
28	66			Date Received	05-04-16	Date T	esting started 29-04-16				
20	58			Description:	Light brown/	grey silt	y, sandy, GRAVEL				
14	50	GRAVEL									
10	46	OIVWLL		Remarks	Sample size did not meet the req	quirements of BS137					
6.3	40						8 22 23	22	rč.		
5	38						0.063 0.425 0.6 1.18	3.35 6.3 10 14 20 20 28	720.7		
3.35	33		100								
2	29		90						 		
1.18	25		<u> </u>	+ + + + + + + + + + + + + + + + + + + +					/ - - - - -		
0.6	20		% 70	+ + + + + + + + + + + + + + + + + + + +				 			
0.425	18	SAND	issing 60								
0.3	16		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00								
0.15	13		ob 143								
0.063	11		cen								
			20								
		SILT/CLAY	10								
			0	 			 				
			0.0	0.0	01	0.01	0.1 1	10	100		
				CLAY	,	SILT	Sieve size (mm) SAND	GRAVEL			
	<u> </u>						Approved by: Date	te:	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. R72512 Contract GCTP Phase 3 - Contact 1

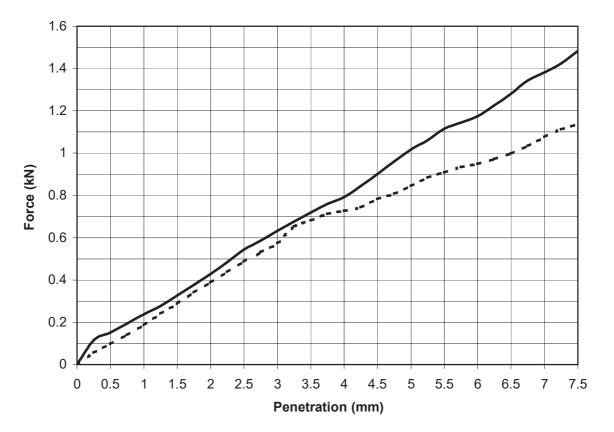
Contract No. 18963 Customer

Galway Co.Co.

Date received 29-03-16 Date Tested 07-06-16

BH/TP No. BH3/19 Sample No. AA39979 Type: B

Depth (m) 0.50 Lab sample No. A16/1320



Key: ----- Base

Description: Dark brown silty, sandy, GRAVEL with some cobbles Initial Condition: Soaked 4 Days Bulk Density (Mg/m³): Moisture Content (%): 18 2.07 Dry Density (Mg/m³): Surcharge (kg): 4 1.75 % Material >20mm: 24 Method of compaction: Static Compaction Method 2

Test Result	Тор	Base
CBR %	5	4
Moisture	17	19
Content %	''	13

Persons authorized to approve reports

J Barrett (Quality Manager)

H Byrne (Laboratory 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.	R72513	Contract	GCTP Phase 3 - Contact 1
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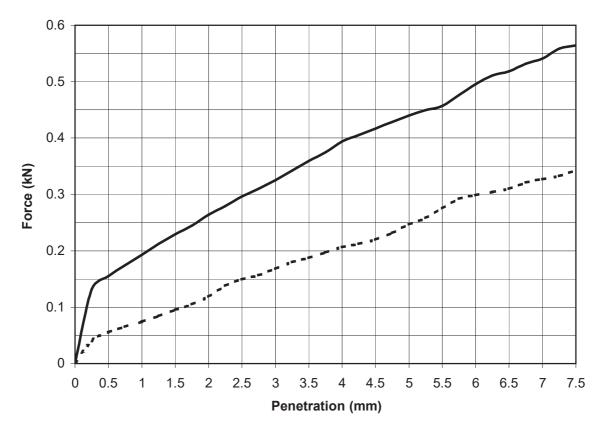
Contract No. 18963 Customer

Galway Co.Co.

Date received 29-03-16 Date Tested 07-06-16

BH/TP No. BH3/31CR Sample No. AA48878 Type: B

Depth (m) 3.00 Lab sample No. A16/1327



Key: ----- Base

Description: Mottled li	ght brown sli	ghtly sandy, slightly gravel	ly, SILT	
Initial Condition:	Unsoaked			
Moisture Content (%):	11	Bulk Density (Mg/m ³):	2.23	
Surcharge (kg):	4	Dry Density (Mg/m ³):	2.01	
% Material >20mm:	4.5			
Method of compaction:	Static Con	npaction Method 2		

Test Result	Тор	Base
CBR %	2.2	1.2
Moisture	11	11
Content %	l ''	

Persons authorized to approve reports

J Barrett (Quality Manager)

H Byrne (Laboratory 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. R72514 Contract GCTP Phase 3 - Contact 1

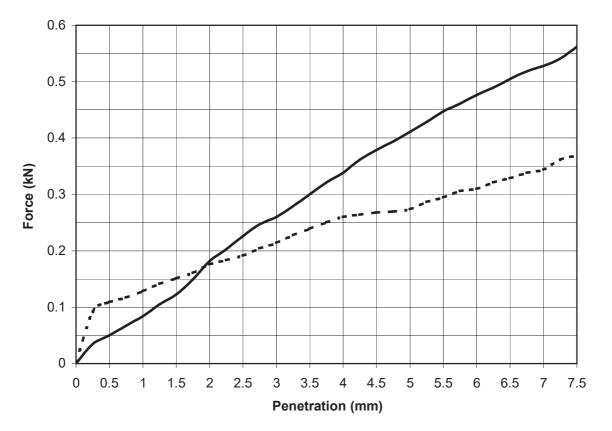
Contract No. 18963 Customer

Galway Co.Co.

Date received 29-03-16 Date Tested 07-06-16

BH/TP No. BH3/47 Sample No. AA48891 Type: B

Depth (m) 1.00 Lab sample No. A16/1630



Key: ----- Base

Description: Light brow	wn slightly sa	andy, slightly gravelly, SILT	•	
Initial Condition:	Unsoaked			
Moisture Content (%):	10	Bulk Density (Mg/m ³):	2.33	
Surcharge (kg):	4	Dry Density (Mg/m ³):	2.13	
% Material >20mm:	4.4			
Method of compaction:	Static Con	npaction Method 2		

Test Result	Тор	Base
CBR %	2.1	1.4
Moisture	10	10
Content %	10	10

Persons authorized to approve reports

J Barrett (Quality Manager)

H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory

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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. R72385 Contract GCTP Phase 3 - Contact 1

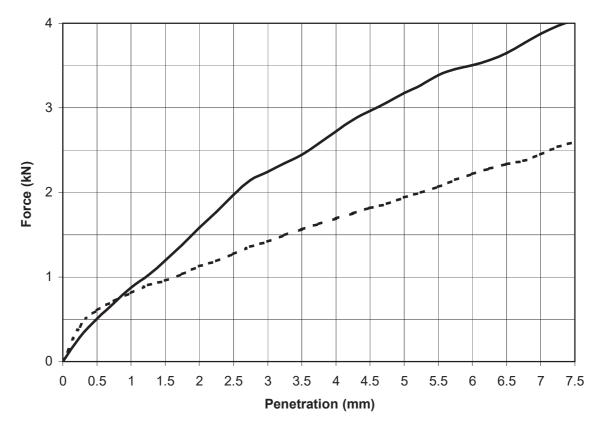
Contract No. 18963 Customer

Galway Co.Co.

Date received 29-03-16 Date Tested 28-04-16

BH/TP No. TP3/20 Sample No. AA49486 Type: B

Depth (m) 0.50 Lab sample No. A16/1322



Key: ----- Base

Description: Brown sa	ndy very g	ravelly CLAY		
Initial Condition:	Unsoake	d Point 1 of 5		
Moisture Content (%):	17	Bulk Density (Mg/m ³):	2.04	
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.74	
% Material >20mm:	34			
Method of compaction: Static Compaction Method 2				

Test Result	Тор	Base
CBR %	16	10
Moisture	17	17
Content %	l ''	17

Persons authorized to approve reports

J Barrett (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. R72385 Contract GCTP Phase 3 - Contact 1

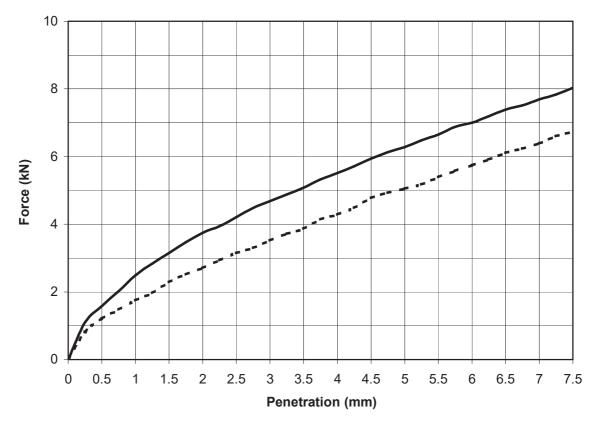
Contract No. 18963 Customer

Galway Co.Co.

Date received 29-03-16 Date Tested 04-05-16

BH/TP No. BH3/20 Sample No. AA49486 Type: B

Depth (m) 0.50 Lab sample No. A16/1322



Key: ----- Base

Description: Orange/Brown slightly clayey/silty, sandy, GRAVEL with many cobbles Initial Condition: Unsoaked Point 2 of 5 Bulk Density (Mg/m³): Moisture Content (%): 5 1.96 4 Dry Density (Mg/m³): Surcharge (kg): 1.87 % Material >20mm: 34 Method of compaction: Static Compaction Method 2

Test Result	Тор	Base
CBR %	32	25
Moisture	5	5
Content %		3

Persons authorized to approve reports

J Barrett (Quality Manager)

H Byrne (Laboratory Manager)

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IGSL Ltd Materials Laboratory

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. R72385 Contract GCTP Phase 3 - Contact 1

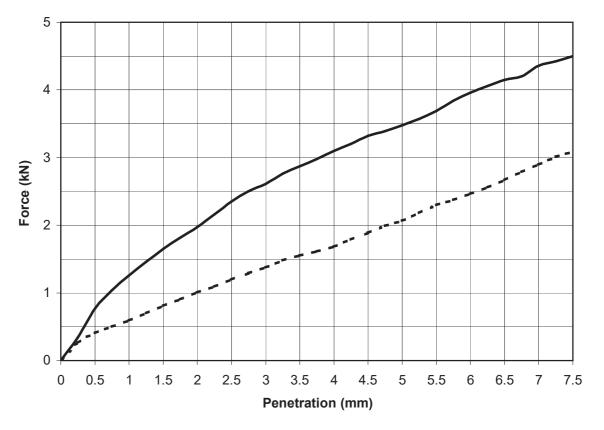
Contract No. 18963 Customer

Galway Co.Co.

Date received 29-03-16 Date Tested 05-05-16

BH/TP No. BH3/20 Sample No. AA49486 Type: B

Depth (m) 0.50 Lab sample No. A16/1322



Key: ----- Base

Description: Orange/Brown slightly clayey/silty, sandy, GRAVEL with many cobbles Initial Condition: Unsoaked Point 3 of 5 Bulk Density (Mg/m³): Moisture Content (%): 10 2.02 Dry Density (Mg/m³): Surcharge (kg): 4 1.84 % Material >20mm: 34 Method of compaction: Static Compaction Method 2

Test Result	Тор	Base
CBR %	18	10
Moisture	9	10
Content %	9	10

Persons authorized to approve reports

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H Byrne (Laboratory Manager)

Approved by	Date	Page No.
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IGSL Ltd

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. R72385 Contract GCTP Phase 3 - Contact 1

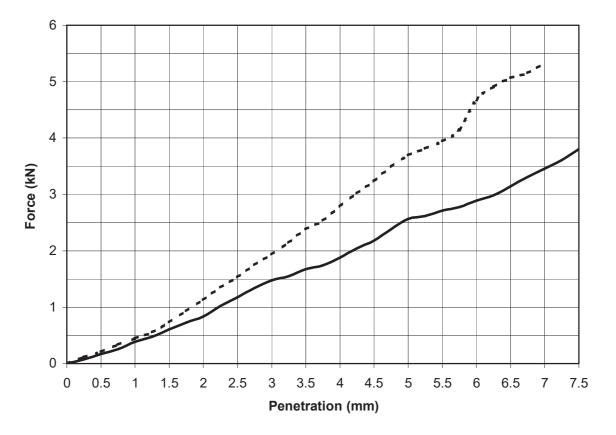
Contract No. 18963 Customer

Galway Co.Co.

Date received 29-03-16 Date Tested 05-05-16

BH/TP No. BH3/20 Sample No. AA49486 Type: B

Depth (m) 0.50 Lab sample No. A16/1322



Key: ----- Base

Description: Orange/Brown slightly clayey/silty, sandy, GRAVEL with many cobbles Initial Condition: Unsoaked Point 4 of 5 Bulk Density (Mg/m³): Moisture Content (%): 13 2.02 Dry Density (Mg/m³): Surcharge (kg): 4 1.79 % Material >20mm: 34 Method of compaction: Static Compaction Method 2

Test Result	Тор	Base
CBR %	13	19
Moisture	13	13
Content %	10	10

Persons authorized to approve reports

J Barrett (Quality Manager)

H Byrne (Laboratory Manager)

Approved by	Date	Page No.
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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. R72385 Contract GCTP Phase 3 - Contact 1

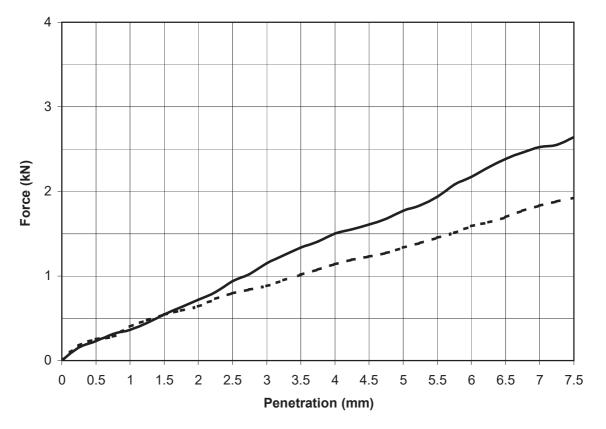
Contract No. 18963 Customer

Galway Co.Co.

Date received 29-03-16 Date Tested 05-05-16

BH/TP No. BH3/20 Sample No. AA49486 Type: B

Depth (m) 0.50 Lab sample No. A16/1322



Key: ----- Base

Description: Orange/B	rown slight	ly clayey/silty, sandy, GRAV	EL with many cobbles
Initial Condition:	Unsoake	d Point 5 of 5	
Moisture Content (%):	15	Bulk Density (Mg/m ³):	2.00
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.74
% Material >20mm:	34		
Method of compaction:	Static Co	empaction Method 2	

Test Result	Тор	Base
CBR %	9	7
Moisture	15	15
Content %	10	10

Persons authorized to approve reports

J Barrett (Quality Manager)

H Byrne (Laboratory Manager)

Approved by	Date	Page No.
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IGSL Ltd Materials Laboratory M7 Business Park Naas Co.Kildare 045 846176

TEST REPORT Determination of MCV / moisture content Relation of a soil

Tested in accordance with BS1377-4:1990, clause 5.5

Report No. R72128 Contract GCTP Phase 3,Contract 1 GI

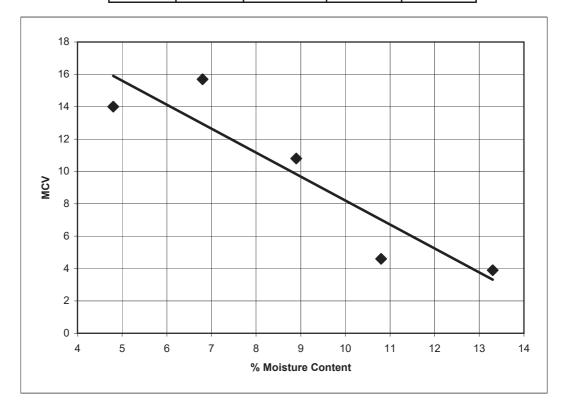
Contract No. 18963 Customer Galway Co.Co.

Date received 29-03-16 Date Tested 03-05-16

BH/TP No. BH47 Sample No. AA48892 Type: B

Depth (m) 2.00 Lab sample No. A16/1631

MC% 13 4.8 6.8 8.9 11 MCV 3.9 14 15.7 10.8 4.6



% material >20mm 14

Persons authorized to approve reports

J Barrett (Quality Manager) H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory

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 Date
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IGSL Ltd Materials Laboratory M7 Business Park Naas

Co. Kildare

Test Report

Dry Density/Moisture Content Relationship



Tested in accordance with BS1377:Part 4:1990

Report No. R72384 Contract No. 18963

Contract Name: GCTP Phase 3 - Contract 1 GI

Lab Contract No. 18963 Location: BH3/20

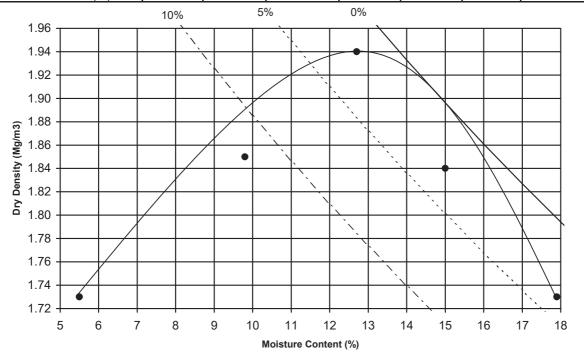
Sample No. AA49486 Depth (m) 0.5 Material Type E

Lab sample no. A16/1222 Customer: Galway Co.Co.

Date Received: 29-03-16 Test Method: 2.5 KG Rammer

Date Tested: 28-04-16 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	1.73	1.85	1.84	1.73	1.94	
Moisture Content (%)	18	10	15	5.5	13	



Maximum Dry Density (Mg/m³): 1.94 Optimum Moisture Content (%): 13

Description: Orange/Brown slightly clayey/silty, 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: 34

The result relates to the specimen tested.

Opinions and interpretations are outside the scope of accreditation

ICCI Matariala I abarratam	Approved by	Date	Page
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One dimensional Consolidation

BS1377:Part 5:1990

Report No. R72309

Contract: GCTP Phase 3 Contract number: 18963

BH: 3/31 Sample number: AA48877 Depth (m): 2.0

Description Greyish brown sandy gravelly SILT/CLAY (remoulded includes some fine gravel)

Specimen Height (mm) 18.7 Specimen diameter (mm) 75.9

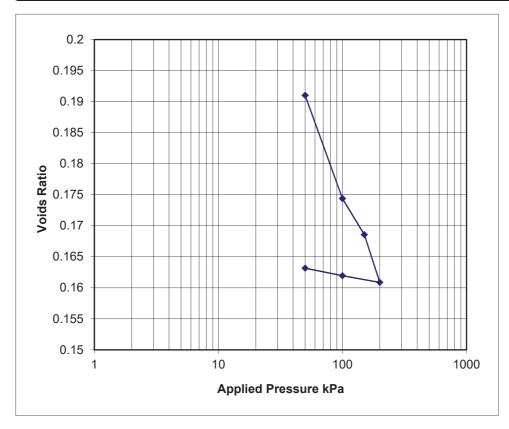
Moisture content % Bulk density Mg/m³ Dry density Mg/m³ Void ratio

Initial	Final
11	11
2.33	2.47
2.10	2.21
0.264	0.163

Assumed Particle density Mg/m³

2.65

Applied Pressure (kPa)	$m_v (m^2/MN)$	c _v (m²/year)	Voids Ratio
0 - 50	1.153	2.288	0.19101
50 - 100	0.279	1.838	0.17439
100 - 150	0.099	0.926	0.16857
150 - 200	0.132	0.446	0.16087
200 - 100	0.009	1.020	0.16195
100 - 50	0.021	4.858	0.16317





One dimensional Consolidation

BS1377:Part 5:1990

Report No. R72310

Contract: GCTP Phase 3 Contract number: 18963

BH: 3/52 Sample number: AA48886 Depth (m): 2.0

Description Greyish brown sandy gravelly SILT/CLAY (remoulded includes some fine gravel)

Specimen Height (mm) 18.5 Specimen diameter (mm) 76.2

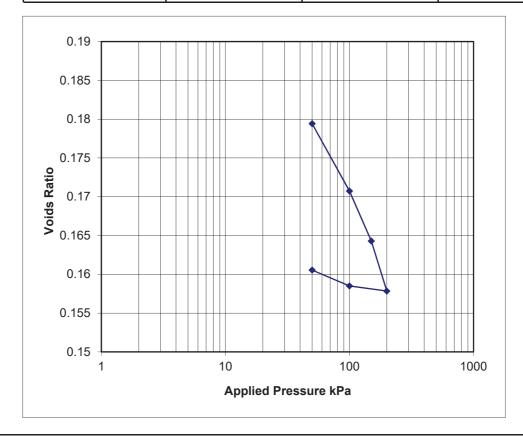
Moisture content % Bulk density Mg/m³ Dry density Mg/m³ Void ratio

Initial	Final
10	9
2.40	2.49
2.18	2.28
0.217	0.161

Assumed Particle density Mg/m³

2.65

Applied Pressure (kPa)	$m_v (m^2/MN)$	c _v (m²/year)	Voids Ratio
0 - 50	0.618	3.596	0.17942
50 - 100	0.147	1.129	0.17074
100 - 150	0.110	1.652	0.16429
150 - 200	0.111	0.176	0.15784
200 - 100	0.006	2.382	0.15850
100 - 50	0.035	2.983	0.16054





Consolidated undrained Triaxial Compression with pore pressure measurement

BS1377:Part 8:1990 and K H Head Manual of Soil Laboratory Testing vol 3

Report No. R72733 Lab Sample no. A16/1534

Contract No. 18963 Contract Name GCTP Phase 3

Location BH3/52 Sample No. AA48885 Depth (m) 1.00 Sample Type B

Method of Preparation Remoulded 2.5kg rammer 5 layers 25 blows / layer

Description Light greyish brown sandy gravelly silty CLAY Test Type Multi-stage

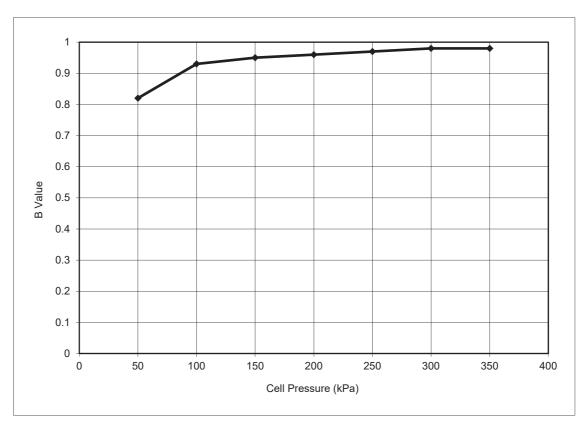
Initial Dimensions and condition

Height (mm)	202.0	Diameter (mm)	102.0	Side drains fitted	Yes
		Initial	Final		
Moisture Content (%	o)	9.7	7.9		
Bulk Density (Mg/m ³	['])	2.33	2.38		
Dry Density (Mg/m ³)		2.13	2.21		

Saturation Stage

Saturation by increments of Cell & Back Pressure

Initial B Value 0.82 Final B Value 0.98 Increments of Pressure 50

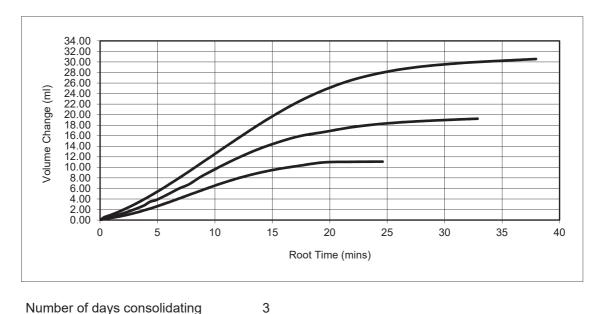




Consolidated undrained Triaxial Compression with pore pressure measurement

BS1377:Part 8:1990 and K H Head Manual of Soil Laboratory Testing vol 3

Report No.		R72733			Lab Samp	ole no.	A16/1534	
Contract N	0.	18963	Contract I	Name	GCTP Ph	ase 3		
Location	BH3/52	Sample No.		Depth (m)	1.00	Sample T	уре	В
Consolidati	ion Stage							
Stage Num	ber		1	2	3			
Cell Pressu	ıre (kPa)		350	400	450			
Back Press	sure (kPa)		300	300	300			
Effective P	ressure (kl	Pa)	50	100	150			
Final Pore	Pressure (kPa)	297	290	301			
Volume Ch	ange (ml)		30.56	19.23	11.09			
% Pore Pre	essure Dis	sipation	100	100	99			



Number of days consolidating

Compression Stage

Failure criteria	Maximum	Effective Pri	incipal Stres	ss Ratio
Stage		1	2	3
Effective Stress (kPa)		50	100	150
Rate of Strain (mm/min)		0.005	0.0041	0.004
Pore Pressure at start (kPa)		299	291	301
Axial strain at failure (%)		3.37	5.25	7.55
Deviator Stress at failure (kPa)		79.3	201	369.3
Pore Pressure at failure (kPa)		325.8	340.1	349.2
Major Principal stress at failure		103.5	261.0	470.1
Minor Principal stress at failure		24.2	59.9	100.8

Number of days in compression 3

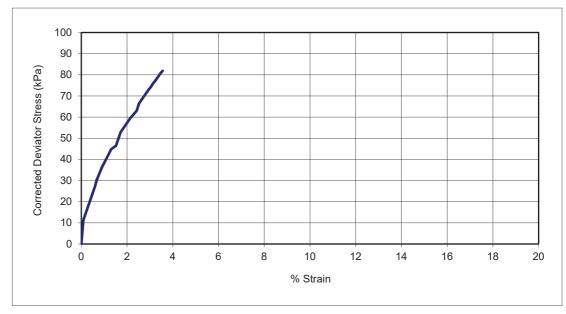
Total Number of days on test 11

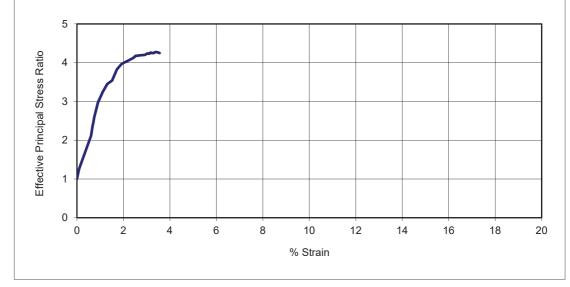


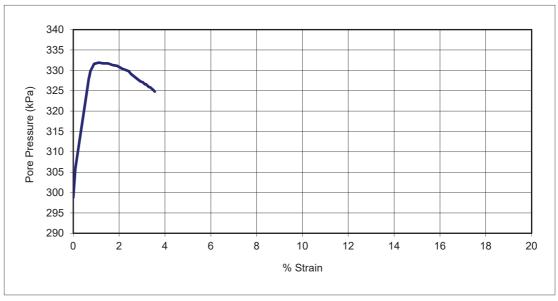
Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

Contract No. 18963 Location BH3/52 Sample No. AA48885 Depth

1.00





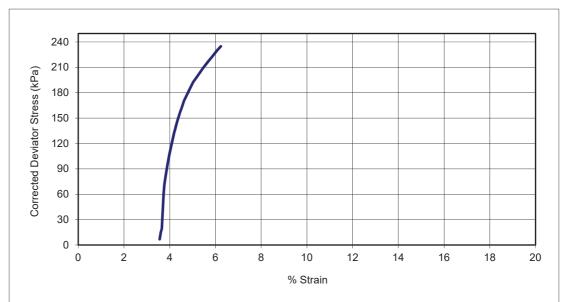


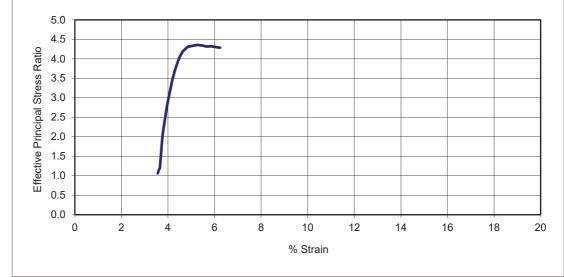


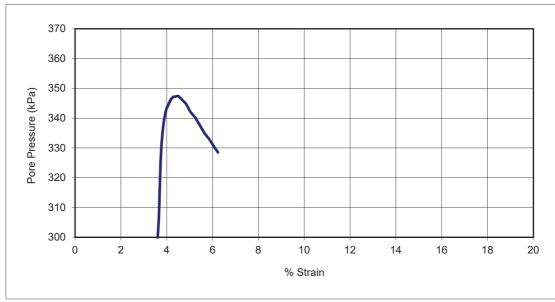
Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

Contract No. 18963 Location BH3/52 Sample No. AA48885 Depth

1.00



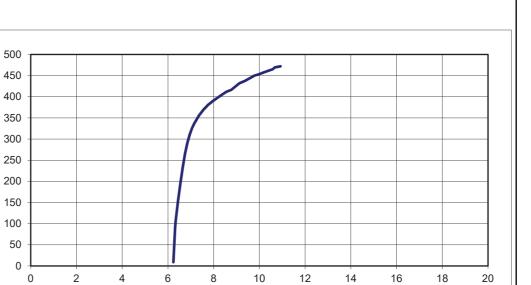






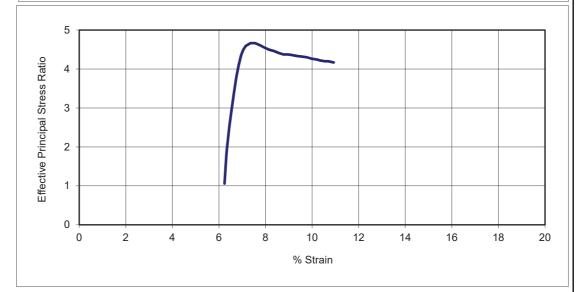
Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

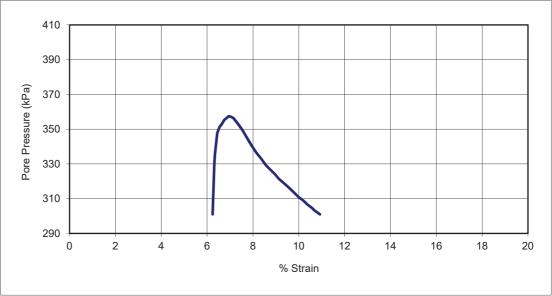
Contract No. 18963 Location BH3/52 Sample No. AA48885 Depth



% Strain

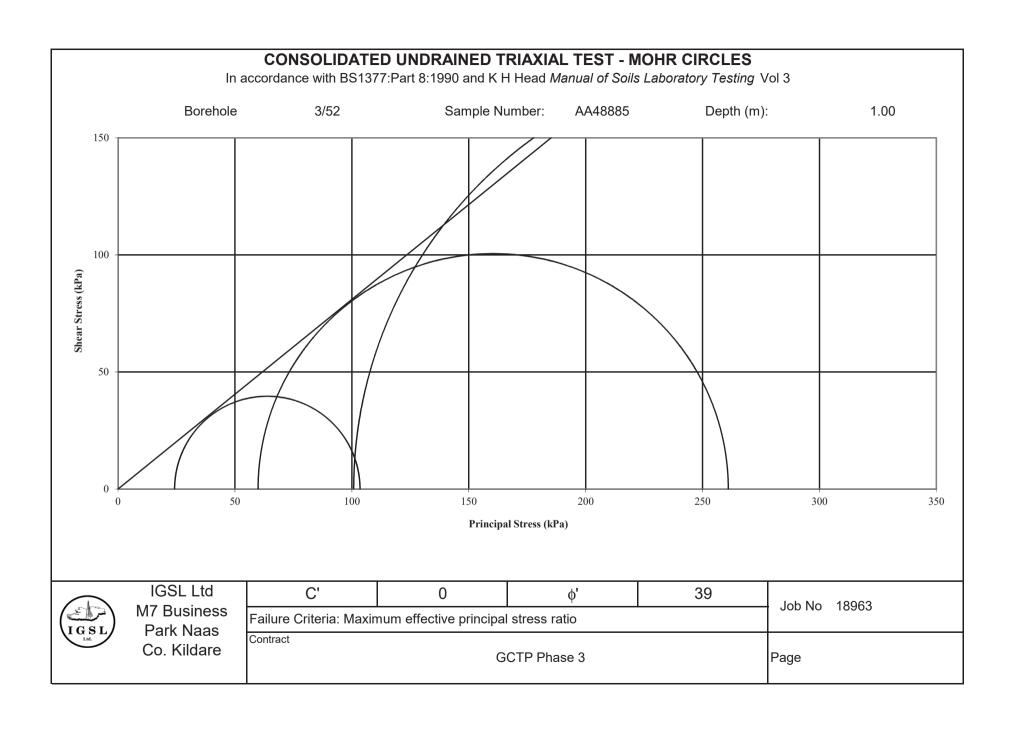
1.00





Stage 3

Corrected Deviator Stress (kPa)





Consolidated undrained Triaxial Compression with pore pressure measurement

BS1377:Part 8:1990 and K H Head Manual of Soil Laboratory Testing vol 3

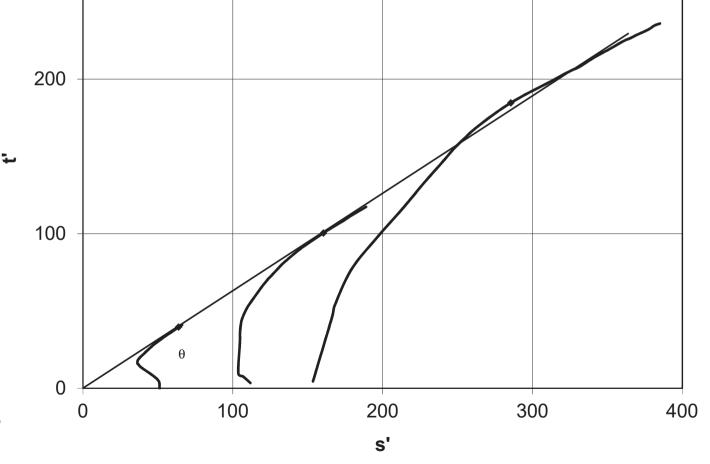
Contract No. 18963
Location BH3/52
Sample No. AA48885
Depth (m) 1.0

300

Shear strength parameters

 $\begin{array}{ccc} c' & & 0 \\ \phi' & & 40 \\ \theta & & 33 \end{array}$

 $\sin \phi' = \tan \theta$ c' = t'_o / Cos ϕ'



Plot of Stress Path Parameters s' v t'





Contract Number: 30805

Client's Reference: **18963 - PO: 8741** Report Date: **19-05-2016**

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: 29-04-2016
Date Commenced: 29-04-2016
Date Completed: 19-05-2016

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)

1

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

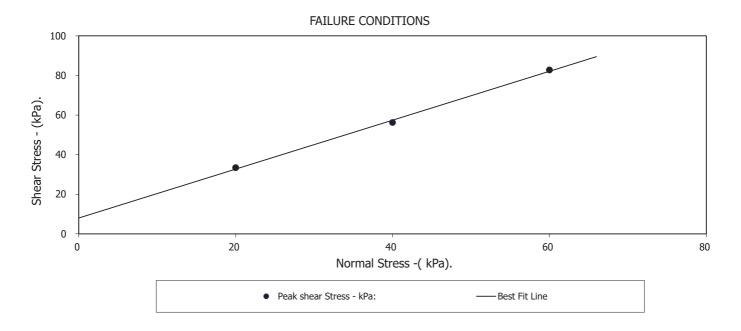
Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk

Test Report: Quick Shearbox Test BS1377:Part 7:4.5 :1990.

BH3/17 A16/1318 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 re	moved	
Sample Description:				
light brown slightly clayey slightly silty sand	y (fine-medium) GRAVEL (fine-coarse/subangular-	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 - %:		11	11	11
Bulk Density - Mg/m3:		2.24	2.24	2.24
Dry Density - Mg/m3:		2.01	2.01	2.01
Voids Ratio:		0.3199	0.3202	0.3198
Normal Pressure- kPa		20	40	60
Consolidation				
Consolidated Height - mm:		24.50	24.34	24.18
Shear				
Rate of Strain (mm/min)		1.250	1.250	1.250
Strain at peak shear stress (mm)	·	10.34	9.84	9.33
Peak shear Stress - kPa:		33	56	83

PEAK	
Angle of Shearing Resistance:(0)	51.0
Effective Cohesion - kPa:	8



2 P Granz

19/05/16

Checked Page 1 by:

Date

2 P Granz

19/05/16 Date

Approved Page 1 by:

Contract No.: **30805**

Client Ref Number: 8741



G.C.T.P

1 of 1

030704 QSHEARBOX

Appendix 13

Geotechnical Laboratory Testing

Lab Schedule 8

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. R71368

Contract No.

18963 Contract Name:

GCTP Phase 3 - Contract 1

Customer Galway Co.Co.

Samples Received: 29-03-16 Date Tested: 26-04-16

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
BH3/35 CF	AA001	0.5	A16/1329	В	5.9	21	12	9	67	WS	4.4	CL	Brown slightly sandy, gravelly, CLAY
BH3/35 CF	AA002	1.0	A16/1330	В	8.3	18	NP	NP	60	WS	4.4		Light brown/grey slightly sandy, slightly gravelly, SILT
BH3/35 CF	AA003	2.0	A16/1331	В	6	21	NP	NP	61	WS	4.4		Light brown/grey slightly sandy gravelly SILT
BH3/35 CF	AA004	3.0	A16/1332	В	9.7	22	NP	NP	71	WS	4.4		Light brown/grey slightly sandy, gravelly, SILT with some cobbles
BH3/35 CF	AA005	4.0	A16/1333	В	11	22	NP	NP	69	WS	4.4		Mottled brown slightly sandy, gravelly, SILT
BH3/35 CF	AA006	5.0	A16/1334	В	8.9	23	NP	NP	53	WS	4.4		Mottled light brown slightly sandy, slightly gravelly, SILT with many cobbles
BH3/35 CF	AA007	6.5	A16/1323	В	5.3		NP	NP					Mottled grey/brown slightly sandy, slightly gravelly, SILT
BH3/35 CF	800AA	8.0	A16/1336	В	13	24	NP	NP	68	WS	4.4		Mottled grey/brown slightly sandy, slightly gravelly, SILT
BH3/54	AA009	0.5	A16/1337	В	2.3		NP	NP					COBBLES with dark brown/grey slightly silty, slightly sandy, gravel
BH3/54	AA010	1.0	A16/1338	В	5.1	21	NP	NP	39	WS	4.4		Grey brown silty sandy GRAVEL
BH3/54	AA011	2.0	A16/1339	В	2.7	23	NP	NP	33	WS	4.4		Light brown/grey slightly silty, sandy, GRAVEL with many cobbles
BH3/54	AA012	3.0	A16/1340	В	5.2	19	NP	NP	39	WS	4.4		Mottled light brown/grey silty, sandy, GRAVEL with some cobbles
			·				·			·			
			·				·			·			
						_			_				

Notes: Preparation:

WS - Wet sieved

Sample Type: B - bulk disturbed

U - Undisturbed

AR - As received

O - Official

NP - Non plastic

o - Ondisturbed

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

A Byane

Date Page 28-04-16

1 of 1

H Byrne (Laboratory Manager)

Remarks:

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R72659					
size	passing		(Contract:	GCTP Phas	se 3 - Co	ontact 1					
75	100	COBBLES		BH:	BH03/35CR	1						
63	100	CODDLLO	;	Sample No.	AA1	Lab. Sa	ample No.	A16/1329				
50	92		;	Sample Type:	В							
37.5	87			Depth (m)	0.50	Custom	ner: Galway Co.C	0.				
28	81			Date Received	05-04-16	Date Te	esting started	09-06-16				
20	79			Description:	Brown slight	tly sandy	, gravelly, CLAY					
14	77	GRAVEL										
10	73	OIVAVLL		Remarks								
6.3	70						55	8 22	ري	5		
5	68						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	930.7		
3.35	66		100 7							ППИШП		
2	62		90 -									
1.18	58		80 -									
0.6	54		% 70 -									
0.425	52	SAND	ssing 60 -									
0.3	49		6 50 -									
0.15	44		Percentage passing (%) 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0									
0.063	37		cent									
0.034	30											
0.024	27		20 -									
0.016	24	SILT/CLAY	10 -									
0.010	19	OIL 170L7(1	0 -									
0.007	17		0.00	0.0	001	0.01	0.1	1	10	100		
0.005	15			CLA	Υ	SILT	Sieve size (mm)	SAND	GRAVEL			
0.002	9											
		IGSL L+	d Matoria	als Laborate	orv		Approved by:		Date:	Page no:		
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	Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)											

Determination of Particle Size Distribution





	%			Contract No:	18963	Damant Na	D74004			
particle size				Contract:		Report No. se 3 - Conta				
75	passing 100			сопітасі. ВН:	BH03/35CF		ICL I			
63	100	COBBLES		Sample No.	AA2		lo No	A16/1330		
50	100			•		Lab. Samp	ile No.	A10/1330		
37.5	95			Sample Type: Depth (m)	B 1.00	Customori	Galway Co.C	`		
28	92			Deptif (III) Date Received	05-04-16	Date Testi		.o. 27-04-16		
20	89			Date Received Description:			ıg starteu ⁄ sandy, slightly			
14	86			Description.	Light brown	i wgi o'y oligi iliy	, canay, engine	g.avoy, c		
10	83	GRAVEL		Remarks						
6.3	79							10		
5	77						0.063	0.3 0.425 0.6 1.18	2 3.35 5.3 10 14 14	28 37.5 53 63
3.35	74		100 T							
2	70		90 -							
1.18	67		80							
0.6	62		Percentage passing (%) 90 - 09 - 09 - 09 - 09 - 09 - 09 - 09							
0.425	60	SAND	ssing 60 +							
0.3	57		bas 50 +							
0.15	50		30 - 40 -							
0.063	42		cent							
0.037	38									
0.027	35		20 +							
0.017	32	SILT/CLAY	10 +	-					1 11 1 11 11 11 1	
0.010	28	3.2.7,027.11	0 +							
0.007	25		0.00	0.0	01	0.01	0.1	1	10	100
0.005	22			CLA	1	SILT Si	eve size (mm)	SAND	GRAVEL	
0.002	14						Δ		ID. L	ID
		IGSL I to	d Materia	als Laborato	orv		Approved by		Date:	Page no:
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						Persons auth	norised to approve	report: J Barrett (C	uality Manager) H Byrne ((Laboratory Manage

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R72000					
size	passing			Contract:	GCTP Pha	ise 3 - Co	ontact 1					
75	83	COBBLES		BH:	BH3/35CR							
63	83	COBBLES		Sample No.	AA3	Lab. Sa	ample No.	A16/1331				
50	74			Sample Type:	В							
37.5	71			Depth (m)	2.00	Custom	ner: Galway Co.C	О.				
28	63			Date Received	05-04-16	Date Te	esting started	26-04-16	;			
20	60			Description:	Light brow	n/grey slig	ghtly sandy, gravelly	, SILT with so	me cobbles			
14	58	GRAVEL										
10	55	OIVWEE		Remarks	Sample size did not meet the	requirements of BS1377						
6.3	52						63	3 25 3 3 18	35	r.		
5	51		100				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 14 20	23 23 23 23 23 23 24 25 25 25 25 25 25 25 25 25 25 25 25 25		
3.35	48											
2	46		90									
1.18	44		© 80	† 								
0.6	42		§ 70	+				+				
0.425	40	SAND	ssin 60							1		
0.3	39		<u>e</u> 50									
0.15	34		40 tage									
0.063	28		Percentage passing (%) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0									
0.036	25											
0.026	23		20									
0.017	22	SILT/CLAY	10									
0.010	19		0									
0.007	18		0.0	0.0		0.01	0.1	1	10	100		
0.005	16			CLA	Υ	SILT	Sieve size (mm)	SAND	GRAVEL			
0.001	11								In (Tp.		
		IGSL I to	d Materi	als Laborat	orv		Approved by:		Date:	Page no:		
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	Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)											

Determination of Particle Size Distribution





particle	%		C	Contract No:	18963	Report	No. R71925	
size	passing		С	Contract:	GCTP Phas			
75	100	COBBLES	В	BH:	BH03/35CR			
63	100	COBBLES	S	Sample No.	AA4	Lab. Sa	ample No. A16/1332	
50	100		S	Sample Type:	В			
37.5	95		D	Pepth (m)	3.00	Custom	ner: Galway Co.Co.	
28	94		D	ate Received	05-04-16	Date Te	esting started 27-04-16	
20	90		D	Description:	Brown slight	lly sandy	, slightly gravelly, SILT	
14	87	GRAVEL						
10	85	OIVWLL	R	Remarks				
6.3	82						63 225 35 18	
5	80		400				0.063 0.425 0.425 0.6 1.18 1.06 1.10 1.06 3.35 5.3 5.3 5.3 5.3 5.3 6.3 7.5 5.0 6.3	
3.35	77		100 T					
2	74		90 +					
1.18	72		80 +					
0.6	70		8 70 -					
0.425	67	SAND	Percentage passing (%) 40 + 40 + 40 + 40 + 40 + 40 + 40 + 40					
0.3	64		<u>6</u> 50 +					
0.15	54		40 +					
0.063	41		30 +					
0.037	35							
0.027	33		20 +					
0.017	27	SILT/CLAY	10 +					
0.010	22	0.21702711	0 +					
0.007	19		0.00	01 0.00)1	0.01	0.1 1 10 100	
0.005	16			CLAY	•	SILT	Sieve size (mm) SAND GRAVEL	
0.002	10							
		IGSL L+	d Matoria	Is Laborato	rv.		Approved by: Date: Page no:	
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						Persons	authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Man	nager)

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



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

particle	%			Contract No:	18963	Report	No. R72001			
size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1			
75	100	COBBLES		BH:	BH3/35CR					
63	100	COBBLLO		Sample No.	AA5	Lab. Sa	ample No.	A16/1333		
50	84			Sample Type:	В					
37.5	79			Depth (m)	4.00	Custom	er: Galway Co.C	О.		
28	77			Date Received	05-04-16	Date Te	esting started	27-04-16		
20	74			Description:	Mottled bro	wn slight	ly sandy, gravelly, S	SILT		
14	71	GRAVEL								
10	68	ONAVEL		Remarks	Sample size did not meet the red	quirements of BS1377				
6.3	65						5 5	8 22	ις.	ις.
5	64		4.5.5				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	37.5 37.5 53 53
3.35	62		100							
2	60		90							
1.18	58		<u> </u>	+ + + + + + + + + + + + + + + + + + + +						
0.6	56		8 70	+ + + + + + + + + + + + + + + + + + + +						
0.425	54	SAND	issing 60							
0.3	52		Percentage passing (%) 80 00 00 00 00 00 00 00 00 00 00 00 00							
0.15	46		40							
0.063	33		cen							
0.037	28									
0.026	26		20							
0.017	21	SILT/CLAY	10	† † † † † † † † † † † † † † † † † † † 						
0.010	18		0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		ш			<u> </u>	
0.007	15		0.0	0.0	31	0.01	0.1	1	10	100
0.005	13			CLA	,	SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	7						-		I=	
		IGSL Ltd	d Materi	als Laborato)rv		Approved by:		Date:	Page no:
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Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



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

			(or commonwater ougo	,					
particle	%			Contract No:	18963 Re	port No. R719	26			
size	passing		1	Contract:	GCTP Phase 3	- Contact 1				
75	80	COBBLES	1	BH:	BH03/35CR					
63	80	COBBLLO	1	Sample No.	AA6 La	b. Sample No.	A1	6/1334		
50	80		1	Sample Type:	В					
37.5	72		1	Depth (m)	5.00 Cu	stomer: Galw	ay Co.Co.			
28	70		1	Date Received	05-04-16 Da	ite Testing start	ed	27-04-16		
20	64		1	Description:	Mottled light bro	own slightly san	dy, slightly g	ravelly, SIL	.T with many	
14	61	GRAVEL	1		cobbles					
10	57	GRAVEL	1	Remarks	Sample size did not meet the requirement	ts of BS1377				
6.3	54					<u>ო</u>	الم الم	?	2	2
5	52					0.063	0.15	0.6 1.18	2 3.35 5.3 10 14 20	28 37. 50 63
3.35	49		100	1						
2	46		90) 						
1.18	43		_ 80) 						
0.6	40		% 70) 						
0.425	39	SAND	iss 60	, 📙 📗 📗						
0.3	37		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.15	32		age						+	
0.063	25		Senta 04							
0.037	22									
0.026	21		20) 						
0.017	18	SILT/CLAY	10) 						
0.010	15	OIL I / CLAT	0)						
0.007	14		0	.0001 0.0	01 0.0	01	0.1	1	10	100
0.005	13			CLAY	' Si	/LT Sieve siz	e (mm) SA	ND	GRAVEL	
0.002	9						-			
		1001 14	d Mata:		140.7	- Table	oved by:		Date:	Page no:
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Determination of Particle Size Distribution





particle	%		С	ontract No:	18963	Report	No. R71927		
size	passing		С	ontract:	GCTP Phas	se 3 - Co	ontact 1		
75	100	COBBLES	В	H:	BH03/35CF	₹			
63	100		S	ample No.	AA7	Lab. Sa	ample No. A16/1335		
50	100		S	ample Type:	В				
37.5	98		D	epth (m)	6.50	Custom	ner: Galway Co.Co.		
28	97		D	ate Received	05-04-16		esting started 26-04-1		
20	93		D	escription:	Mottled gre	y/brown	slightly sandy, slightly gravelly, S	ILT	
14	90	GRAVEL							
10	86	0.0	R	emarks					
6.3	81						0.15 0.15 0.3 0.6 0.6	35	ιτί
5	79		100				0.063 0.3 0.425 0.6	2 3.35 5.3 10 14 20	97.00
3.35	76		100 T						
2	71		90 +						
1.18	68		80 +						
0.6	64) 70 +						
0.425	62	SAND	38 gg +						
0.3	58		<u>\ode{\text{\tint{\text{\tin}\text{\texi{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\ti}\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\ti}}\tilith{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\texi}\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\texi}\text{\text{\text{\text{\text{\text{\texi}\text{\text{\texi}\text{\text{\texi}\text{\text{\text{\text{\text{\texi}\tint{\text{\texi}\text{\text{\text{\text{\texi}\text{\texi}\text{\text{\texi}\texit{\</u>						
0.15	50		6 day 10 +						
0.063	37		Percentage passing (%) 40 40 40 40 40 40 40 40 40 40 40 40 40						
0.038 0.027	32 30		20 +						
0.027	30 27		10 —						
0.017	23	SILT/CLAY	0 +						
0.010	23 21		0.000	0.00)1	0.01	0.1 1	10	100
0.007	19		3.000	CLAY		SILT	Sieve size (mm) SAND	GRAVEL	.00
0.002	13			OLAT		O.L.	SIGNO SIZO (IIIIII) OMNO	JIVAVLL	
0.002							Approved by:	Date:	Page no:
		IGSL Ltd	d Materia	ls Laborato	ry		A Ryane	13-05-16	1 of 1
	_		-			Persons	authorised to approve report: J Barrett	Quality Manager) H Byrne (Laboratory Manager

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



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

	0/			0 1 111	40000	- · ·	N			
particle	%			Contract No:	18963	•	No. R71928			
size	passing	 		Contract:	GCTP Phas		ntact 1			
75	100	COBBLES		BH:	BH03/35CF					
63	100			Sample No.	AA8	Lab. Sa	mple No. A1	6/1338		
50	100			Sample Type:	В					
37.5	93			Depth (m)	8.00		er: Galway Co.Co.			
28	89			Date Received	05-04-16		sting started	26-04-16		
20	82			Description:	Mottled gre	y/brown s	slightly sandy, slightly g	ravelly, SII	_T	
14	79	GRAVEL								
10	76			Remarks						
6.3	73						63 5	2 8	35	rz.
5	71		400				0.063	0.6	2 3.35 6.3 10 20	37.5 50 53 63
3.35	69		100							
2	67		90							
1.18	65		<u> </u>	1						
0.6	62		% 70 ·	+						
0.425	61	SAND	is 60							
0.3	59		se 50							
0.15	49		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.063	37		Sent 40							
0.037	31			<u> </u>						
0.027	29		20	+ + + + + + + + + + + + + + + + + + + +					 	
0.017	26	SILT/CLAY	10	+ + + + + + + + + + + + + + + + + + + +	-1++					
0.010	23	SIL I / CLAY	0							
0.007	21		0.0	0.0	01	0.01	0.1	1	10	100
0.005	19			CLA'	Y	SILT	Sieve size (mm) SA	ND	GRAVEL	
0.002	12						` ,			
		1001 11	-	ala Labarra			Approved by:		Date:	Page no:
		IGSL Lt	a wateri	als Laborate	эгу		A Byene	-	13-05-16	1 of 1
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Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R71931		!	-
size	passing			Contract:	GCTP Phas					
75	46			BH:	BH3/54					
63	27	COBBLES		Sample No.	AA9	Lab. Sa	ample No.	A16/1337		
50	20			Sample Type:	В					
37.5	14			Depth (m)	0.50	Custom	ner: Galway Co.C	0.		
28	10			Date Received	05-04-16		esting started	27/4/116		
20	9			Description:	COBBLES	with dark	brown/grey slightly	/ silty, slightly s	sandy, gravel	
14	8	GRAVEL		·						
10	8	GRAVEL		Remarks	Sample size did not meet the re	equirements of BS1377				
6.3	7						5 53	8 52	ις	2
5	7		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 14 20	37.5 530 533 533 533 533 533
3.35	6		100							
2	5		90							
1.18	5		© 80							
0.6	4		<u>©</u> 70							
0.425	4	SAND	Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.3	4		ed 50							
0.15	3		fagt 40							
0.063	3) 90 90 90 90							
			20							
			10							
		SILT/CLAY								
			0.0	0001 0.0	01	0.01	0.1	1	10	100
				CLA'		SILT	Sieve size (mm)	SAND	GRAVEL	
							Approved by:		Date:	Page no:
		IGSL Ltd	d Materi	als Laborato	ory		A Bejon		13-05-16	1 of 1
						Persons	authorised to approve r	eport: J Barrett (Q	uality Manager) H Byrne (Laboratory Manager

Determination of Particle Size Distribution





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

particle	%		Contract No:	18963 Report No.	R72736		
size	passing		Contract:	GCTP Phase 3 - Contact 1	I		
75	100	COBBLES	BH:	BH3/54			
63	100	CODDLLS	Sample No.	AA10 Lab. Sample	e No. A16/1338		
50	100		Sample Type:	В			
37.5	85		Depth (m)	1.00 Customer:	Galway Co.Co.		
28	82		Date Received	05-04-16 Date Testing	g started 09-06-16		
20	75		Description:	Mottled light brown/grey s	silty, very sandy, GRAVEL		
14	70	GRAVEL					
10	65	GRAVEL	Remarks	Sample size did not meet the requirements of BS1377			
6.3	61				8 2 2 3	ις	
5	58		100		0.063 0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	37.5 37.5 53 53
3.35	51		100				
2	46		90 +				
1.18	41		80				
0.6	35		8 70				
0.425	31	SAND	ig 60 				
0.3	27		<u>8</u> 50				
0.15	19		40 de la de				
0.063	11		%) 70				
			Per 20 +				
			20				
		SILT/CLAY	10 +				
			0 +				
			0.0001 0.0	0.01	0.1 1	10	100
				CLAY SILT Sie	eve size (mm) SAND	GRAVEL	
	Approved by: Date: Page no:						
	IGSL Ltd Materials Laboratory						

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Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



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

10 10 14 14 20 20 33 50 50 50 50 50 50 50 50 50 50 50 50 50
20 20 33 33 50 50 50 50
20 20 20 20 20 20 20 20 20 20 20 20 20 2
20 20 20 37.5 50 50
10 10 10 10 10 10 10 10 10 10 10 10 10 1
10 100
RAVEL
Page no:
05-16 1 of 1

Determination of Particle Size Distribution





particle	%			Contract No:	18963	Report	No. R72075			
size	passing			Contract:	GCTP Phas	se 3 - Co	ntact 1			
75	84	COBBLES		BH:	BH3/54					
63	84	OOBBLLO		Sample No.	AA12	Lab. Sa	mple No.	A16/1340		
50	55			Sample Type:	В					
37.5	47			Depth (m)	3.00	Custom	er: Galway Co.C	ю.		
28	44			Date Received	05-04-16		esting started	27-04-16		
20	40			Description:	Mottled ligh	nt brown/g	rey silty, sandy, G	RAVEL with so	me cobbles	
14	38	GRAVEL								
10	35	OIVWLL		Remarks	Sample size did not meet the r	requirements of BS1377				
6.3	33						53	8 8	55	75.
5	31		400				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	28 37. 50 53
3.35	30		100							
2	28		90							
1.18	26		® 80	† 						
0.6	24		§ 70	+ + + + + + + + + + + + + + + + + + + +						
0.425	23	SAND	Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.3	21		<u>a</u> 50							
0.15	18		96 40							
0.063	13		acen 30							
			20							
		SILT/CLAY	10							
			0	+ + + + + + + + + + + + + + + + + + + +						
			0.0	0.0		0.01	0.1	1	10	100
				CLA	/	SILT	Sieve size (mm)	SAND	GRAVEL	
		1001 14	d M.c.45	ala I alaansti			Approved by:		Date:	Page no:
IGSL Ltd Materials Laboratory 17-05-16 1 of 1							1 of 1			
						Persons	authorised to approve r	eport: J Barrett (Q	uality Manager) H Byrne	(Laboratory Manaç

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. R71831 Contract GCTP Phase 3 - Contract 1

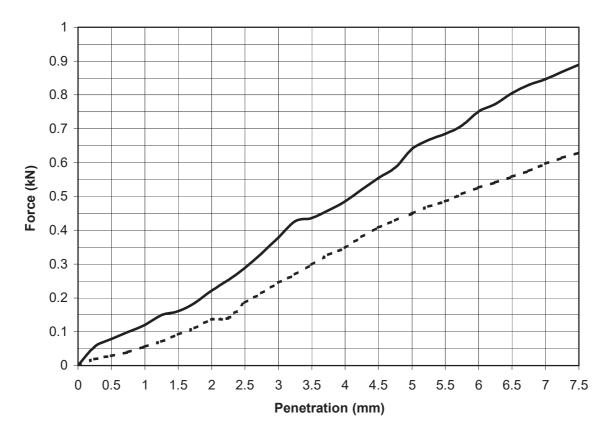
Contract No. 18963 Customer

Galway Co.Co.

Date received 05-04-16 Date Tested 03-05-16

BH/TP No. BH3/35CR Sample No. AA2 Type: B

Depth (m) 1.00 Lab sample No. A16/1330



Key: ----- Base

Description: Light brow	wn/grey slig	htly sandy, slightly gravelly,	SILT
Initial Condition:	Soaked 4	Day	
Moisture Content (%):	13	Bulk Density (Mg/m ³):	2.29
Surcharge (kg):	4	Dry Density (Mg/m ³):	2.03
% Material >20mm:	13		
Method of compaction:	Static Co	mpaction Method 2	

Test Result	Тор	Base
CBR %	3.2	2.3
Moisture	13	12
Content %	10	12

Persons authorized to approve reports

J Barrett (Quality Manager)

H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
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IGSL Ltd

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. R71830 Contract GCTP Phase 3 - Contract 1

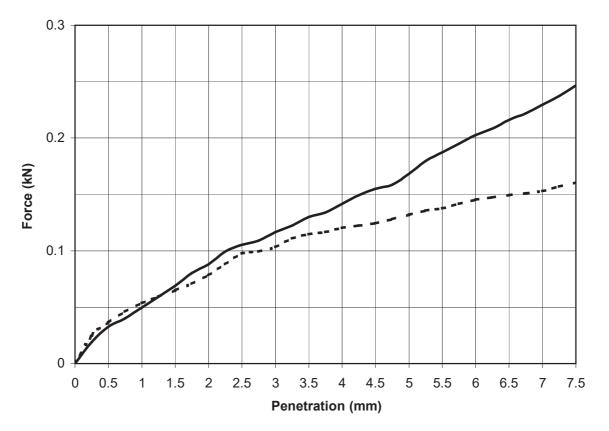
Contract No. 18963 Customer

Galway Co.Co.

Date received 05-04-16 Date Tested 03-05-16

BH/TP No. BH3/35CR Sample No. AA6 Type: B

Depth (m) 5.00 Lab sample No. A16/1334



Key: ----- Base

Description:	Mottled light brown slightly sandy, slightly gravelly, SILT with many					
	cobbles					
Initial Condition	on:	Soaked 4	Day			
Moisture Con	tent (%):	13	Bulk Density (Mg/m ³):	2.10		
Surcharge (kg	g):	4	Dry Density (Mg/m ³):	1.94		
% Material >2	20mm:	11				
Method of cor	mpaction:	Static Co	mpaction Method 2			

Test Result	Тор	Base
CBR %	8.0	0.7
Moisture	13	14
Content %	'0	

Persons authorized to approve reports

J Barrett (Quality Manager)

H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
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BS1377:Part 5:1990

Report No. R72448

Contract: GCTP Phase 3 Contract number: 18963

BH: 3/35 Sample number: AA3 Depth (m): 2.0

Description Greyish brown sandy gravelly silty CLAY (Remoulded specimen included some gravel)

Specimen Height (mm) 20.1 Specimen diameter (mm) 75.1

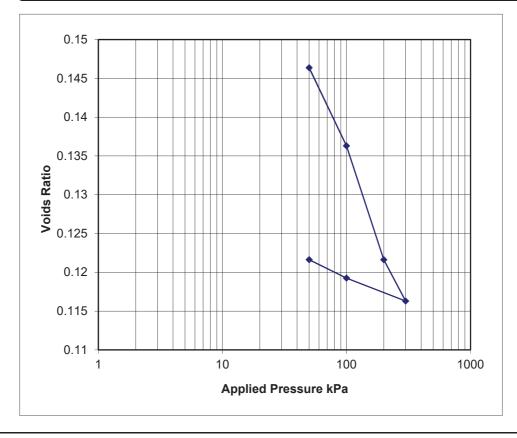
Moisture content % Bulk density Mg/m³ Dry density Mg/m³ Void ratio

Initial	Final
8.8	8.4
2.42	2.53
2.23	2.34
0.190	0.122

Assumed Particle density Mg/m³

2.65

Applied Pressure (kPa)	$m_v (m^2/MN)$	c _v (m²/year)	Voids Ratio
0 - 50	0.736	5.927	0.14638
50 - 100	0.176	3.182	0.13631
100 - 200	0.129	3.940	0.12162
200 - 300	0.048	12.234	0.11629
300 - 100	0.013	3.422	0.11926
100 - 50	0.042	993.567	0.12162





Consolidated undrained Triaxial Compression with pore pressure measurement

BS1377:Part 8:1990 and K H Head Manual of Soil Laboratory Testing vol 3

Report No. R72456 Lab Sample no. A16/1329

Contract No. 18963 Contract Name GCTP Phase 3

Location BH3/35CF Sample No. AA1 Depth (m) 0.50 Sample Type B

Method of Preparation Remoulded 2.5kg rammer 5 layers 25 blows / layer

Description Greyish brown sandy gravelly CLAY Test Type Multi-stage

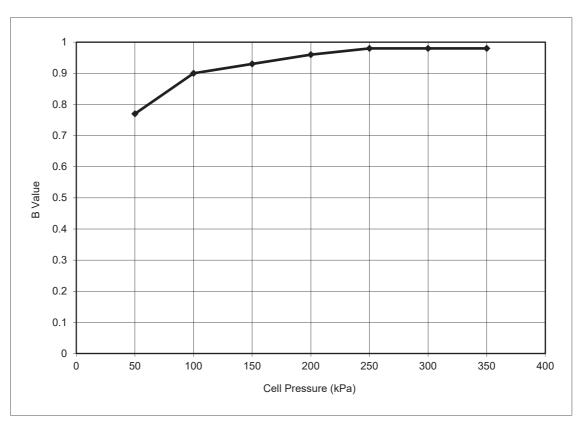
Initial Dimensions and condition

Height (mm)	200.0	Diameter (mm)	102.0	Side drains fitted	Yes
		Initial	Final		
Moisture Content	(%)	9.9	8.2		
Bulk Density (Mg/	m³)	2.34	2.37		
Dry Density (Mg/r	n ³)	2.13	2.19		

Saturation Stage

Saturation by increments of Cell & Back Pressure

Initial B Value 0.77 Final B Value 0.98 Increments of Pressure 50

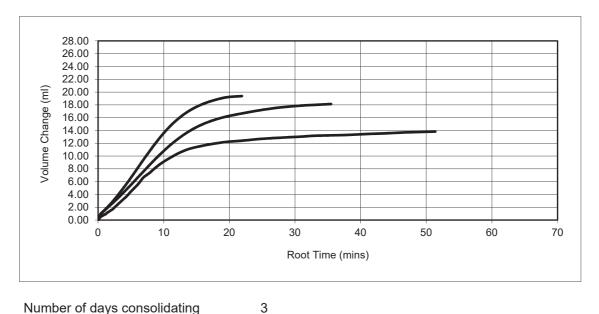




Consolidated undrained Triaxial Compression with pore pressure measurement

BS1377:Part 8:1990 and K H Head Manual of Soil Laboratory Testing vol 3

Report No.	R72456			Lab Samp	ole no.	A16/1329	
Contract No.	18963	Contract N	Name	GCTP Ph	ase 3		
Location BH3/35CF	Sample No.		Depth (m)	0.50	Sample T	ype	В
Consolidation Stage	Consolidation Stage						
Stage Number		1	2	3			
Cell Pressure (kPa)		350	400	450			
Back Pressure (kPa)		300	300	300			
Effective Pressure (kPa)		50	100	150			
Final Pore Pressure (kPa)	301	305	300			
Volume Change (ml)		18.13	27.21	13.83			
% Pore Pressure Dis	sipation	98	95	99			



Number of days consolidating

Compression Stage

Failure criteria	Maximum Effective Principal Stress Ratio					
Stage		1	2	3		
Effective Stress (kPa)		50	100	150		
Rate of Strain (mm/mi	n)	0.007	0.00598	0.00517		
Pore Pressure at start	(kPa)	301	305	302		
Axial strain at failure (%)	2.54	5.22	7.79		
Deviator Stress at faile	ure (kPa)	75	213.4	455.5		
Pore Pressure at failu	re (kPa)	331.3	339.6	321.5		
Major Principal stress	at failure	93.7	273.8	584.0		
Minor Principal stress	at failure	18.7	60.4	128.5		

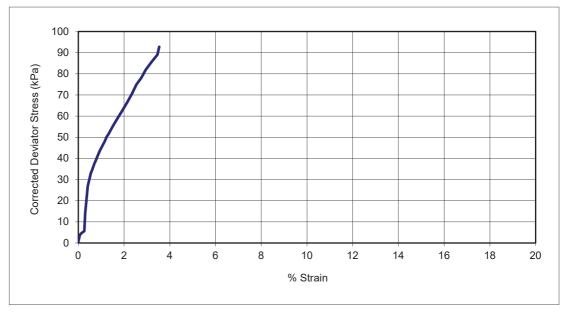
Number of days in compression 3

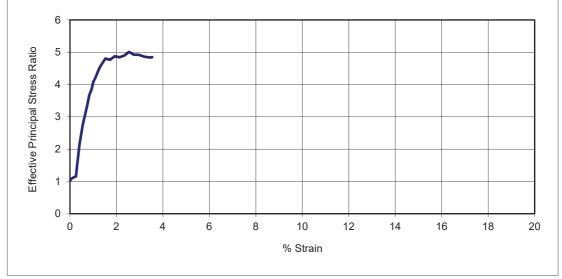
9 Total Number of days on test

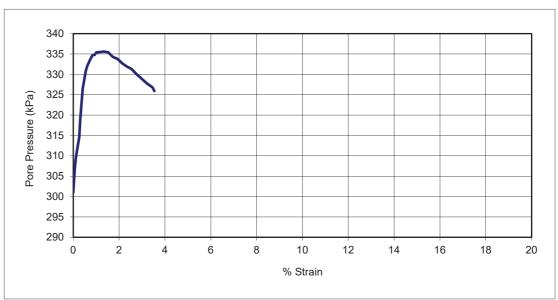


Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

Contract No. 18963 Location BH3/35CF Sample No. AA1 Depth 0.50





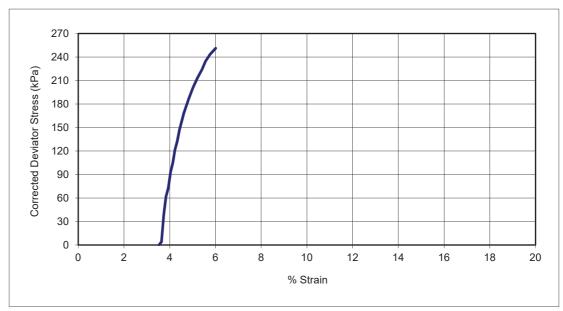


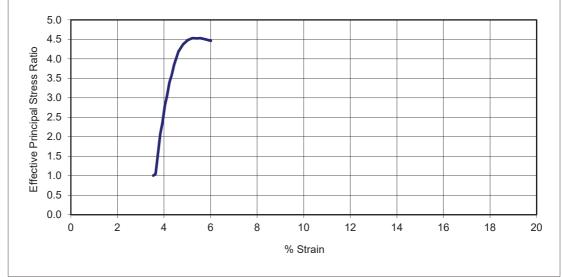


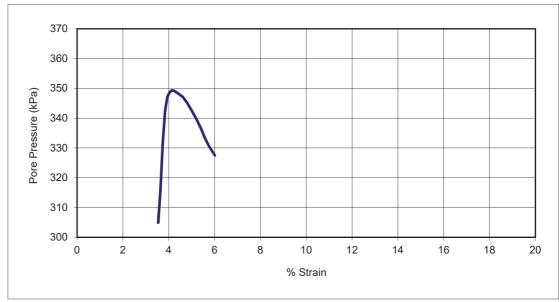
Stage 2

Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

Contract No. 18963 Location BH3/35CF Sample No. AA1 Depth 0.50



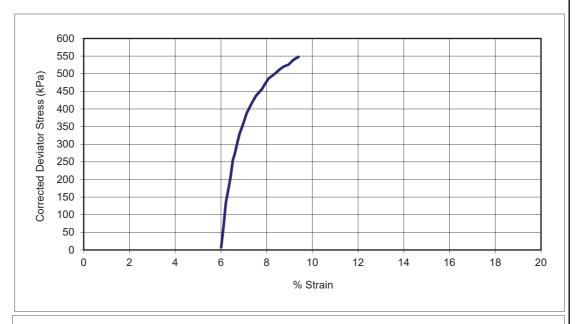


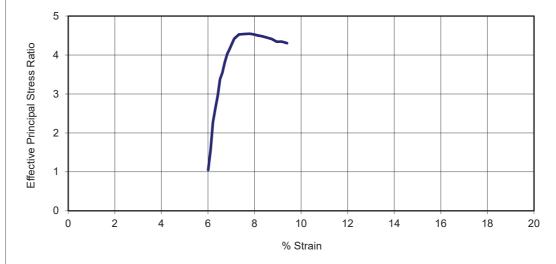


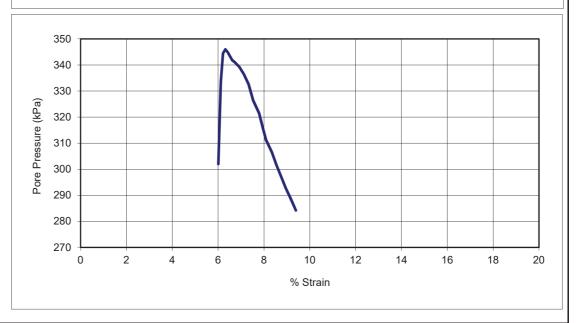


Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

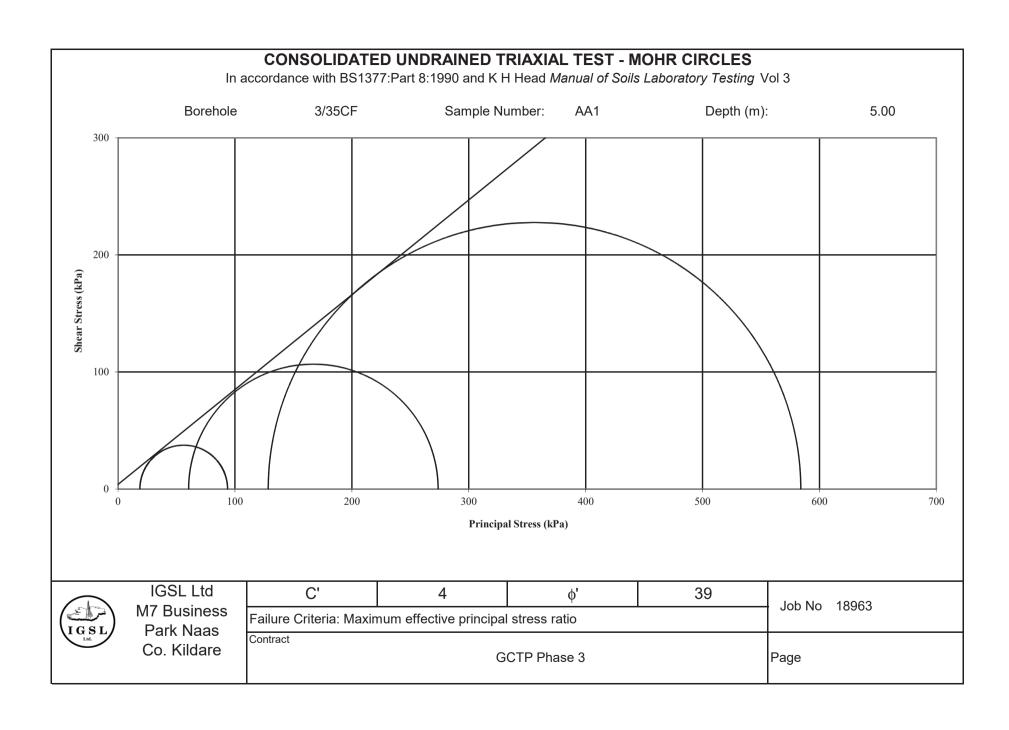
Contract No. 18963 Location BH3/35CF Sample No. AA1 Depth 0.50







Stage 3





Consolidated undrained Triaxial Compression with pore pressure measurement

BS1377:Part 8:1990 and K H Head Manual of Soil Laboratory Testing vol 3

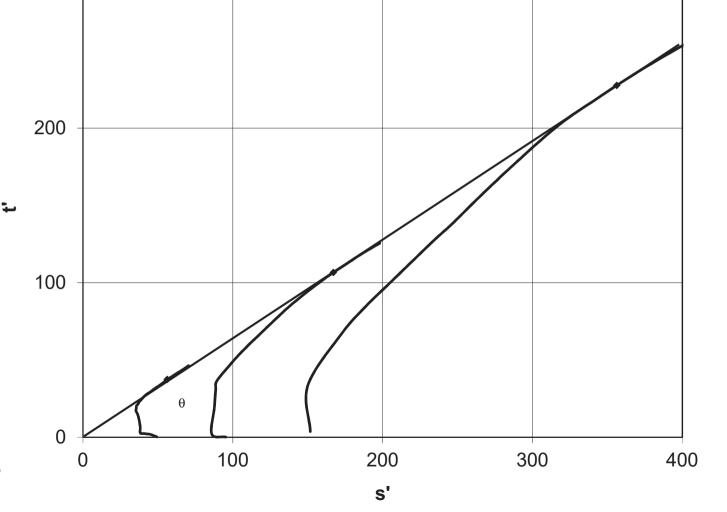
Contract No. 18963
Location BH3/35CF
Sample No. AA1
Depth (m) 0.5

300

Shear strength parameters

c' 4 φ' 40.5 θ 33

 $\sin \phi' = \tan \theta$ c' = t'_o / Cos ϕ'



Plot of Stress Path Parameters s' v t'

Appendix 13

Geotechnical Laboratory Testing

Lab Schedule 9

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. R73993 Contract No. 18963 Contract Name: GCTP Phase 3.Contract 1

Customer Galway Co.Co

Samples Received: 29-04-16 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		
WS3/01	N/A	0.4	A16/1650	WS	89								Brown sandy organic CLAY
WS3/02	N/A	0.6	A16/1651	WS	177								Brown PEAT with occasional clay
WS3/02	N/A	1.3	A16/1652	WS	9.1								Brown slightly sandy slightly gravelly CLAY
WS3/02	N/A	2.4	A16/1653	WS	7.2								Grey sandy gravelly SILT/CLAY
WS3/03	N/A	0.7	A16/1654	WS	23								Brown slightly sandy slightly gravelly CLAY with root hairs
WS3/04	N/A	0.1	A16/1655	WS	265								Brown PEAT
WS3/04	N/A	1.0	A16/1656	WS	12								Grey gravelly silty/clayey SAND
WS3/04	N/A	2	A16/1657	WS	11								Grey sandy gravelly SILT/CLAY
						•							
Notes:	Preparation:	WS - Wet sie	ved		Sample Type:	B - bulk distu	rbed	Remarks:					

Clause:

AR - As received

U - Undisturbed

NP - Non plastic

H Byrne (Laboratory Manager)

Liquid Limit 4.3 Cone Penetrometer definitive method

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

20-07-16 1 of 1

Page

Date



BS1377:Part 5:1990

Report No. R72732

Contract: GCTP Phase 3 Contract number: 18963

BH: WS3/04 Sample number: - Depth (m): 3.3

Description Grey slightly sandy slightly gravelly CLAY

Specimen Height (mm) 20.0 Specimen diameter (mm) 50.0

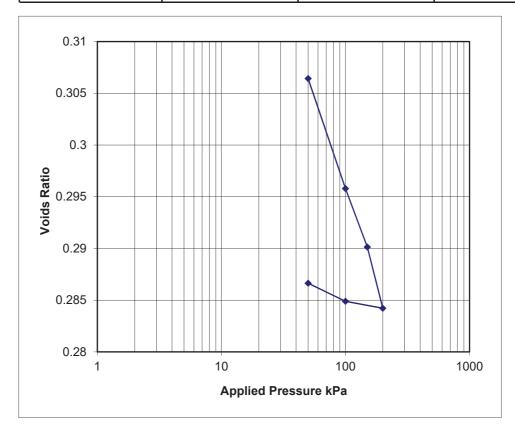
Moisture content % Bulk density Mg/m³ Dry density Mg/m³ Void ratio

Initial	Final
10	15
2.17	2.27
1.97	1.98
0.346	0.287

Assumed Particle density Mg/m³

2.65

Applied Pressure (kPa)	m _v (m ² /MN)	c _v (m²/year)	Voids Ratio
0 - 50	0.586	10.777	0.30642
50 - 100	0.163	5.293	0.29579
100 - 150	0.087	3.545	0.29014
150 - 200	0.092	2.538	0.28422
200 - 100	0.005	8.357	0.28489
100 - 50	0.027	5.995	0.28664





BS1377:Part 5:1990

Report No. R72752

Contract: GCTP Phase 3 Contract number: 18963

BH: WS3/02 Sample number: - Depth (m): 0.6

Description Dark brown fibrous PEAT with occasional light greyish brown clay

Specimen Height (mm) 20.0 Specimen diameter (mm) 49.9

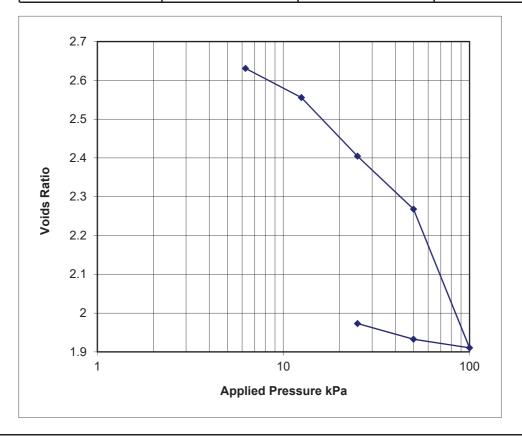
Moisture content % Bulk density Mg/m³ Dry density Mg/m³ Void ratio

Initial	Final
177	161
1.11	1.29
0.40	0.49
2.749	1.973

Assumed Particle density Mg/m³

1.50

Applied Pressure (kPa)	m _v (m ² /MN)	c _v (m²/year)	Voids Ratio
0 - 6.25	5.024	0.133	2.63099
6.25 - 12.5	3.320	0.241	2.55565
12.5 - 25	3.399	0.030	2.40457
25 - 50	1.603	0.454	2.26812
50 - 100	2.189	0.209	1.91049
100 - 50	0.152	0.223	1.93261
50 - 25	0.552	0.430	2.29998





BS1377:Part 5:1990

Report No. R72753

Contract: GCTP Phase 3 Contract number: 18963

BH: WS3/02 Sample number: - Depth (m): 1.3

Description Light grey slightly sandy slightly gravelly CLAY

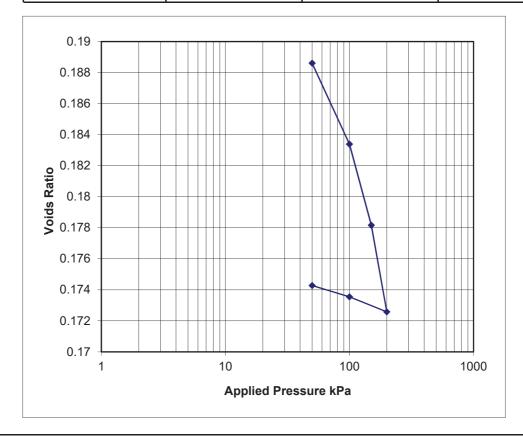
Specimen Height (mm) 20.0 Specimen diameter (mm) 50.0

Moisture content % Bulk density Mg/m³ Dry density Mg/m³ Void ratio

Initial	Final
9.1	8.8
2.38	2.44
2.18	2.24
0.214	0.174

Assumed Particle density Mg/m³ 2.65

Applied Pressure (kPa)	$m_v (m^2/MN)$	c _v (m²/year)	Voids Ratio
0 - 50	0.424	1.739	0.18861
50 - 100	0.088	3.094	0.18339
100 - 150	0.088	1.166	0.17817
150 - 200	0.095	0.289	0.17258
200 - 100	0.008	165.729	0.17355
100 - 50	0.012	10.373	0.17428





Consolidated undrained Triaxial Compression with pore pressure measurement

BS1377:Part 8:1990 and K H Head Manual of Soil Laboratory Testing vol 3

Report No. R73541 Lab Sample no.

Contract No. 18963 Contract Name GCTP Phase 3

Location WS3/03 Sample No. - Depth (m) 0.50 Sample Type U

Method of Preparation Remoulded

Description Brown slightly sandy slightly gravelly CLAY Test Type Multi-stage

with fine rootlets

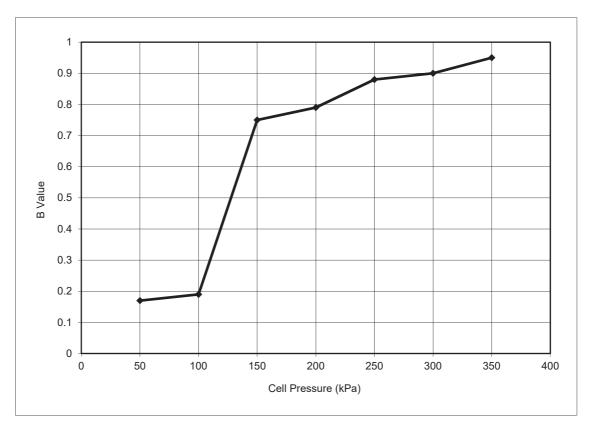
Initial Dimensions and condition

Height (mm)	76.0	Diameter (mm)	38.0	Side drains fitted	No
		Initial	Final		
Moisture Content	(%)	23	29		
Bulk Density (Mg/	m ³)	1.74	2.00		
Dry Density (Mg/n	n^3)	1.42	1.55		

Saturation Stage

Saturation by increments of Cell & Back Pressure

Initial B Value 0.17 Final B Value 0.95 Increments of Pressure 50

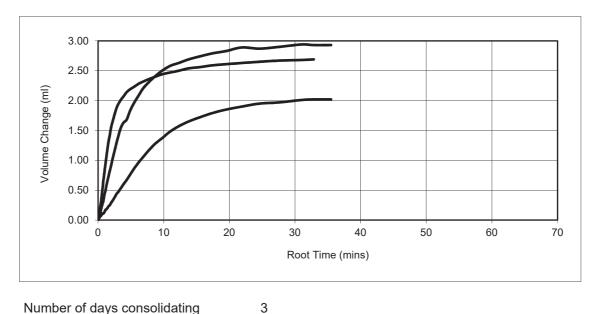




Consolidated undrained Triaxial Compression with pore pressure measurement

BS1377:Part 8:1990 and K H Head Manual of Soil Laboratory Testing vol 3

Report No. R73541		Lab Sample no					
Contract No. 18963 Co		Contract Name		GCTP Ph	ase 3		
Location	WS3/03	Sample No.		Depth (m)	0.50	Sample Type	U
Consolidation Stage							
Stage Num	nber		1	2	3		
Cell Pressi	ure (kPa)		350	400	450		
Back Press	sure (kPa)		300	300	300		
Effective Pressure (kPa)		50	100	150			
Final Pore	Pressure (kPa)	300	299	302		
Volume Ch	nange (ml)		2.69	2.92	2.02		
% Pore Pre	essure Dis	sipation	100	100	99		



Number of days consolidating

Compression Stage

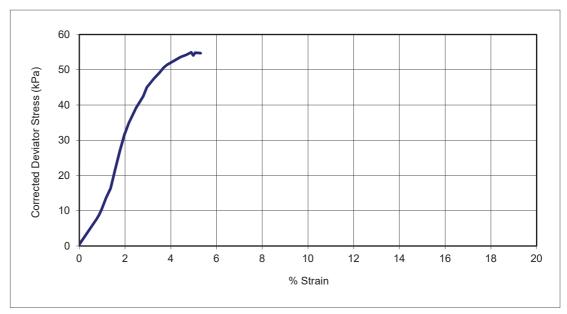
Failure criteria	Maximum	Effective Prin	cipal Stress	Ratio
Stage		1	2	3
Effective Stress (kPa)		50	100	150
Rate of Strain (mm/mi	n)	0.0063	0.0007	0.0023
Pore Pressure at start	(kPa)	300	300	302
Axial strain at failure (%)	5.07	8.41	14.8
Deviator Stress at failu	ıre (kPa)	54.9	115.8	188.5
Pore Pressure at failur	re (kPa)	327.9	355.1	382.9
Major Principal stress	at failure	77.0	160.7	255.6
Minor Principal stress	at failure	22.1	44.9	67.1

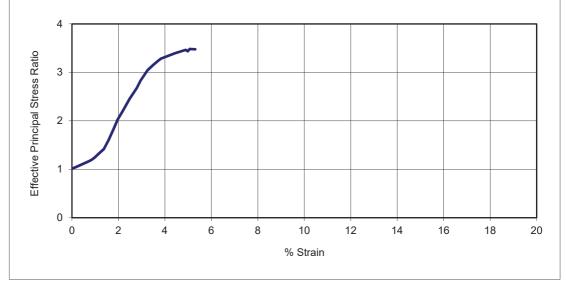
Number of days in compression 3

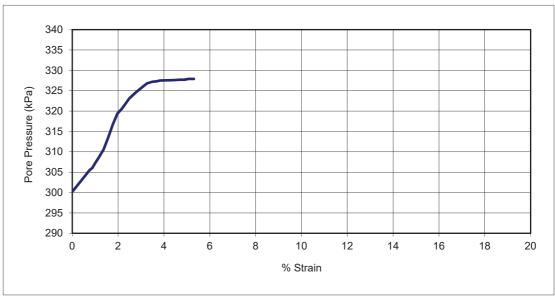
Total Number of days on test 10



Contract No. 18963 Location WS3/03 Sample No. - Depth 0.50

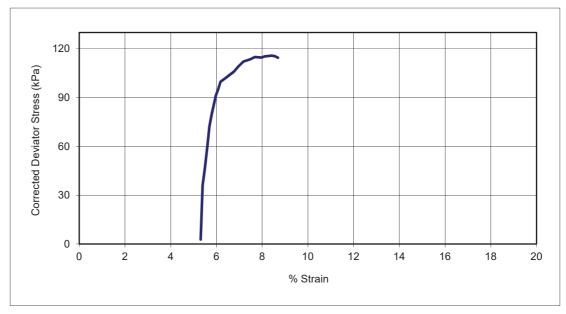


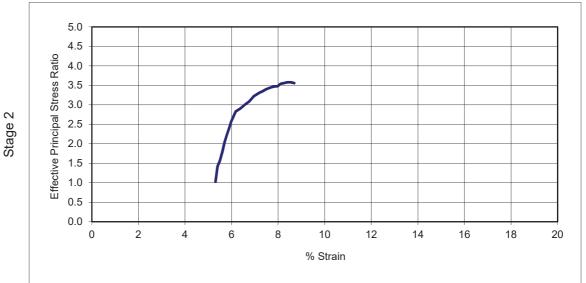


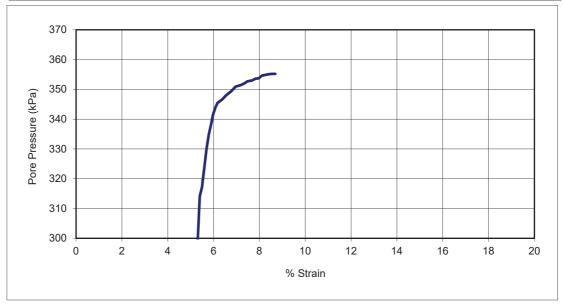




Contract No. 18963 Location WS3/03 Sample No. - Depth 0.50

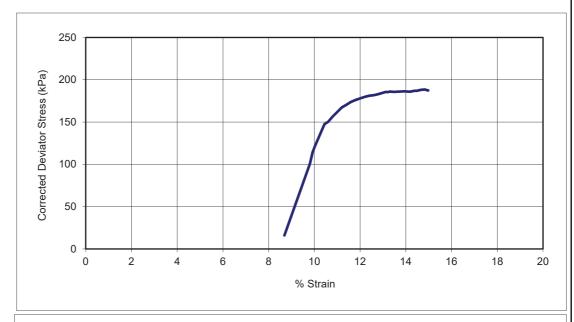


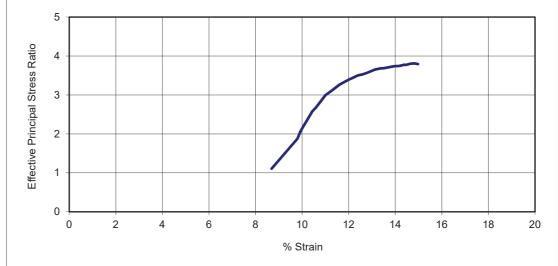


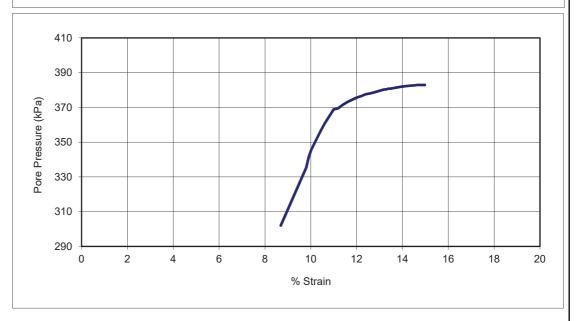




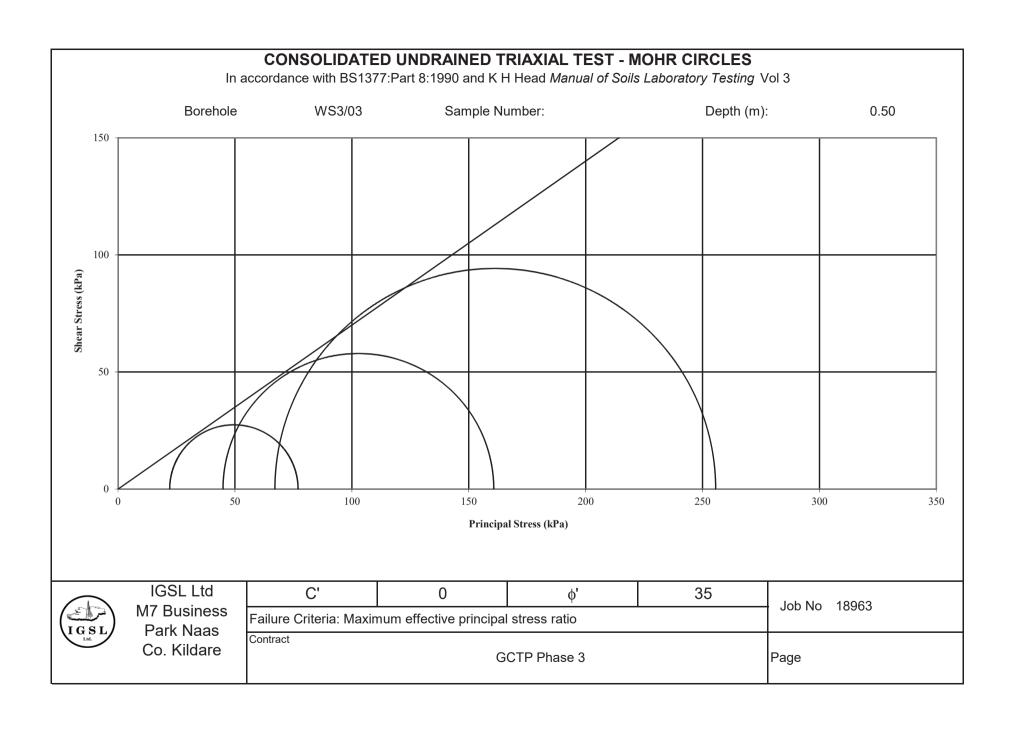
Contract No. 18963 Location WS3/03 Sample No. - Depth 0.50







Stage 3





BS1377:Part 8:1990 and K H Head Manual of Soil Laboratory Testing vol 3

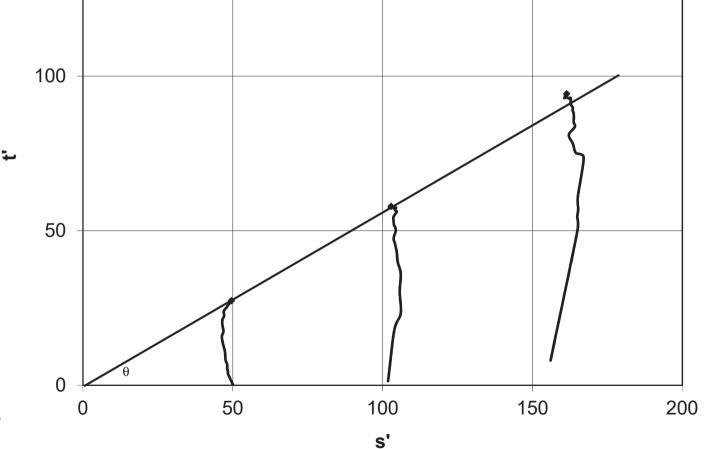
Contract No. 18963
Location WS3/03
Sample No. Depth (m) 0.5

150

Shear strength parameters

 $\begin{array}{ccc} c' & & 0 \\ \phi' & & 35 \\ \theta & & 30 \end{array}$

 $\sin \phi' = \tan \theta$ c' = t'_o / Cos ϕ'



Plot of Stress Path Parameters s' v t'



BS1377:Part 8:1990 and K H Head Manual of Soil Laboratory Testing vol 3

Report No. R72964 Lab Sample no. -

Contract No. 18963 Contract Name GCTP Phase 3

Location WS3/04 Sample No. - Depth (m) 2.00 Sample Type B

Method of Preparation Remoulded

Description Grey slightly gravelly silty/clayey SAND Test Type Multi-stage

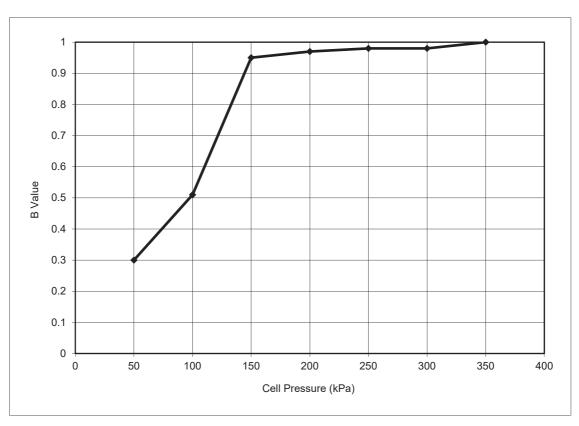
Initial Dimensions and condition

Height (mm)	76.0	Diameter (mm)	38.0	Side drains fitted	No
		Initial	Final		
Moisture Content	(%)	10	10		
Bulk Density (Mg/	m³)	2.30	2.41		
Dry Density (Mg/n	n ³)	2.08	2.19		

Saturation Stage

Saturation by increments of Cell & Back Pressure

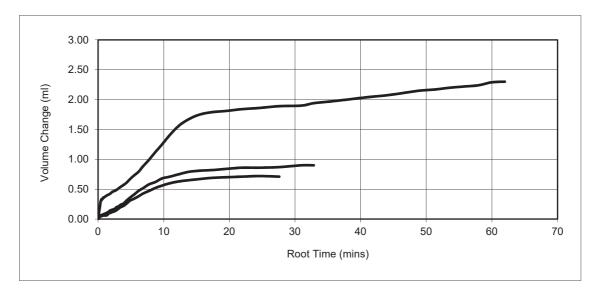
Initial B Value 0.30 Final B Value 1.00 Increments of Pressure 50





BS1377:Part 8:1990 and K H Head Manual of Soil Laboratory Testing vol 3

R72964			Lab Sam	ole no	
18963	Contract N	Name	GCTP Ph	ase 3	
Sample No.		Depth (m)	2.00	Sample Type	В
	1	2	3		
	350	400	450		
	300	300	300		
⊃a)	50	100	150		
kPa)	300	305	300		
	2.30	0.90	0.71		
sipation	100	100	100		
	18963 Sample No. Pa) kPa)	18963 Contract N Sample No. 1 350 300 Pa) kPa) 50 kPa) 2.30	18963 Contract Name Sample No. Depth (m) 1 2 350 400 300 300 2a) 50 100 kPa) 300 305 2.30 0.90	18963 Contract Name GCTP Ph Sample No. Depth (m) 2.00 1 2 3 350 400 450 300 300 300 Pa) 50 100 150 kPa) 300 305 300 2.30 0.90 0.71	18963 Contract Name GCTP Phase 3 Sample No. Depth (m) 2.00 Sample Type 1 2 3 350 400 450 300 300 300 Pa) 50 100 150 kPa) 300 305 300 2.30 0.90 0.71



3

Number of days consolidating

Compression Stage

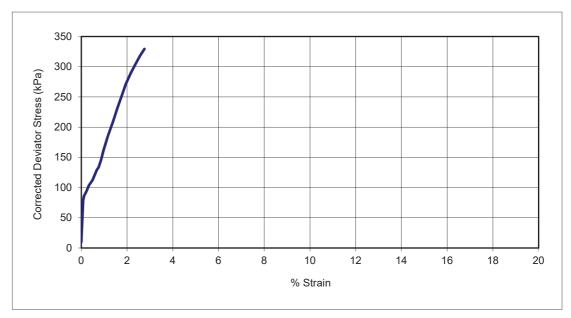
Failure criteria	Maximum	Effective Prir	ncipal Stres	s Ratio
Stage		1	2	3
Effective Stress (kPa)		50	100	150
Rate of Strain (mm/mi	n)	0.0024	0.0035	0.00517
Pore Pressure at start	(kPa)	300	300	300
Axial strain at failure (%)	2.16	4.42	6.08
Deviator Stress at failu	ıre (kPa)	289.5	504.4	795.5
Pore Pressure at failur	re (kPa)	302.5	290.7	283.3
Major Principal stress	at failure	337.0	613.7	962.2
Minor Principal stress	at failure	47.5	109.3	166.7

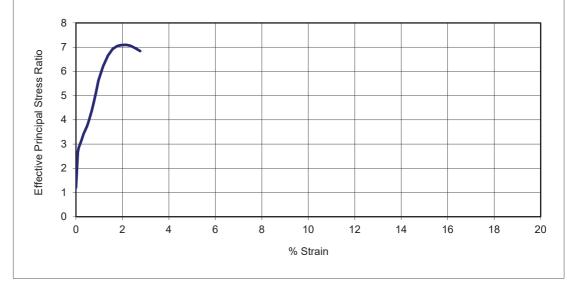
Number of days in compression 3

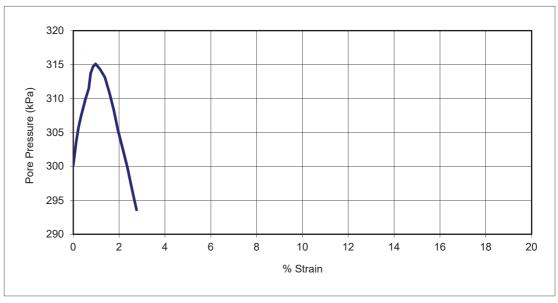
Total Number of days on test 10



Contract No. 18963 Location WS3/04 Sample No. - Depth 2.00





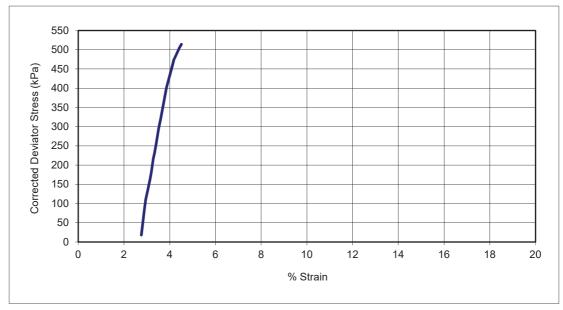


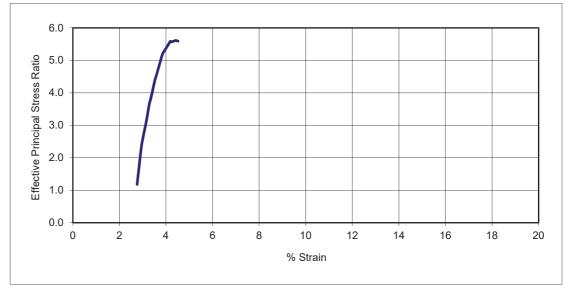


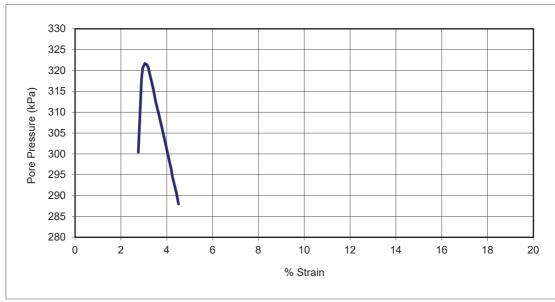
Stage 2

Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

Contract No. 18963 Location WS3/04 Sample No. - Depth 2.00

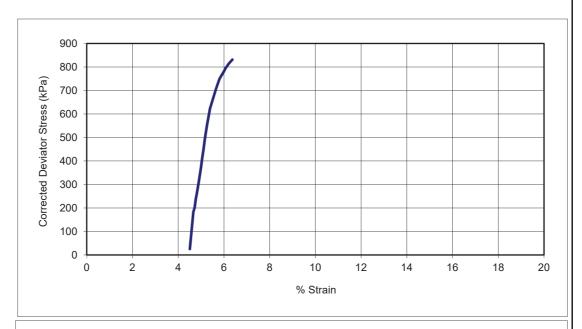


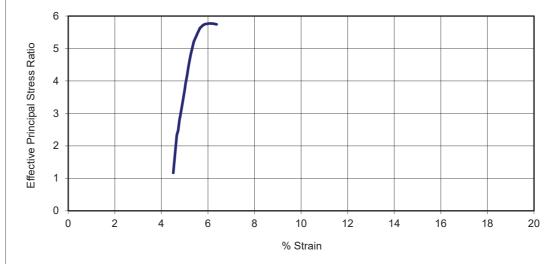


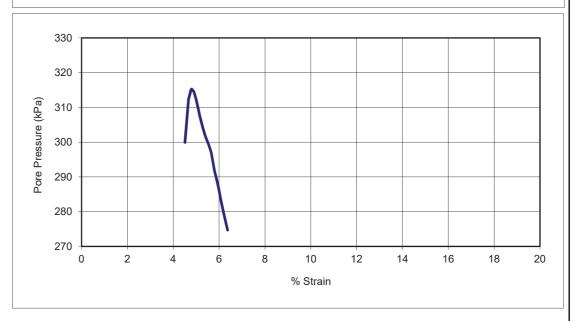


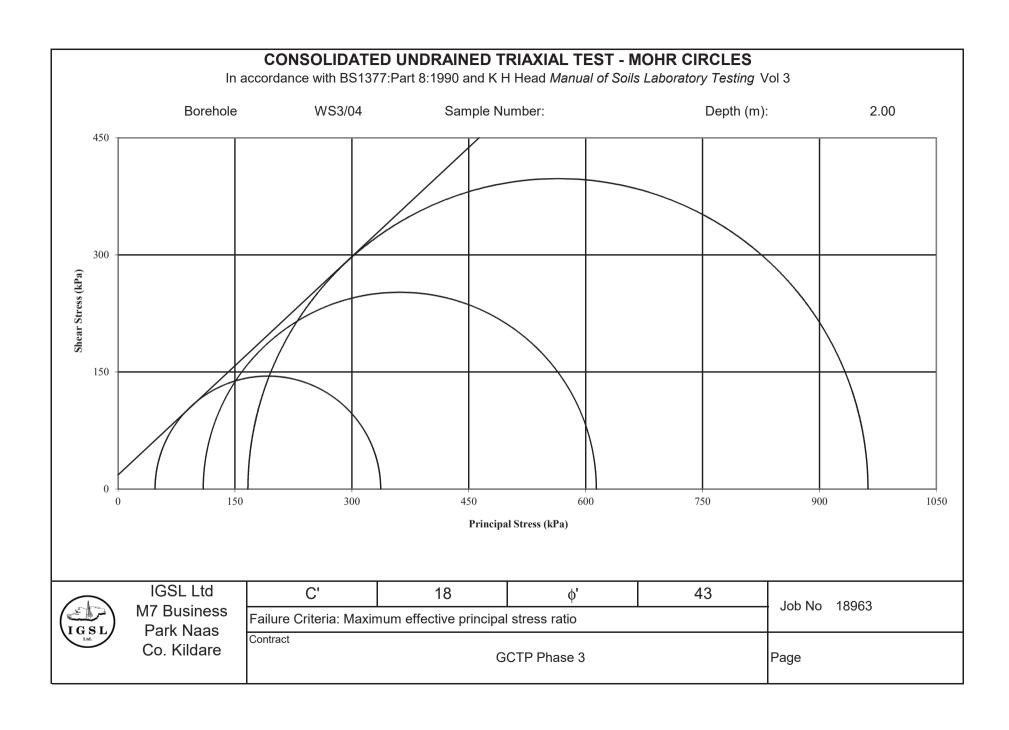


Contract No. 18963 Location WS3/04 Sample No. - Depth 2.00











BS1377:Part 8:1990 and K H Head Manual of Soil Laboratory Testing vol 3

Contract No. 18963 Location WS3/04 Sample No. -

Depth (m) 2.0

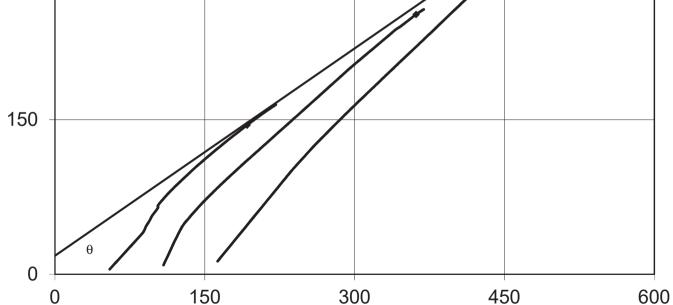
Shear strength parameters

c' 15 φ' 42 θ 34

 $\sin \phi' = \tan \theta$ c' = t'_o / Cos ϕ'



450



s'

Plot of Stress Path Parameters s' v t'

Appendix 13

Geotechnical Laboratory Testing

Lab Schedule 10

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. R72102 Contract No. 18963 Contract Name: GCTP Phase 3, Contract 1

Customer Galway Co.Co

Samples Received: 12-05-16 Date Tested: 27-05-16

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample	Moisture	Liquid	Plastic	Plasticity	%	Preparation	Liquid Limit	Classification (BS5930)	Description
				Type	Content %	Limit %	Limit %	Index	<425μm		Clause	(B33930)	
SW3/02	AA46069	0.5	A16/1921	В	23								Brown sandy, slightly gravelly, SILT/CLAY
SW3/02	AA46070	1.0	A16/1922	В	10								Light brown slightly sandy, gravelly, SILT/CLAY
TP3/36	AA43065	0.4	A16/1923	В	25								Brown slightly sandy, slightly gravelly, SILT/CLAY
TP3/36	AA43066	0.4	A16/1924	В	27								Brown slightly sandy, slightly gravelly, SILT/CLAY
TP3/36	AA43067	0.8	A16/1925	В	11								Brown slightly sandy, gravelly, SILT/CLAY
TP3/36	AA43068	0.8	A16/1926	В	10								Brown slightly sandy, gravelly, SILT/CLAY
TP3/37	AA49488	0.5	A16/1927	В	15								Dark brown clayey/silty, very sandy, GRAVEL
TP3/37	AA49489	1.0	A16/1928	В	14								Brown very sandy very gravelly CLAY
TP3/39	AA49491	0.5	A16/1929	В	9.9								Dark brown slightly clayey/silty, sandy, GRAVEL
TP3/39	AA49492	1.1	A16/1930	В	54								Brown very sandy GRAVEL
TP3/40	AA49490	0.3	A16/1931	В	16								Dark brown clayey/silty, very sandy, GRAVEL
TP3/41	AA43057	0.5	A16/1932	В	19								Orange/Brown sandy, slightly gravelly, CLAY
TP3/41	AA43058	0.5	A16/1933	В	21	38	17	21	56	WS	4.4	СІ	Orange/Brown sandy, slightly gravelly, CLAY
TP3/42	AA43059	0.4	A16/1934	В	17								Dark brown sandy gravelly SILT/CLAY
TP3/42	AA43060	0.8	A16/1935	В	12	19	11	8	75	WS	4.4	CL	Light brown slightly sandy, slightly gravelly, CLAY
Notes:	Preparation:	WS - Wet sie	eved	-	Sample Type:	B - bulk distu	rbed	Remarks:	-	-		-	-

AR - As received

NP - Non plastic

IGSL Ltd Materials Laboratory

4.3 Cone Penetrometer definitive method 4.4 Cone Penetrometer one point method

Liquid Limit Clause:

Persons authorized to approve reports

U - Undisturbed

H Byrne (Laboratory Manager)

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 17-06-16 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. R72103 Contract No.

Contract Name:

GCTP Phase 3.Contract 1

Customer Galway Co.Co

Samples Received: 12-05-16 Date Tested: 27-05-16

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		
TP3/42	AA43061	0.8	A16/1936	D	11								Light brown slightly sandy, slightly gravelly, CLAY
TP3/42	AA43062	1.5	A16/1937	В	8.3								Brown clayey/silty, gravelly, SAND
TP3/42	AA43063	2.5	A16/1938	В	8.6								Brown slightly clayey gravelly SAND
TP3/42	AA43064	3.5	A16/1939	В	8.5								Brown clayey/silty, very sandy, GRAVEL
TP3/44	AA49493	1.0	A16/1940	В	9.8								Brown slightly sandy, slightly gravelly, SILT/CLAY
TP3/44	AA49494	1.0	A16/1941	В	12								Brown slightly sandy, slightly gravelly, SILT/CLAY
TP3/44	AA49495	1.0	A16/1942	D	15	20	NP	NP	67	WS	4.4		Brown slightly sandy gravelly SILT
TP3/44	AA49496	2.0	A16/1943	В	9.5								Light brown/grey slightly sandy, slightly gravelly, CLAY
TP3/44	AA49497	2.0	A16/1944	В	8.4								Light brown/grey slightly sandy, slightly gravelly, CLAY
TP3/44	AA49498	2.0	A16/1945	D	7.9	20	10	10	72	WS	4.4	CL	Light brown/grey slightly sandy, slightly gravelly, CLAY
TP3/45	AA43051	1.5	A16/1946	В	11								Brown slightly sandy, slightly gravelly, SILT/CLAY
TP3/45	AA43052	1.5	A16/1947	В	9.8								Brown slightly sandy, slightly gravelly, SILT/CLAY
TP3/45	AA43053	1.5	A16/1948	D	14	21	NP	NP	66	WS	4.4		Brown slightly sandy, slightly gravelly, SILT
TP3/45	AA43054	2.5	A16/1949	В	8.3								Light brown/grey slightly sandy, slightly gravelly, SILT/CLAY
TP3/45	AA43055	2.5	A16/1950	В	9.1								Light brown/grey slightly sandy, slightly gravelly, SILT/CLAY
Notes:	Preparation:	WS - Wet sie	eved		Sample Type:	B - bulk distu	rbed	Remarks:					

18963

U - Undisturbed

H Byrne (Laboratory Manager)

AR - As received 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

17-06-16

1 of 1

Date

Page

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. R72104 Contract No. 18963 Contract Name: GCTP Phase 3.Contract 1

Customer Galway Co.Co

Samples Received: 12-05-16 Date Tested: 27-05-16

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
TP3/45	AA43056	2.5	A16/1951	В	12	20	10	10	62	WS	4.4	CL	Light brown/grey slightly sandy, slightly gravelly, CLAY
Notes:	Preparation:	WS - Wet sie	ved		Sample Type:	B - bulk distu	rbed	Remarks:					

Notes:

AR - As received

U - Undisturbed

NP - Non plastic

H Byrne (Laboratory 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

17-06-16

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Page

Date

Determination of Particle Size Distribution



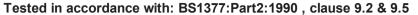
(note: Sedimentation stage not accredited)



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

					(note: Sea	imentation	stage not accredited)		W. WOOFE REST NO. 1	J4-
particle	%			Contract No:	18963	Report	No. R72689		-	
size	passing		1	Contract:	GCTP Pha	ise 3 - Co	ntact 1			
75	100	COBBLES	1	BH/TP:	SW3/02					
63	100	OODDELO	1	Sample No.	AA46096	Lab. Sa	mple No.	A16/1921		
50	100		1	Sample Type:	В					
37.5	100		1	Depth (m)	0.50	Custom	er: Galway Co.C	Co.		
28	100		1	Date Received	10-05-16	Date Te	esting started	27-05-16		
20	99		1	Description:	Brown san	dy, slightly	gravelly, SILT/CL	.AY		
14	98	GRAVEL	1							
10	96	GRAVEL	1	Remarks						
6.3	94						5 53	8 35	2	2
5	93						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	28 37.5 53 63 73
3.35	91		100							
2	88		90	0						++++
1.18	84		_ 80	0 +						
0.6	75		% 70	o 						
0.425	71	SAND	Sinis 60	o 				4		
0.3	66		sed 5							
0.15	55		Ď							
0.063	39		Senta							
0.037	26									
0.027	23		20	0						
0.017	18	SILT/CLAY	10	0 +						++++++++
0.010	13	SIL I / CLAY	(0 +					1 111 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
0.007	12		C	0.0001 0.0	001	0.01	0.1	1	10	100
0.005	10			CLA	Y	SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	6						,			
		1001 14	al Mata	wiele I elec			Approved by:		Date:	Page no:
		IGSL LT	a wate	rials Laborat	эгу		A Beren		14-06-16	1 of 1

Determination of Particle Size Distribution



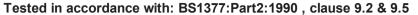
(note: Sedimentation stage not accredited)



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

					(· · · · · · · · · · · · · · · · · · ·				
particle	%		C	Contract No:	18963	Report	No. R72469					
size	passing		C	Contract:	GCTP Phas	se 3 - Co	ontact 1					
75	100	COBBLES	В	BH/TP:	SW3/02							
63	100	OOBBLLO	S	Sample No.	AA46070	Lab. Sa	ample No.	A16/1922				
50	100		S	Sample Type:	В							
37.5	92		D	Depth (m)	1.00	Custom	ner: Galway Co	o.Co.				
28	91		D	Date Received	16-05-16	Date Te	esting started	27-05-1	6			
20	88		D	Description:	Light brown	n slightly :	sandy, gravelly, S	SILT/CLAY				
14	82	GRAVEL										
10	78	GIVAVLL	R	Remarks								
6.3	75						5 53	8	2		2	
5	73						0.063	0.3 0.425 0.6 1.18	2 & v0 6. v. v.	0 4 7 0 8 7 8 7 8 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9	37. 50. 53.	
3.35	69		100 T									
2	65		90 +									
1.18	61		80 +									H = I
0.6	56		8 70 +									\parallel
0.425	54	SAND	is 60 +									\parallel
0.3	51		Percentage passing (%) 40 + 40 + 40 + 40 + 40 + 40 + 40 + 40									
0.15	42		40 +									
0.063	36		cen c									
0.037	32											
0.027	30		20 +									
0.017	26	SILT/CLAY	10 +									
0.010	22	0.21,02,11	0 +				<u> </u>			4		4
0.007	18		0.00	0.00	1	0.01	0.1	1		10	1	00
0.005	16			CLAY		SILT	Sieve size (mr	n) SAND	GR	RAVEL		
0.002	8											
		IGSL Lt	d Mataria	le I aborato	r\/		Approved I		Date:		Page no	
	IGSL Ltd Materials Laboratory									of 1		

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



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

					(note: Sea	ilmentation s	tage not accredited)		W ACOPE RESING.	10
particle	%			Contract No:	18963	Report N	lo. R72470		•	
size	passing			Contract:	GCTP Pha	ase 3 - Cor	ntact 1			
75	100	COBBLES		TP:	TP3/36					
63	100	OODBLLO		Sample No.	AA43065	Lab. Sar	nple No.	A16/1923		
50	100			Sample Type:	В					
37.5	100			Depth (m)	0.40	Custome	er: Galway Co.C	Co.		
28	100			Date Received	16-05-16	Date Te	sting started	27-05-16	i	
20	97			Description:	Brown slig	htly sandy,	slightly gravelly, \$	SILT/CLAY		
14	94	GRAVEL								
10	92	OIVAVEL		Remarks						
6.3	90						5 53	855	ις.	ت
5	89						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 14 20	28 37.5 53 63
3.35	86		100							
2	82		90) 						++++++
1.18	78		<u> </u>) 						++++++
0.6	73		8 70) 						++++++
0.425	71	SAND	iss 60) 						
0.3	69		<u>8</u> 50)						
0.15	61		Percentage passing (%) 20 90 90 90 90 90 90 90 90 90 90 90 90 90							
0.063	55		cen							
0.034	49									
0.025	46		20							
0.016	38	SILT/CLAY	10) †	$\overline{1}$					++++++
0.010	32	O.L.I / OL/XI	C						1 111 1 1111 1 1 1	
0.007	27		0	.0001 0.0	01	0.01	0.1	1	10	100
0.005	22			CLAY	′	SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	10									
		1661 14	d Mata	riale Laborato	\F\/		Approved by:		Date:	Page no:
		IGSL LI	u mater	rials Laborato	יו y		A Beren	-	14-06-16	1 of 1

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



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

					(augo nor acorcanica,			
particle	%			Contract No:	18963	Report	No. R72531			
size	passing		·	Contract:	GCTP Phas	se 3 - Co	ntact 1			
75	100	COBBLES	1	TP:	TP3/36					
63	100	COBBLES	1	Sample No.	AA43067	Lab. Sa	mple No. A	16/1925		
50	100		1	Sample Type:	В					
37.5	86		1	Depth (m)	0.80	Custom	er: Galway Co.Co.			
28	84		1	Date Received	16-05-16	Date Te	sting started	27-05-16		
20	75		l	Description:	Brown sligh	ntly sandy	gravelly, SILT/CLAY			
14	70	GRAVEL	1							
10	67	GRAVEL	1	Remarks	Sample size did not meet the r	requirements of BS1377				
6.3	64						Ω Ω	8 5	2	
5	62						0.063	0.425	2 3.3 6.3 7 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8	37. 50. 63
3.35	60		100)						
2	57		90) 						
1.18	53		_ 80) 						
0.6	49		<u>%</u> 70) 						
0.425	47	SAND	issing 60) 						
0.3	45		Percentage passing (%) 20 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9							
0.15	40		age							
0.063	35		Senta							
0.036	31		Per 30) †						
0.026	29		20) 						
0.017	26	SILT/CLAY	10) - 						
0.010	21	SIL I / CLAY	C)						
0.007	19		0	0.0001 0.0) 1	0.01	0.1	1	10	100
0.005	16			CLAY	•	SILT	Sieve size (mm) SA	4 <i>ND</i>	GRAVEL	
0.002	8		l							
		1001 14	d Moto	riolo I oborota			Approved by:		Date:	Page no:
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Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



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

					(note: oear	memation	stage not accreaited	4)	1	
particle	%			Contract No:	18963	Report	No. R72467			
size	passing		•	Contract:	GCTP Phas	se 3 - C	ontact 1			
75	100	COBBLES		TP:	TP3/37					
63	100	COBBLLO		Sample No.	AA49488	Lab. Sa	ample No.	A16/1927		
50	100			Sample Type:	В					
37.5	100			Depth (m)	0.50	Custon	ner: Galway Co.	.Co.		
28	90			Date Received	16-05-16	Date T	esting started	27-05-16		
20	85			Description:	Dark brown	n clayey/s	silty, very sandy, 0	GRAVEL		
14	72	GRAVEL								
10	66	GNAVEL		Remarks						
6.3	60						2 3	8 55	22	2
5	58						0.063	0.3 0.425 0.6 1.18	2 3.35 5 6.3 10 14 20	28 37.5 53 73 73
3.35	52		100							
2	44		90	 						
1.18	36		_ 80	+ + + + + + + + + + + + + + + + + + + +				 	 	
0.6	27		% 70	+ + + + + + + + + + + + + + + + + + + +						
0.425	22	SAND	Siniss 60		-					
0.3	18		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00							
0.15	11		age						$\mathcal{X} $	
0.063	6		Senta 04							
			De 30	†						
			20	 						
		SILT/CLAY	10	+ + + + + + + + + + + + + + + + + + + +				1		
		SIL 1/CLA1	0							
			0.0	0.00)1	0.01	0.1	1	10	100
				CLAY		SILT	Sieve size (mm	n) SAND	GRAVEL	
		1001 14	d Nata				Approved b		Date:	Page no:
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Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)

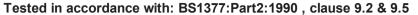


					(Hote: Oeal	memation	stage not accredited)			
particle	%			Contract No:	18963	Report	No. R72471		-	
size	passing		•	Contract:	GCTP Phas	se 3 - C	ontact 1			
75	100	COBBLES		TP:	TP3/39					
63	100	COBBLLO		Sample No.	AA49491	Lab. S	ample No.	A16/1929		
50	100			Sample Type:	В					
37.5	94			Depth (m)	0.50	Custon	ner: Galway Co.0	Co.		
28	84			Date Received	16-05-16	Date T	esting started	27-05-16		
20	69			Description:	Dark brown	n slightly	clayey/silty, sandy,	GRAVEL		
14	46	GRAVEL								
10	39	GRAVEL		Remarks						
6.3	31							8 22	2	2
5	27						0.063	0.3 0.425 0.6 1.18	2 3.35 5.3 10 14 20	28 37. 530. 530.
3.35	19		100							
2	13		90	+ + + + + + + + + + + + + + + + + + + +						 /
1.18	8		_ 80	+ + + + + + + + + + + + + + + + + + + +					 	4
0.6	4		Percentage passing (%) 00 00 00 00 00 00 00 00 00 00 00 00 00	+					 	
0.425	3	SAND	iss 60						1	
0.3	2		8e 50							
0.15	1		age 40							
0.063	1		centa							
			20							
		SILT/CLAY	10	+ + + + + + + + + + + + + + + + + + + +					1	
		SIL 1/CLA1	0							
			0.	0001 0.00)1	0.01	0.1	1	10	100
				CLAY	r	SILT	Sieve size (mm)	SAND	GRAVEL	
		1001 14	d Mate:				Approved by		Date:	Page no:
		IGSL Lt	a water	ials Laborato	гу		A Regar		14-06-16	1 of 1

IGSL Ltd, M7 Business Park, Newhall, Naas, Co Kildare

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

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



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

						(Hote: Oed	interitation	stage not accreaited)			
particle	%			Contract N	No:	18963	Report	No. R72620			
size	passing		•	Contract:		GCTP Pha	ise 3 - Co	ontact 1			
75	100	COBBLES	1	TP:		TP3/40					
63	100	COBBLLO	I	Sample N	0.	AA49490	Lab. Sa	ample No.	A16/1931		
50	100		I	Sample T	уре:	В					
37.5	100		I	Depth (m))	0.30	Custom	er: Galway Co.C	0.		
28	94		I	Date Rece	eived	10-05-16	Date Te	esting started	27-05-16		
20	83		I	Descriptio	n:	Dark brow	n clayey/s	ilty, very sandy, GF	RAVEL		
14	63	GRAVEL	I								
10	59	GRAVEL	I	Remarks							
6.3	53							5 3	8 ئ ر	22	
5	50							0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	27. 37. 53. 53.
3.35	46			100							
2	41			90						 	
1.18	35			80						 	
0.6	27		%) f	70						 	
0.425	24	SAND	sing	60							
0.3	20		as	50							
0.15	14		age								
0.063	8		cent	40						1	
			Per	30							
				20							
		SILT/CLAY		10							
		SIL 1/CLA1		0							
				0.0001	0.00	1	0.01	0.1	1	10	100
					CLAY		SILT	Sieve size (mm)	SAND	GRAVEL	
		1001 14	-1 B# - 1	anial - 1 . 1				Approved by:		Date:	Page no:
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Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



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

					(note. Sed	iiileiilalioii S	lage not accredited)		13. E MEN 40.	
particle	%			Contract No:	18963	Report N	No. R72621			
size	passing			Contract:	GCTP Pha	ise 3 - Coi	ntact 1			
75	100	COBBLES		TP:	TP3/41					
63	100	OODDELO		Sample No.	AA43057	Lab. Sar	mple No.	A16/1932		
50	100			Sample Type:	В					
37.5	100			Depth (m)	0.50	Custome	er: Galway Co.C	0.		
28	100			Date Received	10-05-16	Date Te	sting started	27-05-16		
20	98			Description:	Orange/Br	own sandy	, slightly gravelly,	CLAY		
14	96	GRAVEL								
10	94	GRAVEL		Remarks						
6.3	93						2 3	8 ن ت	22	
5	92						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 14 20	28 37.5 53 63
3.35	90		100)						
2	86		90) 						++++
1.18	82		_ 80) 						+ + + + + + + + + + + + + + + + + + + +
0.6	74		<u>%</u> 70) 🕂						
0.425	69	SAND	Sing 60	,						
0.3	65		Percentage passing (%) 20 90 90 90 90 90 90 90 90 90 90 90 90 90							
0.15	58		age 40							
0.063	50		Senta 34							
0.037	43		Per 30) †						
0.027	40		20) 						++++
0.017	37	SILT/CLAY	10) 						
0.010	33	SIL1/CLAY	C)						
0.007	29		0	.0001 0.0	01	0.01	0.1	1	10	100
0.005	28			CLA'	/	SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	18						. ,			
	•	1001 14					Approved by:		Date:	Page no:
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Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



				(note: Se	dimentation si	age not accredited)		· ····································	.100
particle	%		Contract N	lo: 18963	Report N	lo. R72472			
size	passing		Contract:	GCTP Ph	ase 3 - Cor	tact 1			
75	100	COBBLES	TP:	TP3/42					
63	100	OODDELO	Sample No	AA43060	Lab. Sar	nple No.	A16/1935		
50	100		Sample Ty	rpe: B					
37.5	100		Depth (m)	0.80	Custome	r: Galway Co.C	So.		
28	98		Date Rece	ived 16-05-16	Date Tes	sting started	27-05-16		
20	96		Description	n: Light brow	vn slightly sa	andy, slightly grave	elly, CLAY		
14	95	GRAVEL							
10	93	OIVAVLL	Remarks						
6.3	91					5 53	8 22	ۍ	
5	90					0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	28 37.5 50 63 63
3.35	84		100						
2	80		90						
1.18	75		80						
0.6	70		∞ 70 - 						
0.425	68	SAND	ils 60 + + + + + + + + + + + + + + + + + +				1		
0.3	66		8 50 + 50 + 50 + 50						
0.15	59		Sercentage passing (%) 80						
0.063	54		Ceu 40						
0.034	49								
0.025	46		20						
0.016	43	SILT/CLAY	10						
0.009	38	OIL I / OL/XI	0 +					1 111 1 111111	
0.007	34		0.0001	0.001	0.01	0.1	1	10	100
0.005	31			CLAY	SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	15								
						Approved by:		Date:	Page no:

IGSL Ltd Materials Laboratory

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

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



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

						(omgo nor nocronica,			
particle	%				Contract No:	18963	Report	No. R72532			
size	passing				Contract:	GCTP Pha	ase 3 - Co	ontact 1			
75	100	COBBLES	1		TP:	TP3/42					
63	100	COBBLLO	1		Sample No.	AA43062	Lab. Sa	ample No.	A16/1937		
50	100		1		Sample Type:	В					
37.5	99		1		Depth (m)	1.50	Custom	er: Galway Co.C	co.		
28	96		1		Date Received	16-05-16	Date Te	esting started	27-05-16		
20	93		1		Description:	Brown clay	yey/silty, g	ravelly, SAND			
14	91	GRAVEL	1								
10	89	GRAVEL	1		Remarks						
6.3	88							5 3	8 55	22	
5	87							0.063	0.3 0.425 0.6 1.18	2 3.35 5.3 10 14 20	37. 50. 53.
3.35	85			100							
2	84			90							
1.18	78			80	+ + + + + + + + + + + + + + + + + + + +					1 	
0.6	61) (%	70	+				+		
0.425	51	SAND	Percentage passing (%)	60							
0.3	39		pas	50							
0.15	21		tage	40					ИШШ		
0.063	14		cen	40					/		
			Per								
				20							
		SILT/CLAY		10							
		0.21,02,11		0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						
				0.0	0.00	1	0.01	0.1	1	10	100
					CLAY		SILT	Sieve size (mm)	SAND	GRAVEL	
		1001 14		4	lala Labausts			Approved by:		Date:	Page no:
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Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)

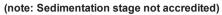


Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

						(ougo not accidance,			
particle	%				Contract No:	18963	Report	No. R72473			
size	passing				Contract:	GCTP Pha	se 3 - Co	ontact 1			
75	100	COBBLES			TP:	TP3/42					
63	100	COBBLES			Sample No.	AA43064	Lab. Sa	ample No.	A16/1939		
50	100				Sample Type:	В					
37.5	99				Depth (m)	3.50	Custom	ner: Galway Co.Co	Ο.		
28	97				Date Received	16-05-16	Date Te	esting started	27-05-16		
20	92				Description:	Brown clay	/ey/silty, v	ery sandy, GRAVE	L		
14	84	GRAVEL									
10	74	GRAVEL			Remarks						
6.3	65							5 33	8 35	22	
5	61							0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 14 20	33.0 53.0 53.0
3.35	53			100							
2	47			90						1 1111111111111111111111111111111111111	
1.18	38			80	+ + + + + + + + + + + + + + + + + + + +					 / 	
0.6	25		3 (%	70	+ + + + + + + + + + + + + + + + + + + +						
0.425	21	SAND	ssing	60		-					
0.3	18		Percentage passing (%)	50							
0.15	15		age	40						<u> </u>	
0.063	14		cent	40							
			Per		†						
				20							
		SILT/CLAY		10	+ + + + + + + + + + + + + + + + + + + +						
		SIL 17CLA1		0							
				0.0	0.00)1	0.01	0.1	1	10	100
					CLAY		SILT	Sieve size (mm)	SAND	GRAVEL	
		1001.14	-1 84 -	4	Sala Labarata			Approved by:		Date:	Page no:
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Determination of Particle Size Distribution







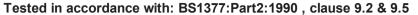
14-06-16

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

1 of 1

					(stage not accreaited	,		
particle	%			Contract No:	18963	Report	No. R72687		-	
size	passing			Contract:	GCTP Phas	se 3 - Co	ontact 1			
75	100	COBBLES		TP:	TP3/44					
63	100	OODDEEO	;	Sample No.	AA49493	Lab. Sa	ample No.	A16/1940		
50	94		;	Sample Type:	В					
37.5	94			Depth (m)	1.00	Custom	ner: Galway Co.	Co.		
28	91			Date Received	10-05-16	Date Te	esting started	27-05-16		
20	90			Description:	Brown sligh	ntly sandy	, slightly gravelly,	SILT/CLAY		
14	88	GRAVEL								
10	86	GIVAVLL		Remarks						
6.3	84						5 53	8 52	Ω.	2
5	83						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	230 230
3.35	80		100 -							
2	76		90 -							
1.18	71		80 -							
0.6	66		× 70 -							
0.425	63	SAND	ssing 60 -							
0.3	61		- 05 -							
0.15	54		- 04 de							
0.063	45		ē							
0.037	37									
0.027	32		20 -							
0.017	25	SILT/CLAY	10 -							
0.010	21	JIL 1/OLAT	0 -				1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		1 111 1 1111 1 1	
0.007	18		0.0	0.00)1	0.01	0.1	1	10	100
0.005	15			CLAY	,	SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	9									
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Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



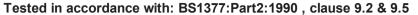
14-06-16

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

1 of 1

					(note: Seair	mentation stag	je not accredited)		W. WOOFE REST NO. 1	134
particle	%			Contract No:	18963	Report No.	R72474			
size	passing		•	Contract:	GCTP Phas	se 3 - Conta	ict 1			
75	100	COBBLES		TP:	TP3/44					
63	100	COBBLEC		Sample No.	AA49496	Lab. Samp	le No.	A16/1943		
50	100			Sample Type:	В					
37.5	94			Depth (m)	2.00	Customer:	Galway Co.Co	0.		
28	93			Date Received	16-05-16	Date Testir	ng started	27-05-16		
20	93			Description:	Light brown	n/grey slightly	y sandy, slightly	gravelly, CLAY	,	
14	90	GRAVEL								
10	88	GNAVEL		Remarks						
6.3	86						5 5	8 8	<u></u>	22
5	84						0.063	0.3 0.425 0.6 1.18	2 3.35 5.3 10 14 20	28 37.5 50 53 750
3.35	80		100							
2	77		90	+ + + + + + + + + + + + + + + + + + + +			 	 		####
1.18	73		<u> </u>	+ + + + + + + + + + + + + + + + + + + +			 	 		
0.6	69		Percentage passing (%) 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	+ + + + + + + + + + + + + + + + + + + +			 		 	
0.425	67	SAND	iss 60	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				4	 - -	
0.3	65		sed 50							
0.15	57		age 40							
0.063	51		centa 40							
0.033	46					1111			1	#####
0.024	44		20		+		 		1 111 1 1111 1 1	
0.015	41	SILT/CLAY	10	+ + + + + + + + + + + + + + + + + + + +			 		1 111 1 1111 1 1	
0.009	36	SIL I /OLA I	0							
0.007	32		0.0	0001 0.	.001	0.01	0.1	1	10	100
0.005	29			CLA	4Y	SILT Sie	eve size (mm)	SAND	GRAVEL	
0.001	17									
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Determination of Particle Size Distribution



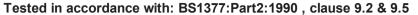
(note: Sedimentation stage not accredited)



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

					(Hote. Sed	iiiieiitatioii S	tage not accredited)			
particle	%			Contract No:	18963	Report I	No. R72622			
size	passing		ı	Contract:	GCTP Pha	se 3 - Co	ntact 1			
75	100	COBBLES	ı	TP:	TP3/45					
63	100	COBBLLO	ı	Sample No.	AA43051	Lab. Sa	mple No.	A16/1946		
50	100		ı	Sample Type:	В					
37.5	100		ı	Depth (m)	1.50	Custome	er: Galway Co.C	Co.		
28	98		ı	Date Received	10-05-16	Date Te	sting started	27-05-16		
20	98		ı	Description:	Brown slig!	htly sandy,	slightly gravelly,	SILT/CLAY		
14	92	GRAVEL	ı							
10	90	OIVWLL	ı	Remarks						
6.3	87						5 53	8 22	22	ر ن
5	86		404				0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 14 20	28 37.5 53 63
3.35	82		100							
2	78		90) 						
1.18	73		80) 						
0.6	68		8 70) +						
0.425	64	SAND	iss 60) 	$\overline{}$					
0.3	62		<u>a</u> 50) 						
0.15	55		Percentage passing (%) 20 90 90 90 90 90 90 90 90 90 90 90 90 90							
0.063	47		ercen 30							
0.037	39									
0.027	37		20							
0.017	33	SILT/CLAY	10) 						
0.010	28		C							
0.007	24		0	.0001 0.0		0.01	0.1	1	10	100
0.005	21			CLAY		SILT	Sieve size (mm)	SAND	GRAVEL	
0.002	10								ID. 4	TD.
		IGSL Ltd	d Mater	rials Laborato	rv		Approved by		Date:	Page no:
				= anolute	H Bree	14-06-16				

Determination of Particle Size Distribution



(note: Sedimentation stage not accredited)



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

					(note: Seaime	entation	stage not accredited)		W. JOURE REST NO. 1	30									
particle	%			Contract No:	18963 I	Report	No. R72688		-										
size	passing		1	Contract:	GCTP Phase	3 - Cc	ontact 1												
75	100	COBBLES	ı	TP:	TP3/45														
63	100	OODDELEO	ı	Sample No.	AA43054 I	Lab. Sa	ımple No.	A16/1949											
50	100		ı	Sample Type:	В														
37.5	100		ı	Depth (m)	2.50	Custom	er: Galway Co.C	Co.											
28	98		ı	Date Received	10-05-16 I	Date Te	esting started	27-05-16	i										
20	97		ı	Description:	Light brown/g	grey slig	ıhtly sandy, slightly	gravelly, SILT	CLAY										
14	97	GRAVEL	ı																
10	96	OIVAVEE	ı	Remarks															
6.3	92						5 5	8 22 8	22	٠ċ									
5	90						0.063	0.3 0.425 0.6 1.18	2 3.35 6.3 10 20	28 37.5 50 63 63									
3.35	86		100 -																
2	81		90 -																
1.18	77		80 -																
0.6	72											<u>%</u> 70 −							
0.425	69	SAND	sing 60 -																
0.3	67		50 -																
0.15	61		Percentage passing (%) - 00 - 00 - 00 - 00 - 00 - 00 - 00 -																
0.063	54		Cen																
0.035	47																		
0.025	43		20 -																
0.016	40	SILT/CLAY	10 -																
0.010	37	SIL I / OL/ (I	0 -																
0.007	34		0.0	0.00	11	0.01	0.1	1	10	100									
0.005	30			CLAY		SILT	Sieve size (mm)	SAND	GRAVEL										
0.001	20																		
		1661 14	d Matari	ale I aborato	K//		Approved by:		Date:	Page no:									
	IGSL Ltd Materials Laboratory							H. Bergere 14-06-16											

IGSL Ltd, M7 Business Park, Newhall, Naas, Co Kildare

IGSL Ltd Materials Laboratory Unit J5,M7 Business Park

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. R72383

Contract No. 18963

Contract Name: N6 Galway

Customer: Galway Co.Co.

BH/TP TP3/42

Sample No. AA43059

Depth (m) 0.40

Sample Type: В

Lab Sample No. A16/1934

Source (if applicable) unknown

Material Type (if applicable): В

Sample Received: 12-05-16

Date Tested: 30-05-16

Sample Cert: N/A

Moisture Content (%): 22

% Particles > 20mm 1.2

(By dry mass):

MCV: 7.4

Interpretation of Plot: Steepest Straight Line

Description of Soil: Dark brown sandy gravelly SILT/CLAY

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 authorized to approve reports J Barrett (Quality Manager) H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory

Approved by		Date	Page
A Ryane	(02-06-16	1 of 1

IGSL Ltd Materials Laboratory M7 Business Park Naas Co.Kildare 045 846176

TEST REPORT Determination of MCV / moisture content Relation of a soil

Tested in accordance with BS1377-4:1990, clause 5.5

Report No. R72660 Contract GCTP Phase 3 - Contract 1

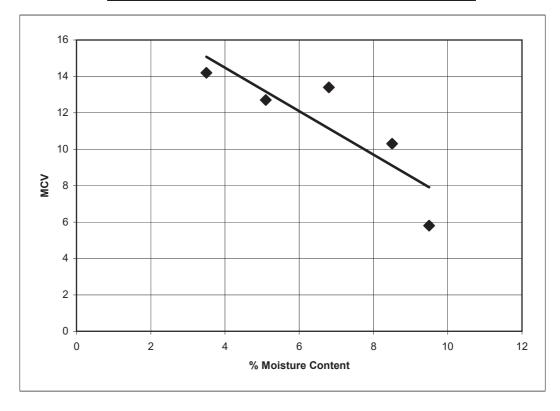
Contract No. 18963 Customer Galway Co.Co.

Date received 12-05-16 Date Tested 01-06-16

BH/TP No. TP3/42 Sample No. AA43060 Type: B

Depth (m) 0.80 Lab sample No. A16/1935

MC% 10 8.5 6.8 5.1 3.5 MCV 5.8 10.3 13.4 12.7 14.2



% material >20mm 1.6

Persons authorized to approve reports

J Barrett (Quality Manager) H Byrne (Laboratory Manager)

Approved by	Date	Page No.
A Byen	15-06-16	1 of 1

IGSL Ltd Materials Laboratory M7 Business Park Naas Co.Kildare 045 846176

TEST REPORT Determination of MCV / moisture content Relation of a soil

Tested in accordance with BS1377-4:1990, clause 5.5

Report No. R72661 Contract GCTP Phase 3 - Contract 1

Contract No. 18963 Customer Galway Co.Co.

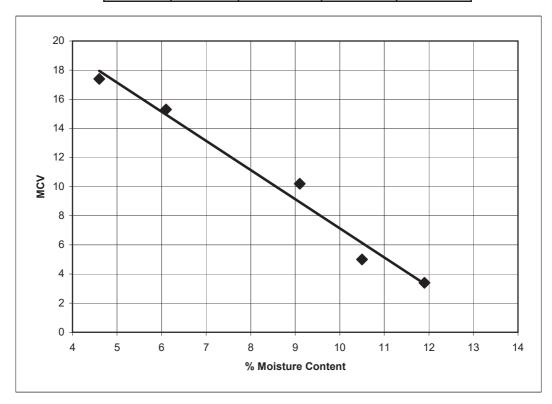
Date received 12-05-16 Date Tested 01-06-16

BH/TP No. TP3/44 Sample No. AA49497 Type: B

Depth (m) 2.00 Lab sample No. A16/1944

 MC%
 9
 12
 10.5
 6.1
 5

 MCV
 10.2
 3.4
 5
 15.3
 17.4



% material >20mm 2.7

Persons authorized to approve reports

J Barrett (Quality Manager) H Byrne (Laboratory Manager)

Approved by	Date	Page No.
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IGSL Ltd Materials Laboratory M7 Business Park Naas Co.Kildare 045 846176

TEST REPORT Determination of MCV / moisture content Relation of a soil

Tested in accordance with BS1377-4:1990, clause 5.5

Report No. R72662 Contract GCTP Phase 3 - Contract 1

Contract No. 18963 Customer Galway Co.Co.

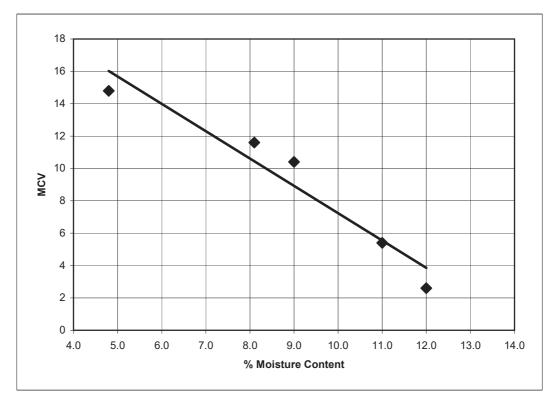
Date received 12-05-16 Date Tested 01-06-16

BH/TP No. TP3/45 Sample No. AA43052 Type: B

Depth (m) 1.50 Lab sample No. A16/1947

 MC%
 4.8
 12
 11
 8.1
 9.0

 MCV
 14.8
 2.6
 5.4
 11.6
 10.4



% material >20mm 4.5

Persons authorized to approve reports

J Barrett (Quality Manager) H Byrne (Laboratory 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. R72515 Contract GCTP Phase 3 - Contact 1

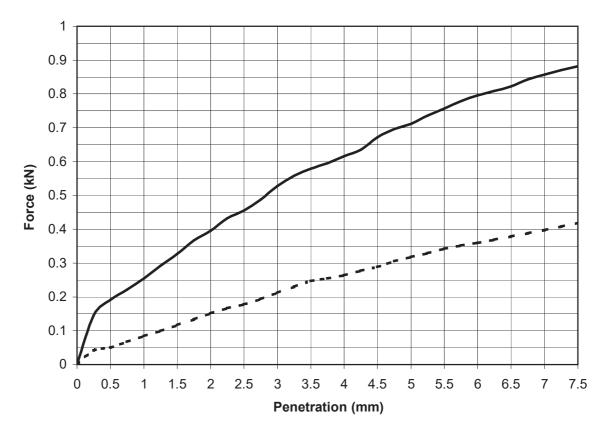
Contract No. 18963 Customer

Galway Co.Co.

Date received 12/5/16 Date Tested 07-06-16

BH/TP No. TP3/44 Sample No. AA49493 Type: B

Depth (m) 1.00 Lab sample No. A16/1940



Key: ----- Base

Description: Brown slightly sandy, slightly gravelly, SILT/CLAY Initial Condition: Soaked 4 Days Bulk Density (Mg/m³): 10 2.28 Moisture Content (%): Dry Density (Mg/m³): Surcharge (kg): 4 2.07 % Material >20mm: 3 Method of compaction: Static Compaction Method 2

Test Result Top Base
CBR % 4 2

Moisture 10 11

Content %

Persons authorized to approve reports

J Barrett (Quality Manager)

H Byrne (Laboratory 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. R72516 Contract GCTP Phase 3 - Contact 1

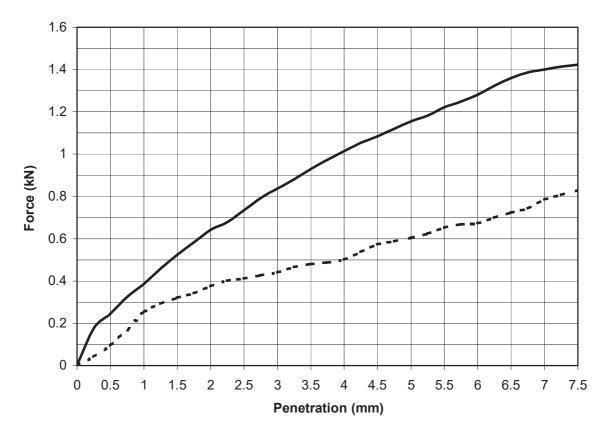
Contract No. 18963 Customer

Galway Co.Co.

Date received 12-05-16 Date Tested 07-06-16

BH/TP No. TP3/45 Sample No. AA43054 Type: B

Depth (m) 2.50 Lab sample No. A16/1949



Key: ----- Base

Description: Light brow	cription: Light brown/grey slightly sandy, slightly gravelly, SILT/CLAY						
Initial Condition:	Soaked 4	l Days					
Moisture Content (%):	10	Bulk Density (Mg/m ³):	2.09				
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.90				
% Material >20mm:	0						
Method of compaction:	Static Compaction Method 2						

Test Result	Тор	Base
CBR %	5.8	3.1
Moisture	10	11
Content %	10	· · ·

Persons authorized to approve reports

J Barrett (Quality Manager)

H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
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Contract Number: 31135

Client's Reference: **18963 PO: 8952** Report Date: **06-06-2016**

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: 01-06-2016
Date Commenced: 01-06-2016
Date Completed: 06-06-2016

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)

1

Non Accredited Test - @ Non Accredited Test

Disposal of Samples on Project

Notes: Observations and Interpretations are outside the UKAS Accreditation

* - denotes test included in laboratory scope of accreditation

- denotes test carried out by approved contractor

@ - denotes non accredited tests

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

Approved Signatories:

Alex Wynn (Associate Director) - Benjamin Sharp (Contracts Manager) - Emma Sharp (Office Manager)
Jon Tatam (Administrative/Quality Assistant) - 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

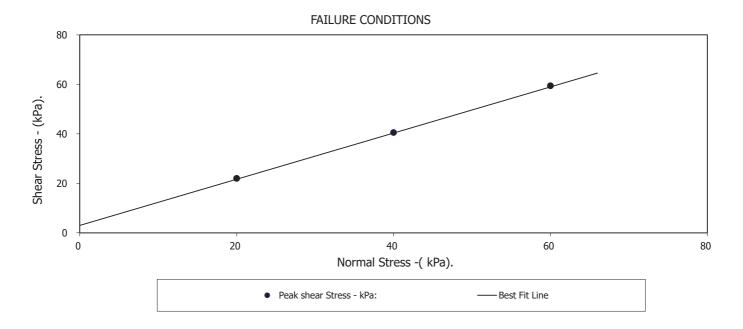
Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk

Test Report: Quick Shearbox Test BS1377:Part 7:4.5 :1990.

TP3/42 A16/1938 Depth (m) from: Borehole: 2.50 Sample Number: Depth (m) to: 2.50

Sample Type:	D			
Particle Density - Mg/m3:	2.65	(Assumed)		
Specimen Tested:	Submerged, Remoulde	ed material above 2.00mm rem	loved	
Sample Description:	•			
Grey brown slightly silty slightly claye	ey GRAVEL (fine-coarse/angular	-subangular)		
STAGE		1	2	3
Initial Conditions				
Height - mm:		24.50	24.50	24.50
Length - mm:		59.90	59.90	59.90
Moisture Content - %:		9	9	9
Bulk Density - Mg/m3:		2.21	2.21	2.21
Dry Density - Mg/m3:		2.02	2.02	2.02
Voids Ratio:		0.3136	0.3123	0.3098
Normal Pressure- kPa		20	40	60
Consolidation				
Consolidated Height - mm:		24.49	24.42	24.35
Shear				
Rate of Strain (mm/min)		1.250	1.250	1.250
Strain at peak shear stress (mm)		10.57	10.26	9.94
Peak shear Stress - kPa:		22	41	59

PEAK	
Angle of Shearing Resistance:(0)	43.0
Effective Cohesion - kPa:	3



2 P Granz

03/06/16

Checked Page 1 by:

Date

2 P Granz

03/06/16

Approved Page 1 by: Date

> Contract No.: 31135

Client Ref Number: 8952



G.C.T.P

030704 QSHEARBOX

Appendix 14

Soil Chemical Test Records

Lab Test Schedule No.	Jones Report Reference
1*	16/4934
2	16/5504
5**	16/9137
7	16/8318
9	16/10473
10	16/9709

^{*}Sample result from TP3/20 contained in Jones Report 16/12147 featured in Appendix 15

 $^{^{\}star\star}\text{Sample}$ result from BH3/03 contained in Jones Report 16/12147 featured in Appendix 15



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

Unit 3 Deeside Point

Zone 3

Deeside Industrial Park

Deeside CH5 2UA

IGSL Unit F M7 Business Park Naas Co Kildare Ireland

Tel: +44 (0) 1244 833780 Fax: +44 (0) 1244 833781





Attention: Darren Keogh

Date: 25th February, 2016

Your reference: 18963

Our reference : Test Report 16/4934 Batch 1

Location: GCTP Phane 3 Contract 1 GI

Date samples received: 15th February, 2016

Status : Final report

Issue:

Thirty four samples were received for analysis on 15th February, 2016 of which thirty four were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

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

Compiled By:

Bruce Leslie

Project Co-ordinator

Client Name: IGSL

Reference: 18963

Location: GCTP Phane 3 Contract 1 GI

Contact: Darren Keogh

Report : Solid

JE Job No.:	16/4934										_		
J E Sample No.	1	2	3	4-5	6	7	8	9	10	11			
Sample ID	TP3/01	TP3/03	TP3/03	TP3/03	TP3/05	TP3/05	TP3/06	TP3/06	TP3/07	TP3/08			
Depth	GL-0.40	0.50	1.00	1.60	0.50	1.00	0.50	1.10	0.20-0.50	0.50		e attached n ations and a	
COC No / misc											abbievi	alions and a	cionyms
Containers	J	J	J	J	J	J	J	J	J	J			
Sample Date													
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1	LOD/LOR	Units	Method No.
Date of Receipt											-0		TM38/PM20
Chloride * Sulphate as SO4 (2:1 Ext) *	-	0.0357	47 -	0.0341	-	0.0154	-	0.0362	0.0127	42 0.0072	<2 <0.0015	mg/kg g/l	TM38/PM20 TM38/PM20
,												Ü	
Organic Matter	17.9	-	8.4	1.8	60.9	-	72.7	-	3.4	1.1	<0.2	%	TM21/PM24
Loss on Ignition#	37.3	-	15.4	4.9	74.5	-	83.4	-	-	-	<1.0	%	TM22/PM0
pH#	6.55	6.18	-	6.64	-	6.72	6.23	6.40	5.28	7.54	<0.01	pH units	TM73/PM11
		l	l					l		I			

Client Name: IGSL

Reference: 18963

Location: GCTP Phane 3 Contract 1 GI

Contact: Darren Keogh JE Job No.: 16/4934

Report : Solid

											1		
J E Sample No.	12	13	14	15	16	17	18	19	20	21			
Sample ID	TP3/08	TP3/12	TP3/13	TP3/14	TP3/15	TP3/16	TP3/18	TP3/19	TP3/20	TP3/20			
Depth	1.20	0.60-0.80	0.50	0.20-0.40	0.10-0.40	0.20-0.50	0.15-0.50	0.50	0.15-0.40	1.00-1.30	Please se	e attached n	otes for all
COC No / misc											abbrevi	ations and a	cronyms
Containers	J	J	J	J	J	J	J	J	J	J			
Sample Date	11/02/2016	11/02/2016	11/02/2016	11/02/2016	11/02/2016	11/02/2016	11/02/2016	11/02/2016	11/02/2016	11/02/2016			
Sample Type	Soil	Soil											
Batch Number	1	1	1	1	1	1	1	1	1	1	LOD/LOR	Units	Method
Date of Receipt	15/02/2016	15/02/2016	15/02/2016	15/02/2016	15/02/2016	15/02/2016	15/02/2016	15/02/2016	15/02/2016	15/02/2016	LODILOR	Office	No.
Chloride #	-	-	-	-	-	51	-	-	-	52	<2	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext)#	0.0437	<0.0015	0.0103	<0.0015	0.0181	<0.0015	-	<0.0015	-	0.4069	<0.0015	g/l	TM38/PM20
Organic Matter	1.1	22.2	1.2	4.6	24.2	1.6	9.8	-	42.7	1.0	<0.2	%	TM21/PM24
Loss on Ignition #	_	26.6			_	-	20.6	_	78.0	_	<1.0	%	TM22/PM0
Loss on Ignition # pH #	7.76	5.56	7.46	4.70	5.96	5.67	7.23	6.35	6.56	7.07	<0.01	% pH units	TM73/PM11
				-			-		.				

Client Name: IGSL

Reference: 18963

Location: GCTP Phane 3 Contract 1 GI

Contact: Darren Keogh JE Job No.: 16/4934

Report : Solid

JE Job No.:	16/4934										_		
J E Sample No.	22	23	24	25	26	27	28	29	30	31			
Sample ID	TP3/21	TP3/23	TP3/23	TP3/23	TP3/25	TP3/25	TP3/27	TP3/27	TP3/28	TP3/29			
Depth	0.15-0.40	0.50	1.10	2.00	0.15-0.40	2.00	0.50	2.00	0.50	0.50		e attached n	
COC No / misc											abbrevi	ations and a	cronyms
Containers	J	J	J	J	J	J	J	J	J	J			
Sample Date													
Sample Type		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number Date of Receipt	15/02/2016	15/02/2016	15/02/2016	1 15/02/2016	1 15/02/2016	1 15/02/2016	15/02/2016	1 15/02/2016	15/02/2016	1 15/02/2016	LOD/LOR	Units	Method No.
Chloride #	30	-	-	-	-	38	29	35	25	-	<2	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext)#	<0.0015	<0.0015	0.0051	0.0056	<0.0015	0.0037	0.0057	0.0047	0.0061	-	<0.0015	g/l	TM38/PM20
Organic Matter	-	0.3	<0.2	0.2	2.6	0.3	1.4	0.2	0.3	67.1	<0.2	%	TM21/PM24
Loss on Ignition#	-	-	-	-	-	-	-	-	-	70.9	<1.0	%	TM22/PM0
pH#	6.38	7.30	8.73	8.70	8.09	8.75	8.39	8.78	8.63	5.99	<0.01	pH units	TM73/PM11

Client Name: IGSL

Reference: 18963

Location: GCTP Phane 3 Contract 1 GI

Contact: Darren Keogh JE Job No.: 16/4934

Report : Solid

	1	1									
J E Sample No.	32	33	34	35							
Sample ID	TP3/29	TP3/34	TP3/35	TP3/17							
Depth	1.60-1.80	0.50	0.50	0.50					Please se	e attached n	otes for all
COC No / misc									abbrevi	ations and a	cronyms
Containers	J	J	J	J							
Sample Date	11/02/2016	11/02/2016	11/02/2016	11/02/2016							
Sample Type	Soil	Soil	Soil	Soil							
Batch Number	1	1	1	1					1.00 // 0.0	11-16-	Method
Date of Receipt	15/02/2016	15/02/2016	15/02/2016	15/02/2016					LOD/LOR	Units	No.
Chloride #	53	-	-	-					<2	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext)#	0.0197	-	-	0.0174					<0.0015	g/I	TM38/PM20
Organic Matter	2.3	71.5	87.3	1.8					<0.2	%	TM21/PM24
Loss on Ignition #	-	71.1	84.1	-					<1.0	%	TM22/PM0
pH#	7.60	6.05	5.79	5.15					<0.01	pH units	TM73/PM11
			İ	<u> </u>	<u> </u>		<u> </u>	İ			i

Client Name: IGSL Reference: 18963

Location: GCTP Phane 3 Contract 1 GI

Contact: Darren Keogh

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason					
	No deviating sample report results for job 16/4934										

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

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 16/4934

SOILS

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

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

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

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

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

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

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

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

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

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

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

WATERS

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

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

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

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

DEVIATING SAMPLES

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

SURROGATES

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

DILUTIONS

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

NOTE

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

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

ABBREVIATIONS and ACRONYMS USED

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

JE Job No: 16/4934

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM22	Modified USEPA 160.4. Gravimetric determination of Loss on Ignition by temperature controlled Muffle Furnace (450°C)	PM0	No preparation is required.	Yes		AD	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground samples with deionised water in a 2:1 water to solid ratio for anions. Extraction of as received samples with deionised water in a 2:1 water to solid ratio for ammoniacal nitrogen. Samples are extracted using an orbital shaker.	Yes		AD	Yes
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No



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

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Zone 3

Deeside Industrial Park

Deeside CH5 2UA

IGSL Unit F M7 Business Park Naas Co Kildare Ireland

Tel: +44 (0) 1244 833780 Fax: +44 (0) 1244 833781





Attention: Darren Keogh

Date: 8th March, 2016

Your reference : N6 Galway

Our reference: Test Report 16/5504 Batch 1

Location :

Date samples received: 26th February, 2016

Status: Final report

Issue:

Three samples were received for analysis on 26th February, 2016 of which three were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

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

Compiled By:

Phil Sommerton BSc Project Manager

Client Name: IGSL

Reference: N6 Galway

Location:

Darren Keogh

Salway

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Report: Solid

Contact:	Darren Keo
JE Job No.:	16/5504

JE JOD NO.:	16/5504						_		
J E Sample No.	1-2	3-4	5-6]		
Sample ID	TP3/04	TP3/09	TP3/32						
Depth	0.50	0.50	0.40				Diagram	e attached n	-t fII
COC No / misc							abbrevi	e allached nations and a	cronyms
Containers	J	J	J						
Sample Date	25/02/2016	25/02/2016	25/02/2016						
Sample Type		Soil	Soil						
Batch Number		1	1						Method
Date of Receipt	26/02/2016	26/02/2016	26/02/2016				LOD/LOR	Units	No.
Organic Matter	70.8	30.6	4.9				<0.2	%	TM21/PM24
Loss on Ignition [#] pH [#]	79.1 5.50	45.2 5.64	5.2 8.16				<1.0 <0.01	% pH units	TM22/PM0 TM73/PM11
pi i								P*** = ****	

Client Name: IGSL

Reference: N6 Galway

Location:

Contact: Darren Keogh

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
					No deviating sample report results for job 16/5504	

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

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 16/5504

SOILS

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

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

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

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

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

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

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

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

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

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

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

WATERS

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

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

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

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

DEVIATING SAMPLES

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

SURROGATES

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

DILUTIONS

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

NOTE

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

16/5504

ABBREVIATIONS and ACRONYMS USED

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DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
ТВ	Trip Blank Sample
OC	Outside Calibration Range

JE Job No: 16/5504

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM22	Modified USEPA 160.4. Gravimetric determination of Loss on Ignition by temperature controlled Muffle Furnace (450°C)	PM0	No preparation is required.	Yes		AD	Yes
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No



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Zone 3

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Deeside CH5 2UA

IGSL
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Co Kildare
Ireland

Tel: +44 (0) 1244 833780 Fax: +44 (0) 1244 833781





Attention: Darren Keogh

Date: 20th July, 2016

Your reference: 18963

Our reference: Test Report 16/9137

Location: GCTP Phase 3

Date samples received : 19th May, 2016

Status: Final report

Issue: 2

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

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

Compiled By:

Bruce Leslie

Project Co-ordinator

IGSL Client Name:

18963 Reference:

GCTP Phase 3 Location: Contact: Darren Keogh

Report: Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

JE Job No.: 16/9137

JE Job No.:	16/9137						_		
J E Sample No.	1	2							
Sample ID	BH321	BH321							
Danish	0.5	4.7							
Depth	0.5	1.7					Please se abbrevia	e attached neations and ac	otes for all cronyms
COC No / misc									•
Containers	J	J							
Sample Date									
Sample Type	Soil	Soil							
Batch Number	1	1					LOD/LOR	Units	Method
Date of Receipt									No.
Organic Matter	<0.2	0.3					<0.2	%	TM21/PM24
pH#	8.78	8.56					<0.01	pH units	TM73/PM11
Pil	0.70	0.00					0.01	priamo	
					 	 			

Client Name: IGSL Reference: 18963

Location: GCTP Phase 3 **Contact:** Darren Keogh

J E Job No.	Batch	Sample ID	Depth	J E Sample No.		Reason
					No deviating sample report results for job 16/9137	

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

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 16/9137

SOILS

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

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

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

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

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

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

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

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

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

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

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

WATERS

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

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

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

DEVIATING SAMPLES

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

SURROGATES

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

DILUTIONS

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

ABBREVIATIONS and ACRONYMS USED

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

JE Job No: 16/9137

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No



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Co Kildare
Ireland

Tel: +44 (0) 1244 833780 Fax: +44 (0) 1244 833781





Attention: Darren Keogh

Date: 10th May, 2016

Your reference: 18963

Our reference : Test Report 16/8318 Batch 1

Location: GCTP

Date samples received: 29th April, 2016

Status: Final report

Issue:

Two samples were received for analysis on 29th April, 2016 of which two were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

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

Compiled By:

Phil Sommerton BSc Project Manager

Client Name: IGSL

Reference: 18963 Location: GCTP Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Contact: Darren Keogh
JE Job No.: 16/8318

JE Job No.:	16/8318										
J E Sample No.	1	2									
Sample ID	BH3131	BH3152									
Depth	0.50	0.50							Diagona	o ottoobod n	aton for all
COC No / misc									abbrevi	e attached no ations and ac	cronyms
Containers	J	J									
Sample Date											
Sample Type		Soil									
Batch Number		1									Madhad
Date of Receipt									LOD/LOR	Units	Method No.
Organic Matter	0.7	<0.2							<0.2	%	TM21/PM24
pH #	7.97	8.49							<0.01	pH units	TM73/PM11
		I.	I	<u> </u>	I	<u> </u>	<u> </u>	<u> </u>	<u> </u>		

Client Name: IGSL Reference: 18963 Location: GCTP

Contact: Darren Keogh

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
				•	No deviating sample report results for job 16/8318	

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

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 16/8318

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DEVIATING SAMPLES

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*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
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LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
ТВ	Trip Blank Sample
OC	Outside Calibration Range

JE Job No: 16/8318

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No



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IGSL Unit F M7 Business Park Naas Co Kildare Ireland

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Attention: Darren Keogh

Date: 30th June, 2016

Your reference: 18963

Our reference: Test Report 16/10473 Batch 1

Location :

Date samples received: 20th June, 2016

Status: Final report

Issue:

Seven samples were received for analysis on 20th June, 2016 of which seven were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

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

Compiled By:

Bruce Leslie

Project Co-ordinator

Client Name: IGSL Report: Solid

Reference: 18963

Location:

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Contact: Darren Keogh
JE Job No.: 16/10473

JE Job No.:	16/10473									_		
J E Sample No.	1	2	3	4	5	6	7					
Sample ID	WS3/01	WS3/02	W\$3/02	WS3/02	WS3/03	WS3/04	WS3/04					
Depth	0.40	0.80	1.20	2.30	0.60	0.40	1.00			Please se	e attached n	otes for all
COC No / misc										abbrevi	ations and a	cronyms
Containers	Т	Т	Т	Т	Т	Т	Т			Ì		
Sample Date	<>	<>	<>	<>	<>	<>	<>			Ì		
Sample Type	Soil			Ì								
Batch Number	1	1	1	1	1	1	1					Method
Date of Receipt	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016			LOD/LOR	Units	No.
Organic Matter	0.8	34.0	0.8	0.3	35.1	40.2	11.5			<0.2	%	TM21/PM24
pH #	-	7.28	8.54	_	-	_	-			<0.01	pH units	TM73/PM11
рп	-	7.20	0.04	-	-	-	-			<0.01	pri units	TIVI7 3/FIVITT
		I					l	l	l	1		

18963

Notification of Deviating Samples

Client Name: IGSL Matrix : Solid

Reference: Location:

Contact: Darren Keogh

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
16/10473	1	WS3/02	0.80	2	All analyses	No sampling date given
16/10473	1	WS3/02	1.20	3	All analyses	No sampling date given

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

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 16/10473

SOILS

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

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

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

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

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

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

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

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

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

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

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

WATERS

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

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

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

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

DEVIATING SAMPLES

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

SURROGATES

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

DILUTIONS

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

NOTE

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

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

ABBREVIATIONS and ACRONYMS USED

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

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No



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

Unit 3 Deeside Point

Zone 3

Deeside Industrial Park

Deeside CH5 2UA

IGSL Unit F M7 Business Park Naas Co Kildare Ireland

Tel: +44 (0) 1244 833780 Fax: +44 (0) 1244 833781





Attention : Darren Keogh

Date: 14th June, 2016

Your reference: 18963

Our reference: Test Report 16/9709 Batch 1

Location: GCTP Phase 3

Date samples received: 1st June, 2016

Status: Final report

Issue:

Two samples were received for analysis on 1st June, 2016 of which two were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

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

Compiled By:

Phil Sommerton BSc Project Manager

Client Name: IGSL

Reference: 18963

Location: GCTP Phase 3
Contact: Darren Keogh

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

JE Job No.:	16/9709								
J E Sample No.	1	2							
Sample ID	A16/1940/TP2/ 44	A16/1946/TP3/ 45							
Depth	1.0	1.5					Division		
COC No / misc							Please se abbrevi	e attached near	otes for all pronyms
Containers		J							
Sample Date	27/05/2016	27/05/2016					i		
Sample Type		Soil							
Batch Number	1	1							Method
Date of Receipt	01/06/2016	01/06/2016					LOD/LOR	Units	No.
Organic Matter	0.3	0.3					<0.2	%	TM21/PM24
pH#	8.72	8.35					<0.01	pH units	TM73/PM11
P	0.72	5.00					0.01	pumo	2.7 1

Client Name: IGSL Reference: 18963

Location: GCTP Phase 3 **Contact:** Darren Keogh

J E Job No.	Batch	Sample ID	Depth	J E Sample No.		Reason
					No deviating sample report results for job 16/9709	

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

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 16/9709

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

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

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

16/9709

ABBREVIATIONS and ACRONYMS USED

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

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No

Appendix 15

Soil Environmental Test Records

Lab Test Schedule No.	Jones Report Reference
1	16/12147
6	16/6459



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

Unit 3 Deeside Point

Zone 3

Deeside Industrial Park

Deeside CH5 2UA

IGSL Unit F M7 Business Park Naas Co Kildare Ireland

Tel: +44 (0) 1244 833780 Fax: +44 (0) 1244 833781





Attention: Darren Keogh

Date: 4th August, 2016

Your reference :

Our reference: Test Report 16/12147 Batch 1

Location:

Date samples received: 26th July, 2016

Status : Final report

Issue: 2

Two samples were received for analysis on 26th July, 2016 of which two were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

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

Compiled By:

Bruce Leslie

Project Co-ordinator

Client Name: IGSL Report: Solid

Reference:

Location:
Contact: Darren Keogh

Contact: Darren Keogh JE Job No.: 16/12147

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

JE JOD NO.:	16/12147								
J E Sample No.	1-2	3							
Sample ID	TP3/20	BH3/03							
Depth	1.0	0.5							
-	1.0	0.5						e attached n ations and a	
COC No / misc									
Containers	٧J	J							
Sample Date	25/07/2016	25/07/2016							
Sample Type	Soil	Soil							
Batch Number	1	1							Method
Date of Receipt	26/07/2016	26/07/2016					LOD/LOR	Units	No.
Antimony	<1	_					<1	mg/kg	TM30/PM15
Arsenic#	3.1	_					<0.5	mg/kg	TM30/PM15
Barium#	59	-					<1	mg/kg	TM30/PM15
Cadmium #	0.3	-					<0.1	mg/kg	TM30/PM15
Chromium#	24.1	-					<0.5	mg/kg	TM30/PM15
Copper#	11	-					<1	mg/kg	TM30/PM15
Lead #	33	-					<5	mg/kg	TM30/PM15
Mercury#	<0.1	-					<0.1	mg/kg	TM30/PM15
Molybdenum #	1.2	-					<0.1	mg/kg	TM30/PM15
Nickel [#]	20.7	-					<0.7	mg/kg	TM30/PM15
Selenium#	1	-					<1	mg/kg	TM30/PM15
Zinc#	67	-					<5	mg/kg	TM30/PM15
PAH MS									
Naphthalene #	0.07	-					<0.04	mg/kg	TM4/PM8
Acenaphthylene #	<0.03	-					<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	-					<0.05	mg/kg	TM4/PM8
Fluorene # Phenanthrene #	<0.04	-					<0.04 <0.03	mg/kg mg/kg	TM4/PM8 TM4/PM8
Anthracene #	0.09	-					<0.03	mg/kg	TM4/PM8
Fluoranthene #	0.12	_					<0.03	mg/kg	TM4/PM8
Pyrene #	0.11	-					<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene#	0.12	-					<0.06	mg/kg	TM4/PM8
Chrysene #	0.10	-					<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene#	0.18	-					<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene#	0.09	-					<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene#	0.09	-					<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	-					<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	0.07	-					<0.04	mg/kg	TM4/PM8
Coronene	<0.04	-					<0.04	mg/kg	TM4/PM8
PAH 17 Total	1.08	-					<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.13	-					<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.05	-					<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	115	-					<0	%	TM4/PM8
EPH (C8-C40)#	222	_					<30	ma/ka	TM5/PM8
C8-C40 Mineral Oil (Calculation)	39	-					<30	mg/kg mg/kg	TM5/PM8
55 546 Millioral Oli (CalculatiOli)	Ja	-					~30	myrky	TIVIO/F IVIO
GRO (>C4-C8)#	<100	-					<100	ug/kg	TM36/PM12
GRO (>C8-C12)#	<100	-					<100	ug/kg	TM36/PM12
GRO (>C4-12)#	<100	-					<100	ug/kg	TM36/PM12
MTBE#	<5	-					<5	ug/kg	TM31/PM12
Benzene#	<5	-					<5	ug/kg	TM31/PM12
Toluene#	<5	-					<5	ug/kg	TM31/PM12

Client Name: IGSL Report: Solid

Reference:

Location: Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Contact: Darren Keogh
JE Job No.: 16/12147

JE Job No.:	16/12147								
J E Sample No.	1-2	3							
Sample ID	TP3/20	BH3/03							
Depth		0.5						e attached n ations and a	
COC No / misc							abbievi	ations and a	oronymo
Containers	٧J	J							
Sample Date	25/07/2016	25/07/2016							
Sample Type	Soil	Soil							
Batch Number	1	1							Method
Date of Receipt	26/07/2016	26/07/2016					LOD/LOR	Units	No.
Ethylbenzene#	<5	-					<5	ug/kg	TM31/PM12
m/p-Xylene#	<5	-					<5	ug/kg	TM31/PM12
o-Xylene #	<5	-					<5	ug/kg	TM31/PM12
	_						_		T1447/D140
PCB 28 # PCB 52 #	<5 <5	-					<5 <5	ug/kg ug/kg	TM17/PM8 TM17/PM8
PCB 52"	<5 <5	-					<5 <5	ug/kg ug/kg	TM17/PM8
PCB 118#	<5	-					<5	ug/kg	TM17/PM8
PCB 138 #	<5	-					<5	ug/kg	TM17/PM8
PCB 153#	<5	-					<5	ug/kg	TM17/PM8
PCB 180 #	<5	-					<5	ug/kg	TM17/PM8
Total 7 PCBs#	<35	-					<35	ug/kg	TM17/PM8
National Maintine Comtant	40.0	440.7					10.1	%	DM4/DM0
Natural Moisture Content % Dry Matter 105°C	10.2 77.8	412.7					<0.1 <0.1	%	PM4/PM0 NONE/PM4
70 DTy Watter 100 O	77.0	_					40.1	70	NONE/I WH
Sulphate as SO4 (2:1 Ext)	-	0.2302					<0.0015	g/l	TM38/PM60
Total Organic Carbon #	0.64	_					<0.02	%	TM21/PM24
Organic Matter	-	79.8					<0.2	%	TM21/PM24
Loss on Ignition#	2.1	92.7					<1.0	%	TM22/PM0
pH#	-	4.53					<0.01	pH units	TM73/PM11
Mana of ways to at wanting	0.4450							le-	NONE/PM17
Mass of raw test portion Mass of dried test portion	0.1156 0.09	-						kg kg	NONE/PM17
								9	

Client Name: IGSL Report: CEN 10:1 1 Batch

Reference:

Location: Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Contact: Darren Keogh
JE Job No.: 16/12147

JE Job No.:	16/12147							
J E Sample No.	1-2					1		
Sample ID	TP3/20							
Depth	1.0					1		
-	1.0						e attached r ations and a	
COC No / misc								
Containers	VJ					!		
Sample Date	25/07/2016					ļ		
Sample Type	Soil							
Batch Number	1							Method
Date of Receipt	26/07/2016					LOD/LOR	Units	No.
Dissolved Antimony (A10)#	<0.02					<0.02	mg/kg	TM30/PM17
Dissolved Arsenic (A10)#	<0.025					<0.025	mg/kg	TM30/PM17
Dissolved Barium (A10)#	0.22					<0.03	mg/kg	TM30/PM17
Dissolved Cadmium (A10)#	<0.005					<0.005	mg/kg	TM30/PM17
Dissolved Chromium (A10)#	0.021					<0.015	mg/kg	TM30/PM17
Dissolved Copper (A10) #	<0.07					<0.07	mg/kg	TM30/PM17
Dissolved Lead (A10)#	<0.05					<0.05	mg/kg	TM30/PM17
Dissolved Mercury (A10)#	<0.01					<0.01	mg/kg	TM30/PM17
Dissolved Molybdenum (A10)#	0.08 <0.02					<0.02 <0.02	mg/kg	TM30/PM17 TM30/PM17
Dissolved Nickel (A10) * Dissolved Selenium (A10) *	<0.02					<0.02	mg/kg mg/kg	TM30/PM17
Dissolved Zinc (A10)#	0.05					<0.03	mg/kg	TM30/PM17
Dissolved Zille (7110)	0.00					0.00	99	
Resorcinol	<0.1					<0.1	mg/kg	TM26/PM0
Catechol	<0.1					<0.1	mg/kg	TM26/PM0
Phenol	<0.1					<0.1	mg/kg	TM26/PM0
m/p-cresol	<0.2					<0.2	mg/kg	TM26/PM0
o-cresol	<0.1					<0.1	mg/kg	TM26/PM0
Total cresols	<0.3					<0.3	mg/kg	TM26/PM0
Xylenols	<0.6					<0.6	mg/kg	TM26/PM0
1-naphthol 2,3,5-trimethyl phenol	<0.1 <0.1					<0.1 <0.1	mg/kg mg/kg	TM26/PM0 TM26/PM0
2-isopropylphenol	<0.1					<0.1	mg/kg	TM26/PM0
Total Speciated Phenols HPLC	<1					<1	mg/kg	TM26/PM0
							0 0	
Fluoride	<3					<3	mg/kg	TM27/PM0
Sulphate #	2394.3					<0.5	mg/kg	TM38/PM0
Chloride #	9					<3	mg/kg	TM38/PM0
Mass of raw test portion	0.1156						kg	NONE/PM17
Leachant Volume Eluate Volume	0.874							NONE/PM17 NONE/PM17
Lidate volume	0.0							NONE/I WITT
Dissolved Organic Carbon	60					<20	mg/kg	TM60/PM0
Total Dissolved Solids#	4458					<350	mg/kg	TM20/PM0
			l					

EPH Interpretation Report

Client Name: IGSL Matrix : Solid

Reference: Location:

Contact: Darren Keogh

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	EPH Interpretation
16/12147	1	TP3/20	1.0	1-2	Possible tarmac/bitumen & Possible naturally occurring compounds

Notification of Deviating Samples

Client Name: IGSL Matrix : Solid

Reference: Location:

Contact: Darren Keogh

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
16/12147	1	TP3/20	1.0	1-2	GRO	Solid Samples were received at a temperature above 9°C.

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

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 16/12147

SOILS

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

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

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

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

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

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

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

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

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

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

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

WATERS

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

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

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

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

DEVIATING SAMPLES

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

SURROGATES

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

DILUTIONS

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

NOTE

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

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

ABBREVIATIONS and ACRONYMS USED

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

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.				
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM17	Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM20	Gravimetric determination of Total Dissolved Solids/Total Solids based on BS 1377-3:1990 and BSEN 15126	PM0	No preparation is required.	Yes		AR	Yes
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM22	Modified USEPA 160.4. Gravimetric determination of Loss on Ignition by temperature controlled Muffle Furnace (450°C)	PM0	No preparation is required.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (lon-Chromatography).	PM0	No preparation is required.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7 and 6010B	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7 and 6010B	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7 and 6010B	PM17	Modified method EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.	Yes		AR	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes		AR	Yes

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM60	As received solid samples are extracted with deionised water in a 2:1 ratio of water to solid.			AR	Yes
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.			AR	Yes
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
NONE	No Method Code	PM17	Modified method EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.				
NONE	No Method Code	PM17	Modified method EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.			AR	
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.			AR	



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

Unit 3 Deeside Point

Zone 3

Deeside Industrial Park

Deeside CH5 2UA

IGSL Unit F M7 Business Park Naas Co Kildare Ireland

Tel: +44 (0) 1244 833780 Fax: +44 (0) 1244 833781





Attention: Darren Keogh

Date: 4th April, 2016

Your reference : N6 Galway

Our reference: Test Report 16/6459 Batch 1

Location:

Date samples received: 17th March, 2016

Status: Final report

Issue:

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

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

Where Waste Acceptance Criteria Suite (EC Decision of 19 December 2002 (2003/33/EC)) has been requested, all analyses have been performed using the relevant EN methods where they exist.

Compiled By:

Phil Sommerton BSc Project Manager

IGSL Client Name:

N6 Galway Reference:

Location:

gh

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Report : Solid

Contact:	Darren Keog
JE Job No.:	16/6459

JE Job No.:	16/6459							
J E Sample No.	1							
Sample ID	BH 3/30							
Depth	0.50							
COC No / misc	0.00						e attached n ations and a	
	Т							
Containers								
Sample Date	01/03/2016							
Sample Type	Soil							
Batch Number	1					LOD/LOR	Units	Method
Date of Receipt	17/03/2016					LOD/LOR	Offics	No.
Antimony	<1					<1	mg/kg	TM30/PM15
Arsenic#	2.8					<0.5	mg/kg	TM30/PM15
Barium #	87					<1	mg/kg	TM30/PM15
Cadmium#	0.5					<0.1	mg/kg	TM30/PM15
Chromium#	31.1					<0.5	mg/kg	TM30/PM15
Copper#	22					<1	mg/kg	TM30/PM15
Lead #	42					<5	mg/kg	TM30/PM15
Mercury [#]	<0.1					<0.1	mg/kg	TM30/PM15
Molybdenum #	1.6					<0.1	mg/kg	TM30/PM15
Nickel#	13.2					<0.7	mg/kg	TM30/PM15
Selenium#	1 94					<1	mg/kg	TM30/PM15
Zinc [#]	94					<5	mg/kg	TM30/PM15
PAH MS								
Naphthalene #	<0.04					<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03					<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05					<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04					<0.04	mg/kg	TM4/PM8
Phenanthrene #	<0.03					<0.03	mg/kg	TM4/PM8
Anthracene#	<0.04					<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.04					<0.03	mg/kg	TM4/PM8
Pyrene #	0.04					<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	<0.06					<0.06	mg/kg	TM4/PM8
Chrysene #	0.04					<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07					<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene#	<0.04					<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene#	<0.04					<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04					<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene#	<0.04					<0.04	mg/kg	TM4/PM8
Coronene	<0.04					<0.04	mg/kg	TM4/PM8 TM4/PM8
PAH 17 Total Benzo(b)fluoranthene	<0.64 <0.05					<0.64 <0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.03					<0.03	mg/kg mg/kg	TM4/PM8
PAH Surrogate % Recovery	110					<0.02	%	TM4/PM8
1741 Carrogate 70 Necovery	110					-0	,,	1101-771 1010
EPH (C8-C40)#	293					<30	mg/kg	TM5/PM8
C8-C40 Mineral Oil (Calculation)	59					<30	mg/kg	TM5/PM8
,								
GRO (>C4-C8)#	<100					<100	ug/kg	TM36/PM12
GRO (>C8-C12)#	<100					<100	ug/kg	TM36/PM12
GRO (>C4-12)#	<100					<100	ug/kg	TM36/PM12
MTBE#	<5					<5	ug/kg	TM31/PM12
Benzene#	<5					<5	ug/kg	TM31/PM12
Toluene#	<5					<5	ug/kg	TM31/PM12

IGSL Client Name:

N6 Galway Reference:

Location:

Darren Keogh

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Contact: 16/6459 JE Job No.:

JE JOD NO.:	16/6459	 	 	 	 	 _		
J E Sample No.	1							
Sample ID	BH 3/30							
Depth	0.50					Planca	e attached n	otes for all
COC No / misc							e attached n ations and a	
Containers	Т							
Sample Date	01/03/2016							
Sample Type	Soil							
Batch Number	1							
						LOD/LOR	Units	Method No.
Date of Receipt Ethylbenzene #	<5					<5	ualka	TM31/PM12
m/p-Xylene#	<5 <5					<5 <5	ug/kg ug/kg	TM31/PM12
o-Xylene#	<5					<5	ug/kg	TM31/PM12
	-						3. 3	
PCB 28 #	<5					<5	ug/kg	TM17/PM8
PCB 52#	<5					<5	ug/kg	TM17/PM8
PCB 101#	<5					<5	ug/kg	TM17/PM8
PCB 118#	<5					<5	ug/kg	TM17/PM8
PCB 138#	<5					<5	ug/kg	TM17/PM8
PCB 153# PCB 180#	<5 <5					<5 <5	ug/kg	TM17/PM8 TM17/PM8
Total 7 PCBs [#]	<35					<35	ug/kg ug/kg	TM17/PM8
10.00							3. 3	
Natural Moisture Content	20.4					<0.1	%	PM4/PM0
% Dry Matter 105°C	83.4					<0.1	%	NONE/PM4
Chloride #	63					<2	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext)#	1.3045					<0.0015	g/l	TM38/PM20
Total Organic Carbon #	1.04					<0.02	%	TM21/PM24
rotal Organio Calzon						****		
Loss on Ignition #	4.2					<1.0	%	TM22/PM0
pH [#]	7.99					<0.01	pH units	TM73/PM11
Mass of raw test portion	0.1077						kg	NONE/PM17
Mass of dried test portion	0.09						kg	NONE/PM17

IGSL Client Name:

N6 Galway Reference:

Location:

Darren Keogh

Contact: 16/6459 JE Job No.:

Report: CEN 10:1 1 Batch

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

						Ì		
J E Sample No.	1							
Sample ID	BH 3/30							
Depth	0.50					Please se	e attached n	otes for all
COC No / misc							ations and a	
Containers	Т							
Sample Date	01/03/2016							
Sample Type	Soil							
Batch Number	1							Method
Date of Receipt	17/03/2016					LOD/LOR	Units	No.
Dissolved Antimony (A10)#	<0.02					<0.02	mg/kg	TM30/PM17
Dissolved Arsenic (A10)#	<0.025					<0.025	mg/kg	TM30/PM17
Dissolved Barium (A10)#	0.12					<0.03	mg/kg	TM30/PM17
Dissolved Cadmium (A10) #	<0.005					<0.005	mg/kg	TM30/PM17
Dissolved Chromium (A10)#	0.016					<0.015	mg/kg	TM30/PM17
Dissolved Copper (A10)#	<0.07					<0.07	mg/kg	TM30/PM17
Dissolved Lead (A10) #	<0.05					<0.05	mg/kg	TM30/PM17
Dissolved Mercury (A10)#	<0.01					<0.01	mg/kg	TM30/PM17
Dissolved Molybdenum (A10)#	0.10					<0.02	mg/kg	TM30/PM17
Dissolved Nickel (A10)#	<0.02					<0.02	mg/kg	TM30/PM17
Dissolved Selenium (A10) #	<0.03					<0.03	mg/kg	TM30/PM17
Dissolved Zinc (A10)#	0.06					<0.03	mg/kg	TM30/PM17
D	.0.4					-0.4		T1400/D140
Resorcinol	<0.1					<0.1	mg/kg	TM26/PM0 TM26/PM0
Catechol Phenol	<0.1 <0.1					<0.1 <0.1	mg/kg mg/kg	TM26/PM0
m/p-cresol	<0.1					<0.1	mg/kg	TM26/PM0
o-cresol	<0.1					<0.1	mg/kg	TM26/PM0
Total cresols	<0.3					<0.3	mg/kg	TM26/PM0
Xylenols	<0.6					<0.6	mg/kg	TM26/PM0
1-naphthol	<0.1					<0.1	mg/kg	TM26/PM0
2,3,5-trimethyl phenol	<0.1					<0.1	mg/kg	TM26/PM0
2-isopropylphenol	<0.1					<0.1	mg/kg	TM26/PM0
Total Speciated Phenols HPLC	<1					<1	mg/kg	TM26/PM0
Fluoride	<3					<3	mg/kg	TM27/PM0
Sulphate #	1034.9					<0.5	mg/kg	TM38/PM0
Chloride #	8					<3	mg/kg	TM38/PM0
							2 0	
Mass of raw test portion	0.1077						kg	NONE/PM17
Leachant Volume	0.882						I	NONE/PM17
Eluate Volume	0.85						I	NONE/PM17
Discolar I Osmania C. I						.00		Th 400 / 51 4 5
Dissolved Organic Carbon Total Dissolved Solids #	30 2920					<20	mg/kg	TM60/PM0 TM20/PM0
Total Dissolved Solids	2920					<100	mg/kg	TIVIZU/PIVIU

10:1 Result Report

Mass of sample taken (kg)	0.1077	Dry Matter Content Ratio (%) =		83.4	
Mass of dry sample (kg) =	0.09	Leachant Volume (I)		0.882	
Particle Size <4mm =	>95%	Eluate Volume (I)		0.85	
JEFL Job No		16/6459	Landf	fill Waste Ac	ceptance
Sample No		1		Criteria Lin	
Client Sample No		BH 3/30			
Depth/Other		0.50			
Sample Date		01/03/2016	Inert	Stable Non-reactive	Hazardous
Batch No		1		THOM TOUGHTO	
Solid Waste Analysis					
Total Organic Carbon (%)	1.04		3	5	6
Sum of BTEX (mg/kg)	<0.025		6	-	-
Sum of 7 PCBs (mg/kg)	<0.035		1	-	-
Mineral Oil (mg/kg)	59		500	-	-
PAH Sum of 6 (mg/kg)	-		-	-	-
PAH Sum of 17 (mg/kg)	<0.64		100	-	-
	10:1				
	10:1 concn			values for co	
Eluate Analysis			le	aching test	using
Eluate Analysis	concn		le		using
Eluate Analysis	concn leached		le	aching test	using
Eluate Analysis Arsenic	concn leached		le	aching test 12457-2 at	using
-	concn leached A10 mg/kg		le BS EN	aching test 12457-2 at 1 mg/kg	using L/S 10 l/kg
Arsenic	concn leached A10 mg/kg <0.025		0.5	mg/kg	using L/S 10 l/kg
Arsenic Barium	concn leached A10 mg/kg <0.025 0.12		0.5 20	mg/kg 2 100	using L/ S 10 l/kg 25 300
Arsenic Barium Cadmium	concn leached A10 mg/kg <0.025 0.12 <0.005		0.5 20 0.04	mg/kg 2 100 1	using L/S 10 l/kg 25 300 5
Arsenic Barium Cadmium Chromium	concn leached A10 mg/kg <0.025 0.12 <0.005 0.016		0.5 20 0.04 0.5	mg/kg 2 100 1 100 100 100 100 100 100 100 100	25 300 5 70
Arsenic Barium Cadmium Chromium Copper	concn leached A10 mg/kg <0.025 0.12 <0.005 0.016 <0.07		0.5 20 0.04 0.5 2	mg/kg 2 100 1 10 50	25 300 5 70
Arsenic Barium Cadmium Chromium Copper Mercury	concn leached A10 mg/kg <0.025 0.12 <0.005 0.016 <0.07 <0.01		0.5 20 0.04 0.5 2	mg/kg 2 100 1 10 50 0.2	25 300 5 70 100 2
Arsenic Barium Cadmium Chromium Copper Mercury Molybdenum	concn leached A10 mg/kg <0.025 0.12 <0.005 0.016 <0.07 <0.01		0.5 20 0.04 0.5 2 0.01	mg/kg 2 100 1 10 50 0.2 10	25 300 5 70 100 2 30
Arsenic Barium Cadmium Chromium Copper Mercury Molybdenum Nickel	concn leached A10 mg/kg <0.025 0.12 <0.005 0.016 <0.07 <0.01 0.10 <0.02		0.5 20 0.04 0.5 2 0.01 0.5	mg/kg 2 100 1 10 50 0.2 10	25 300 5 70 100 2 30 40
Arsenic Barium Cadmium Chromium Copper Mercury Molybdenum Nickel Lead	concn leached A10 mg/kg <0.025 0.12 <0.005 0.016 <0.07 <0.01 0.10 <0.02 <0.05		0.5 20 0.04 0.5 2 0.01 0.5 0.4 0.5	mg/kg 2 100 1 10 50 0.2 10 10 10	25 300 5 70 100 2 30 40 50
Arsenic Barium Cadmium Chromium Copper Mercury Molybdenum Nickel Lead Antimony	concn leached A10 mg/kg <0.025 0.12 <0.005 0.016 <0.07 <0.01 0.10 <0.02 <0.05 <0.02		0.5 20 0.04 0.5 2 0.01 0.5 0.4 0.5	mg/kg 2 100 1 10 50 0.2 10 10 10 0.7	25 300 5 70 100 2 30 40 55
Arsenic Barium Cadmium Chromium Copper Mercury Molybdenum Nickel Lead Antimony Selenium	concn leached A10 mg/kg <0.025 0.12 <0.005 0.016 <0.07 <0.01 0.10 <0.02 <0.05 <0.02 <0.03		0.5 20 0.04 0.5 2 0.01 0.5 0.4 0.5 0.06	mg/kg 2 100 1 10 50 0.2 10 10 10 0.7 0.5	25 300 5 70 100 2 30 40 50 5
Arsenic Barium Cadmium Chromium Copper Mercury Molybdenum Nickel Lead Antimony Selenium Zinc	concn leached A10 mg/kg <0.025 0.12 <0.005 0.016 <0.07 <0.01 0.10 <0.02 <0.05 <0.02 <0.03		0.5 20 0.04 0.5 2 0.01 0.5 0.4 0.5 0.06 0.1	mg/kg 2 100 1 10 50 0.2 10 10 0.7 0.5 50	25 300 5 70 100 2 30 40 50 5 7 200
Arsenic Barium Cadmium Chromium Copper Mercury Molybdenum Nickel Lead Antimony Selenium Zinc Chloride	concn leached A10 mg/kg <0.025 0.12 <0.005 0.016 <0.07 <0.01 0.10 <0.02 <0.02 <0.03 0.06 -		0.5 20 0.04 0.5 2 0.01 0.5 0.4 0.5 0.06 0.1 4	mg/kg 2 100 1 10 50 0.2 10 10 10 0.7 0.5 50 15000	25 300 5 70 100 2 30 40 50 5 7 200 25000
Arsenic Barium Cadmium Chromium Copper Mercury Molybdenum Nickel Lead Antimony Selenium Zinc Chloride Fluoride	concn leached A10 mg/kg <0.025 0.12 <0.005 0.016 <0.07 <0.01 0.10 <0.02 <0.05 <0.02 <0.03 0.06 - <3		0.5 20 0.04 0.5 2 0.01 0.5 0.4 0.5 0.06 0.1 4	mg/kg 2 100 1 10 50 0.2 10 10 10 50 0.5 50 15000	25 300 5 70 100 2 30 40 50 5 7 200 25000 500
Arsenic Barium Cadmium Chromium Copper Mercury Molybdenum Nickel Lead Antimony Selenium Zinc Chloride Fluoride Sulphate as SO4	concn leached A10 mg/kg <0.025 0.12 <0.005 0.016 <0.07 <0.01 0.10 <0.02 <0.05 <0.02 <0.03 0.06 - <3 -		0.5 20 0.04 0.5 2 0.01 0.5 0.4 0.5 0.06 0.1 4 800 10	mg/kg 2 100 1 10 50 0.2 10 10 10 0.7 0.5 50 15000 150 20000	25 300 5 70 100 2 30 40 50 7 200 25000 5000

EPH Interpretation Report

Client Name: IGSL Matrix : Solid

Reference: N6 Galway

Location:

Contact: Darren Keogh

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	EPH Interpretation
16/6459	1	BH 3/30	0.50	1	Possible tarmac/bitumen

Client Name: IGSL Reference: N6 Galway

Location: Contact:

Darren Keogh

Note:

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

Opinions lie outside the scope of our UKAS accreditation.

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

Signed on behalf of Jones Environmental Laboratory:

Ryan Butterworth
Asbestos Team Leader

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Date Of Analysis	Analysis	Result
16/6459	1	BH 3/30	0.50	1	21/03/2016	General Description (Bulk Analysis)	soil-stones
					21/03/2016	Asbestos Fibres	NAD
					21/03/2016	Asbestos Fibres (2)	NAD
					21/03/2016	Asbestos ACM	NAD
					21/03/2016	Asbestos ACM (2)	NAD
					21/03/2016	Asbestos Type	NAD
					21/03/2016	Asbestos Type (2)	NAD
					21/03/2016	Asbestos Level Screen	NAD
16/6459	1	BH 3/30	1.00	2	21/03/2016	General Description (Bulk Analysis)	soil-stones
					21/03/2016	Asbestos Fibres	NAD
					21/03/2016	Asbestos Fibres (2)	NAD
					21/03/2016	Asbestos ACM	NAD
					21/03/2016	Asbestos ACM (2)	NAD
					21/03/2016	Asbestos Type	NAD
					21/03/2016	Asbestos Type (2)	NAD
					21/03/2016	Asbestos Level Screen	NAD

N6 Galway

Notification of Deviating Samples

Client Name: IGSL Matrix : Solid

Reference: Location:

Contact: Darren Keogh

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
16/6459	1	BH 3/30	0.50	1	Chloride, LOI, Sulphate, TOC	Sample holding time exceeded
16/6459	1	BH 3/30	0.50	1	EPH	Sample received in inappropriate container
16/6459	1	BH 3/30	0.50	1	EPH, GRO, PAH, PCB	Sample holding time exceeded prior to receipt
16/6459	1	BH 3/30	0.50	1	GRO	Solid Samples were received at a temperature above 9°C.

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

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 16/6459

SOILS

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

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

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

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

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

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

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

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

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

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

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

WATERS

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

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

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

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

DEVIATING SAMPLES

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

SURROGATES

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

DILUTIONS

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

NOTE

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

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

ABBREVIATIONS and ACRONYMS USED

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

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.				
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM17	Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM20	Modified USEPA 8163. Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes		AR	Yes
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM22	Modified USEPA 160.4. Gravimetric determination of Loss on Ignition by temperature controlled Muffle Furnace (450°C)	PM0	No preparation is required.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)		Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (lon-Chromatography).	PM0	No preparation is required.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM17	Modified method EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.	Yes		AR	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes		AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground samples with deionised water in a 2:1 water to solid ratio for anions. Extraction of as received samples with deionised water in a 2:1 water to solid ratio for ammoniacal nitrogen. Samples are extracted using an orbital shaker.	Yes		AD	Yes
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.			AR	Yes

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.			AR	
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
NONE	No Method Code	PM17	Modified method EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.				
NONE	No Method Code	PM17	Modified method EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.			AR	
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.			AR	

Appendix 16

Rock Test Records

			POINT LOAD \$	TRENGTH 1	NDEX TEST DATA				The state of the s	
	Contract: 18963 - N6 Galway City Transport Sample Type: Core Project Contract no. 18963 Date of test: 6/5/16									
RC No.	Depth	D (Diameter)	P (failure load)	F	Is (index strength)	ls(50) (index strength)	*UCS			
	m	mm	kN		Мра	Мра	MPa	Type	Orienation	
BH3/03R	2.3	78	14.0	1.222	2.30	2.81	56	d	//	
	4.2	78	7.0	1.222	1.15	1.41	28	d	//	
BH3/04R	1.3	70	16.0	1.163	3.27	3.80	76	d	//	
	4.0	70	30.0	1.163	6.12	7.12	142	d	//	
	5.0	70	28.0	1.163	5.71	6.65	133	d	//	
BH3/06R	1.9	78	2.0	1.222	0.33	0.40	8	d	//	
	3.5	78	6.0	1.222	0.99	1.20	24	d	//	
BH3/07R	4.4	78	33.0	1.222	5.42	6.63	133	d	//	
	5.7	78	30.0	1.222	4.93	6.02	120	d	//	
BH3/08R	3.0	70	25.0	1.163	5.10	5.94	119	d	//	
	6.9	70	17.0	1.163	3.47	4.04	81	d	//	
BH3/10R	1.5	78	30.0	1.222	4.93	6.02	120	d	//	
21107 1 011	3.9	78	46.0	1.222	7.56	9.24	185	d	//	
	4.9	78	8.0	1.222	1.31	1.61	32	d	//	
	7.1	78	41.0	1.222	6.74	8.23	165	d	//	
	11.5	78	21.0	1.222	3.45	4.22	84	d	//	
	13.5	78	15.0	1.222	2.47	3.01	60	d	//	
	15.9	78	29.0	1.222	4.77	5.82	116	d	//	
BH3/11R	3.2	78	26.0	1.222	4.27	5.22	104	d	//	
DU2/IIK	7.3	78	16.0	1.222	2.63	3.21	64	d d	//	
BH3/13R	1.5	76 70	19.0	1.163	2.65 3.88	4.51	90	d d	//	
	3.7	70 78	12.0	1.163	3.66 1.97	2.41	48	d d	//	
BH3/16R							-			
DUI 2 /1 7 D	4.7	78	25.0	1.222	4.11	5.02	100	d	//	
BH3/17R	6.8	78	20.0	1.222	3.29	4.02	80	d	//	
	7.4	78	7.0	1.222	1.15	1.41	28	d	//	
	tatistical Sun		ls(50)	UCS*		ormal Distribution Curve			bbreviations	
Number of Sa	amples l'este	d	25	-	0.25			i	irregular	
Minimum			0.40		0.2			а	axial	
Average			4.40		0.2			b	block	
Maximum			9.24		0.15			d	diametral	
Standard Dev			2.32							
Upper 95% C			8.94		0.1	+		appro	x. orientation to	
Lower 95% C	Confidence Li	mit	-0.14	-2.79	0.05				planes of	
					0.05				kness/bedding	
Comments:					0			U	unknown	
*UCS taken a	s k x Point Lo	oad ls(50): k=		20	•	100 200	200	Р	perpendicular	
					0	100 200	300	//	parallel	

			POINT LOAD \$	rength 1	NDEX TEST DATA				(FA)
		way City Transport	Sample Type: Core						(IGSL)
Date of test:	Project 6/5/16		Contract no. 1896	13					
RC No.	Depth	D (Diameter)	P (failure load)	F	Is (index strength)	Is(50) (index strength)	*UCS		
	m	mm	kN	-	Мра	Mpa	MPa	Type	Orienation
BH3/18R	5.7	78	14.0	1.222	2.30	2.81	56	d	//
	7.5	78	31.0	1.222	5.10	6.22	124	d	//
	10.4	78	32.0	1.222	5.26	6.42	128	d	//
	12.4	78	34.0	1.222	5.59	6.83	137	d	//
	15.1	78	31.0	1.222	5.10	6.22	124	d	//
	17.8	78	29.0	1.222	4.77	5.82	116	d	//
	19.8	78	32.0	1.222	5.26	6.42	128	d	//
	21.6	78	30.0	1.222	4.93	6.02	120	d	//
BH3/19R	2.7	78	44.0	1.222	7.23	8.83	177	d	//
	4.9	78	37.0	1.222	6.08	7.43	149	d	//
	10.5	70	22.0	1.163	4.49	5.22	104	d	//
	12.0	70	13.0	1.163	2.65	3.09	62	d	//
	14.0	70	26.0	1.163	5.31	6.17	123	d	//
BH3/20R	6.6	78	11.0	1.222	1.81	2.21	44	d	//
	7.5	78	41.0	1.222	6.74	8.23	165	d	//
	10.9	78	18.0	1.222	2.96	3.61	72	d	//
	12.0	78	44.0	1.222	7.23	8.83	177	d	//
	14.7	78	31.0	1.222	5.10	6.22	124	d	//
BH3/22R	3.2	78	29.0	1.222	4.77	5.82	116	d	//
	6.5	78	30.0	1.222	4.93	6.02	120	d	//
	10.2	78	6.0	1.222	0.99	1.20	24	d	//
	12.7	78	22.0	1.222	3.62	4.42	88	d	//
BH3/23R	7.3	78	11.0	1.222	1.81	2.21	44	d	//
	8.5	78	25.0	1.222	4.11	5.02	100	d	//
S	tatistical Sur	nmary Data	ls(50)	UCS*	*UCS No	ormal Distribution Curve		А	bbreviations
Number of Sa	amples Teste	ed	24	24	0.25			i	irregular
Minimum			1.20	24				а	axial
Average			5.47	109	0.2			b	block
Maximum			8.83	177	0.15			d	diametral
Standard Dev	<i>'</i> .		2.06	41	0.13				
			190.31	0.1	+		appro	x. orientation to	
Lower 95% Confidence Limit 1.43 28			28.59					planes of	
					0.05	+		wea	kness/bedding
Comments:								U	unknown
*UCS taken as k x Point Load Is(50): k=				20	0	100 200	300	P //	perpendicular parallel
								//	[pai aliei

			POINT LOAD S	rength 1	NDEX TEST DATA				(FA TON
Contract: 18963 - N6 Galway City Transport Sample Type: Core Project Contract no. 18963 Date of test: 6/5/16									IGSL
RC No.	Depth m	D (Diameter) mm	P (failure load) kN	F	ls (index strength) Mpa	ls(50) (index strength) Mpa	*UCS MPa	Type	Orienation
BH3/24R	2.0	78	18.0	1.222	2.96	3.61	72	d	//
DH3/24K	6.5	70 70	31.0	1.163	6.33	7.36	147	d d	//
DU 2 / 2 E D	4.6	70 78	13.0	1.163	6.33 2.14	2.61	52	d d	//
BH3/25R					4.77				
	5.6	78	29.0	1.222		5.82	116	d	//
DUIG (0.0D	7.8	78	33.0	1.222	5.42	6.63	133	d	//
BH3/26R	2.3	78	31.0	1.222	5.10	6.22	124	d	//
	6.0	78	19.0	1.222	3.12	3.81	76	d	//
BH3/27R	1.8	78	25.0	1.222	4.11	5.02	100	d	//
	5.6	78	28.0	1.222	4.60	5.62	112	d	//
	7.8	78	25.0	1.222	4.11	5.02	100	d	//
BH3/28R	4.2	78	19.0	1.222	3.12	3.81	76	d	//
	7.4	78	25.0	1.222	4.11	5.02	100	d	//
	8.4	78	19.0	1.222	3.12	3.81	76	d	//
BH3/30R	4.0	78	10.0	1.222	1.64	2.01	40	d	//
	7.0	78	20.0	1.222	3.29	4.02	80	d	//
BH3/32R	24.9	78	22.0	1.222	3.62	4.42	88	d	//
BH3/33R	7.1	78	18.0	1.222	2.96	3.61	72	d	//
	10.3	78	24.0	1.222	3.94	4.82	96	d	//
	12.7	78	28.0	1.222	4.60	5.62	112	d	//
BH3/34R	4.4	78	10.0	1.222	1.64	2.01	40	d	//
2110, 0 111	6.1	78	15.0	1.222	2.47	3.01	60	d	//
	9.6	78	21.0	1.222	3.45	4.22	84	d	//
	11.5	78	22.0	1.222	3.62	4.42	88	d	//
	14.0	78	20.0	1.222	3.29	4.02	80	d	//
	15.2	78	19.0	1.222	3.12	3.81	76	d	//
	17.2	78	24.0	1.222	3.94	4.82	96	d	//
Ç.	tatistical Sun		Is(50)	UCS*		ormal Distribution Curve	30		bbreviations
Number of Sa			26	26	0.45 -	offiai Distribution curve		i	irregular
Minimum	iiihica i eale	u	2.01	40	0.43			a	axial
Average			4.43	89	0.35			b b	block
Average Maximum			7.36	147	0.3			d	diametral
Maximum Standard Dev	,		1.31	26	0.25			u	uiai iieti ai
		mi+		-	0.2			one	v orientation to
7.00 140.04 0 15 / 1 V						appro	x. orientation to		
Lower 95% Confidence Limit 1.86 37.16				37.16	0.1			wea	planes of kness/bedding
Comments:					0.05	+		U	unknown
*UCS taken a	e k v Point L	oad ls(50): k=		20	0	+		P	perpendicular
UCO LANGII A	3 K A FUIIIL LI	Jau 13(30). K=		20	0	100 200	300	//	parallel
								//	lhai allei

POINT LOAD STRENGTH INDEX TEST DATA									and and and and and and and and and and
		way City Transport	Sample Type: Core						(IGSL)
Project			Contract no. 18963						(ISSE)
Date of test:		D (D: .)	D (6 !! 1 1)		1 (1 1 1 1 1)	L (50) (; 1	41100	1	
RC No.	Depth	D (Diameter)	P (failure load)	F	Is (index strength)	ls(50) (index strength)	*UCS	T	0
DUI2 (2.E.D.	m	mm	kN	1 222	Mpa	Mpa	MPa	Туре	Orienation
BH3/35R	21.7	78	22.0	1.222	3.62 2.96	4.42	88	d	//
BH3/36R	2.5	78	18.0	1.222		3.61	72	d	//
	4.9	78	22.0	1.222	3.62	4.42	88	d	//
	7.4	78	21.0	1.222	3.45	4.22	84	d	//
	10.4	78	31.0	1.222	5.10	6.22	124	d	//
	14.1	78	24.0	1.222	3.94	4.82	96	d	//
	16.4	78	19.0	1.222	3.12	3.81	76	d	//
	16.7	78	27.0	1.222	4.44	5.42	108	d	//
	19.8	78	22.0	1.222	3.62	4.42	88	d	//
BH3/38R	4.1	78	18.0	1.222	2.96	3.61	72	d	//
	7.0	78	29.0	1.222	4.77	5.82	116	d	//
	8.8	78	24.0	1.222	3.94	4.82	96	d	//
BH3/39R	3.7	78	23.0	1.222	3.78	4.62	92	d	//
	7.0	78	16.0	1.222	2.63	3.21	64	d	//
	9.6	78	23.0	1.222	3.78	4.62	92	d	//
BH3/40R	2.8	78	22.0	1.222	3.62	4.42	88	d	//
	7.0	78	20.0	1.222	3.29	4.02	80	d	//
	10.0	78	16.0	1.222	2.63	3.21	64	d	//
BH3/41R	3.7	78	29.0	1.222	4.77	5.82	116	d	//
	4.6	78	28.0	1.222	4.60	5.62	112	d	//
	7.0	78	22.0	1.222	3.62	4.42	88	d	//
BH3/42R	3.0	78	23.0	1.222	3.78	4.62	92	d	//
	4.5	78	23.0	1.222	3.78	4.62	92	d	//
	6.5	78	23.0	1.222	3.78	4.62	92	d	//
	9.5	78	20.0	1.222	3.29	4.02	80	d	//
BH3/43R	5.2	78	15.0	1.222	2.47	3.01	60	d	//
	7.2	78	20.0	1.222	3.29	4.02	80	d	//
	9.3	78	23.0	1.222	3.78	4.62	92	d	//
	Statistical Sur		ls(50) UCS*		*UCS Normal Distribution Curve			Α	bbreviations
Number of Samples Tested			28	_	0.8			i	irregular
Minimum			3.01	60	0.7			а	axial
Average			4.47		0.6	1		b	block
Maximum			6.22		0.5	1		d	diametral
Standard Dev.			0.80 16		0.4				
Upper 95% Confidence Limit			6.03 120.65		0.3			appro	x. orientation to
Lower 95% Confidence Limit			2.90 58.04		0.2			planes of	weakness/bedding
Comments					0.1			I.	
<u>Comments:</u> *UCS taken as k x Point Load Is(50): k=				20	0			U	unknown
*UCS taken as k x Point Load Is(50): k=			20		0 100 200 300		P //	perpendicular parallel	
								//	[paralici

POINT LOAD STRENGTH INDEX TEST DATA									(Elm)
	Project	vay City Transport	Sample Type: Core Contract no. 18963						IGSL
RC No.	Depth m	D (Diameter) mm	P (failure load) kN	F	ls (index strength) Mpa	ls(50) (index strength) Mpa	*UCS MPa	Туре	Orienation
BH3/46R BH3/47R BH3/48R BH3/52R BH3/53R BH3/54R	2.6 5.6 7.5 10.7 6.2 1.6 10.0 15.0 9.5 12.5 8.0 10.5 7.1 9.0	78 78 78 78 78 78 78 78 78 78 78 78 78 7	9.0 19.0 19.0 22.0 24.0 22.0 26.0 10.0 25.0 21.0 26.0 28.0 14.0	1.222 1.222 1.222 1.222 1.222 1.222 1.222 1.222 1.222 1.222 1.222 1.222	1.48 3.12 3.12 3.62 3.94 3.62 4.27 1.64 2.96 4.11 3.45 4.27 4.60 2.30	1.81 3.81 3.81 4.42 4.82 4.42 5.22 2.01 3.61 5.02 4.22 5.22 5.62 2.81	36 76 76 88 96 88 104 40 72 100 84 104 112 56	d d d d d d d d d d d d d d d	// // // // // // // // // // // // //
Statistical Summary Data Number of Samples Tested Minimum			14 14 0.25 1.81 36 /		ormal Distribution Curve		Abbreviations i irregular a axial		
Average Maximum Standard Dev Upper 95% C Lower 95% C	onfidence Lin		4.06 81 5.62 112 1.18 24 6.37 127.39 1.75 34.95		0.15			b block d diametral approx. orientation to	
<u>Comments:</u> *UCS taken a	s k x Point Lo	ad ls(50): k=	20		0.05 0 100 200 300		U P	weakness/bedding unknown perpendicular parallel	

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/03

 Depth (m):
 3.3-3.6m

Sample Description

Colour: Light pink/red/brown/grey/white/orange mottled

Grain size: Fine to medium grained

Weathering Grade: Fresh
Rock Type: GRANITE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

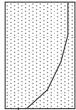
Sketch of Failure Surfaces

 Length
 211

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 294 kN



Strength Calculations

Uniaxial Compressive Strength = 294000 4775.94

> = 1000 x P ∏ x (Ø/2)^2

= 61.53 (Mpa)

Bulk Density = 2.64 (Mg/m³)

Moisture Content = 0.09 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/04

 Depth (m):
 1.9-2.2m

Sample Description

Colour: Light pink/red/brown/grey/white/orange mottled

Grain size: Fine to medium grained

Weathering Grade: Fresh
Rock Type: GRANITE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

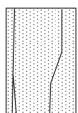
Sketch of Failure Surfaces

 Length
 201

 Diameter (Ø)
 78.1

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 400 kN



Strength Calculations

Uniaxial Compressive Strength = 400000 4788.19385

> = 1000 x P Π x (Ø/2)^2

= 83.50 (Mpa)

Bulk Density = 2.61 (Mg/m³)

Moisture Content = 0.11 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/04

 Depth (m):
 5.1-5.3m

Sample Description

Colour: Light pink/red/brown/grey/white/orange mottled

Grain size: Fine to medium grained

Weathering Grade: Fresh
Rock Type: GRANITE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

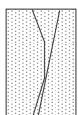
Sketch of Failure Surfaces

 Length
 176

 Diameter (Ø)
 70
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 287 kN



Strength Calculations

Uniaxial Compressive Strength = 287000
3846.5

1000 x P Π x (Ø/2)^2

= 74.58 (Mpa)

Bulk Density = 2.61 (Mg/m³)

Moisture Content = 0.14 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/06

 Depth (m):
 4.5-4.7m

Sample Description

Colour: Grey

Grain size: Fine-grained

Weathering Grade: Fresh
Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

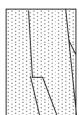
Sketch of Failure Surfaces

 Length
 196

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 344 kN



Strength Calculations

Uniaxial Compressive Strength = 344000 4775.94

> = 1000 x P ∏ x (Ø/2)^2

= 71.99 (Mpa)

Bulk Density = 2.60 (Mg/m³)

Moisture Content = 0.17 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/07

 Depth (m):
 5.0-5.4m

Sample Description

Colour: Pink/brown/green mottled
Grain size: Fine to medium grained

Weathering Grade: Fresh
Rock Type: GRANITE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

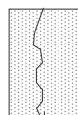
Sketch of Failure Surfaces

 Length
 204

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 254 kN



Strength Calculations

Uniaxial Compressive Strength = 254000 4775.94

> = 1000 x P Π x (Ø/2)^2

= 53.16 (Mpa)

Bulk Density = 2.61 (Mg/m³)

Moisture Content = 0.22 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/08

 Depth (m):
 5.1-5.3m

Sample Description

Colour: Pink/brown/green mottled
Grain size: Fine to medium grained

Weathering Grade: Fresh
Rock Type: GRANITE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

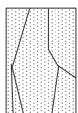
Sketch of Failure Surfaces

 Length
 170

 Diameter (Ø)
 61
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 108 kN



Strength Calculations

Uniaxial Compressive Strength = 108000 2920.985

= 1000 x P Π x (Ø/2)^2

= 36.96 (Mpa)

Bulk Density = 2.60 (Mg/m³)

Moisture Content = 0.15 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/10

 Depth (m):
 2.4-2.6m

Sample Description

Colour: Light pink/red/brown/grey/white/orange mottled

Grain size: Fine to medium grained

Weathering Grade: Fresh
Rock Type: GRANITE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

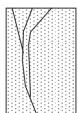
Sketch of Failure Surfaces

 Length
 212

 Diameter (Ø)
 78.1
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 364 kN



Strength Calculations

Uniaxial Compressive Strength = 364000 4788.19385

> = 1000 x P Π x (Ø/2)^2

= 75.98 (Mpa)

Bulk Density = 2.61 (Mg/m³)

Moisture Content = 0.08 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/10

 Depth (m):
 5.2-5.6m

Sample Description

Colour: Light pink/red/brown/grey/white/orange mottled

Grain size: Fine to medium grained

Weathering Grade: Fresh
Rock Type: GRANITE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

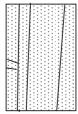
Sketch of Failure Surfaces

 Length
 198

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 313 kN



Strength Calculations

Uniaxial Compressive Strength = 313000 4775.94

> = 1000 x P ∏ x (Ø/2)^2

= 65.50 (Mpa)

Bulk Density = 2.61 (Mg/m³)

Moisture Content = 0.17 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/10

 Depth (m):
 9.2-9.5m

Sample Description

Colour: Light pink/red/brown/grey/white/orange mottled

Grain size: Fine to medium grained

Weathering Grade: Fresh
Rock Type: GRANITE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

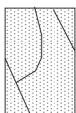
Sketch of Failure Surfaces

 Length
 208

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 112 kN



Strength Calculations

Uniaxial Compressive Strength = 112000 4775.94

> = 1000 x P Π x (Ø/2)^2

= 23.44 (Mpa)

Bulk Density = 2.61 (Mg/m³)

Moisture Content = 0.09 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/10

 Depth (m):
 14.7-14.9m

Sample Description

Colour: Light pink/red/brown/grey/white/orange mottled

Grain size: Fine to medium grained

Weathering Grade: Fresh
Rock Type: GRANITE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

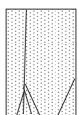
Sketch of Failure Surfaces

 Length
 206

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 196 kN



Strength Calculations

Uniaxial Compressive Strength = 196000 4775.94

> = 1000 x P Π x (Ø/2)^2

= 41.02 (Mpa)

Bulk Density = 2.60 (Mg/m³)

Moisture Content = 0.16 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/11

 Depth (m):
 5.8-6.0m

Sample Description

Colour: Pink/brown/green mottled
Grain size: Fine to medium grained

Weathering Grade: Fresh
Rock Type: GRANITE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

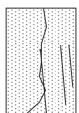
Sketch of Failure Surfaces

 Length
 152

 Diameter (Ø)
 61
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 258 kN



Strength Calculations

Uniaxial Compressive Strength = 258000 2920.985

> = 1000 x P Π x (Ø/2)^2

= 88.28 (Mpa)

Bulk Density = 2.61 (Mg/m³)

Moisture Content = 0.11 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/13

 Depth (m):
 1.1-1.3m

Sample Description

Colour: Purple/brown mottled
Grain size: Fine to medium grained

Weathering Grade: Fresh
Rock Type: GRANITE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

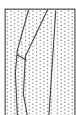
Sketch of Failure Surfaces

 Length
 170

 Diameter (Ø)
 61
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 231 kN



Strength Calculations

Uniaxial Compressive Strength = 231000 2920.985

> = 1000 x P Π x (Ø/2)^2

= 79.04 (Mpa)

Bulk Density = 2.60 (Mg/m³)

Moisture Content = 0.08 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/16

 Depth (m):
 6.2-6.4m

Sample Description

Colour: Purple/brown/grey mottled
Grain size: Fine to medium grained

Weathering Grade: Fresh
Rock Type: GRANITE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

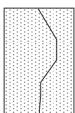
Sketch of Failure Surfaces

 Length
 211

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 262 kN



Strength Calculations

Uniaxial Compressive Strength = 262000 4775.94

> = 1000 x P Π x (Ø/2)^2

= 54.83 (Mpa)

Bulk Density = 2.62 (Mg/m³)

Moisture Content = 0.14 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/17

 Depth (m):
 8.4-8.6m

Sample Description

Colour: Light pink/red/brown/grey/white/orange mottled

Grain size: Fine to medium grained

Weathering Grade: Fresh
Rock Type: GRANITE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

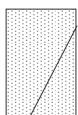
Sketch of Failure Surfaces

 Length
 202

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 202 kN



Strength Calculations

Uniaxial Compressive Strength = 202000 4775.94

1000 x P

= 42.27 (Mpa)

 $\prod x (\emptyset/2)^2$

Bulk Density = 2.60 (Mg/m³)

Moisture Content = 0.11 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/18

 Depth (m):
 5.2-5.6m

Sample Description

Colour: Light pink/red/brown/grey/white/orange mottled

Grain size: Fine to medium grained

Weathering Grade: Fresh
Rock Type: GRANITE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

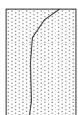
Sketch of Failure Surfaces

 Length
 174

 Diameter (Ø)
 70
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 296 kN



Strength Calculations

Uniaxial Compressive Strength = 296000
3846.5

1000 x P ∏ x (Ø/2)^2

= 76.91 (Mpa)

Bulk Density = 2.62 (Mg/m³)

Moisture Content = 0.13 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/18

 Depth (m):
 13.7-14.2m

Sample Description

Colour: Light pink/red/brown/grey/white/orange mottled

Grain size: Fine to medium grained

Weathering Grade: Fresh
Rock Type: GRANITE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

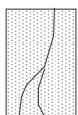
Sketch of Failure Surfaces

 Length
 172

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 157 kN



Strength Calculations

Uniaxial Compressive Strength = 157000 4775.94

> = 1000 x P Π x (Ø/2)^2

= 32.86 (Mpa)

Bulk Density = 2.58 (Mg/m³)

Moisture Content = 0.18 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/18

 Depth (m):
 23.0-23.2m

Sample Description

Colour: Light pink/red/brown/grey/white/orange mottled

Grain size: Fine to medium grained

Weathering Grade: Fresh
Rock Type: GRANITE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

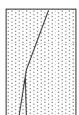
Sketch of Failure Surfaces

 Length
 202

 Diameter (Ø)
 61
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 374 kN



Strength Calculations

Uniaxial Compressive Strength = 374000 2920.985

> 1000 x P ∏ x (Ø/2)^2

= 127.97 (Mpa)

Bulk Density = 2.59 (Mg/m³)

Moisture Content = 0.14 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/19

 Depth (m):
 2.2-2.6m

Sample Description

Colour: Light pink/red/brown/grey/white/orange mottled

Grain size: Fine to medium grained

Weathering Grade: Fresh
Rock Type: GRANITE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

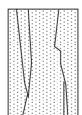
Sketch of Failure Surfaces

 Length
 198

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 215 kN



Strength Calculations

Uniaxial Compressive Strength = 215000 4775.94

> = 1000 x P Π x (Ø/2)^2

= 44.99 (Mpa)

Bulk Density = 2.60 (Mg/m³)

Moisture Content = 0.18 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/19

 Depth (m):
 10.1-10.3m

Sample Description

Colour: Green/pink/brown mottled
Grain size: Fine to medium grained

Weathering Grade: Fresh
Rock Type: GRANITE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

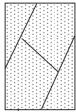
Sketch of Failure Surfaces

 Length
 171

 Diameter (Ø)
 61
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 102 kN



Strength Calculations

Uniaxial Compressive Strength = 102000 2920.985

= 1000 x P Π x (Ø/2)^2

34.90 (Mpa)

Bulk Density = 2.59 (Mg/m³)

Moisture Content = 0.19 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/20

 Depth (m):
 8.8-9.1m

Sample Description

Colour: Very dark green

Grain size: Fine to medium grained

Weathering Grade: Fresh
Rock Type: BASALT

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

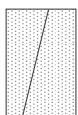
Sketch of Failure Surfaces

 Length
 191

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 272 kN



Strength Calculations

Uniaxial Compressive Strength = 272000 4775.94

> = 1000 x P ∏ x (Ø/2)^2

= 56.92 (Mpa)

Bulk Density = 2.62 (Mg/m³)

Moisture Content = 0.10 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/20

 Depth (m):
 13.5-13.7m

Sample Description

Colour: Very dark green

Grain size: Fine to medium grained

Weathering Grade: Fresh
Rock Type: BASALT

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

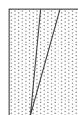
Sketch of Failure Surfaces

 Length
 208

 Diameter (Ø)
 78.1
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 162 kN



Strength Calculations

Uniaxial Compressive Strength = 162000 4788.19385

> = 1000 x P Π x (Ø/2)^2

= 33.82 (Mpa)

Bulk Density = 2.61 (Mg/m³)

Moisture Content = 0.08 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/22

 Depth (m):
 6.2-6.5m

Sample Description

Colour: Light pink/red/brown/grey/white/orange mottled

Grain size: Fine to medium grained

Weathering Grade: Fresh
Rock Type: GRANITE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

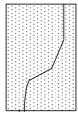
Sketch of Failure Surfaces

 Length
 198

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 176 kN



Strength Calculations

Uniaxial Compressive Strength = 176000 4775.94

> = 1000 x P Π x (Ø/2)^2

= 36.83 (Mpa)

Bulk Density = 2.62 (Mg/m³)

Moisture Content = 0.13 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/22

 Depth (m):
 11.7-11.9m

Sample Description

Colour: Light pink/red/brown/grey/white/orange mottled

Grain size: Fine to medium grained

Weathering Grade: Fresh
Rock Type: GRANITE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

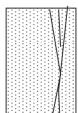
Sketch of Failure Surfaces

 Length
 209

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 172 kN



Strength Calculations

Uniaxial Compressive Strength = 172000 4775.94

> = 1000 x P Π x (Ø/2)^2

= 36.00 (Mpa)

Bulk Density = 2.61 (Mg/m³)

Moisture Content = 0.11 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/24

 Depth (m):
 5.2-5.4m

Sample Description

Colour: Dark and light green
Grain size: Fine to medium-grained

Weathering Grade: Fresh
Rock Type: GRANITE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

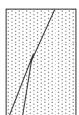
Sketch of Failure Surfaces

 Length
 172

 Diameter (Ø)
 61
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 252 kN



Strength Calculations

Uniaxial Compressive Strength = 252000 2920.985

> = 1000 x P ∏ x (Ø/2)^2

= 86.23 (Mpa)

Bulk Density = 2.63 (Mg/m³)

Moisture Content = 0.18 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/25

 Depth (m):
 4.7-4.9m

Sample Description

Colour: Grey

Grain size: Fine grained

Weathering Grade: Fresh
Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

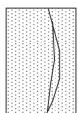
Sketch of Failure Surfaces

 Length
 202

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 349 kN



Strength Calculations

Uniaxial Compressive Strength = 349000 4775.94

> = 1000 x P ∏ x (Ø/2)^2

= 73.04 (Mpa)

Bulk Density = 2.67 (Mg/m³)

Moisture Content = 0.20 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/26

 Depth (m):
 4.7-5.0m

Sample Description

Colour: Grey

Grain size: Fine-grained
Weathering Grade: Fresh

Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

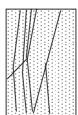
Sketch of Failure Surfaces

 Length
 201

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 262 kN



Strength Calculations

Uniaxial Compressive Strength = 262000 4775.94

> = 1000 x P Π x (Ø/2)^2

= 54.83 (Mpa)

Bulk Density = 2.67 (Mg/m³)

Moisture Content = 0.15 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/27

 Depth (m):
 3.8-4.0m

Sample Description

Colour: Grey

Grain size: Fine-grained
Weathering Grade: Fresh

Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

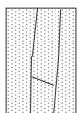
Sketch of Failure Surfaces

 Length
 201

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 472 kN



Strength Calculations

Uniaxial Compressive Strength = 472000 4775.94

> = 1000 x P ∏ x (Ø/2)^2

= 98.78 (Mpa)

Bulk Density = 2.66 (Mg/m³)

Moisture Content = 0.19 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/28

 Depth (m):
 6.2-6.6m

Sample Description

Colour: Grey

Grain size: Fine-grained
Weathering Grade: Fresh
Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

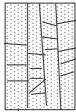
Sketch of Failure Surfaces

 Length
 204

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 223 kN



Strength Calculations

Uniaxial Compressive Strength = 223000 4775.94

> = 1000 x P Π x (Ø/2)^2

= 46.67 (Mpa)

Bulk Density = 2.67 (Mg/m³)

Moisture Content = 0.20 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/32

 Depth (m):
 24.6-24.8m

Sample Description

Colour: Grey

Grain size: Fine-grained
Weathering Grade: Fresh
Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

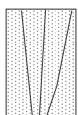
Sketch of Failure Surfaces

 Length
 204

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 168 kN



Strength Calculations

Uniaxial Compressive Strength = 168000 4775.94

> 1000 x P Π x (Ø/2)^2

= 35.16 (Mpa)

Bulk Density = 2.67 (Mg/m³)

Moisture Content = 0.23 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/33

 Depth (m):
 9.3-9.6m

Sample Description

Colour: Grey

Grain size: Fine grained
Weathering Grade: Fresh

Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

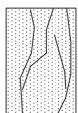
Sketch of Failure Surfaces

 Length
 204

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 210 kN



Strength Calculations

Uniaxial Compressive Strength = 210000 4775.94

> = 1000 x P Π x (Ø/2)^2

= 43.95 (Mpa)

Bulk Density = 2.65 (Mg/m³)

Moisture Content = 0.22 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/33

 Depth (m):
 16.2-16.6m

Sample Description

Colour: Grey

Grain size: Fine-grained
Weathering Grade: Fresh
Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

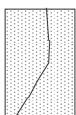
Sketch of Failure Surfaces

 Length
 194

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 185 kN



Strength Calculations

Uniaxial Compressive Strength = 185000 4775.94

> = 1000 x P Π x (Ø/2)^2

= 38.72 (Mpa)

Bulk Density = 2.66 (Mg/m³)

Moisture Content = 0.27 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/34

 Depth (m):
 7.0-7.3m

Sample Description

Colour: Grey

Grain size: Fine-grained

Weathering Grade: Fresh
Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

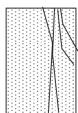
Sketch of Failure Surfaces

 Length
 207

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 231 kN



Strength Calculations

Uniaxial Compressive Strength = 231000 4775.94

= 48.34 (Mpa)

Bulk Density = 2.67 (Mg/m³)

Moisture Content = 0.24 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/34

 Depth (m):
 13.1-13.3m

Sample Description

Colour: Grey

Grain size: Fine-grained
Weathering Grade: Fresh

Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

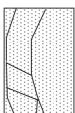
Sketch of Failure Surfaces

 Length
 200

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 83 kN



Strength Calculations

Uniaxial Compressive Strength = 83000 4775.94

> = 1000 x P Π x (Ø/2)^2

= 17.37 (Mpa)

Bulk Density = 2.65 (Mg/m³)

Moisture Content = 0.27 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/35

 Depth (m):
 21.6-21.8m

Sample Description

Colour: Grey

Grain size: Fine-grained
Weathering Grade: Fresh
Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

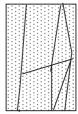
Sketch of Failure Surfaces

 Length
 204

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 243 kN



Strength Calculations

Uniaxial Compressive Strength = 243000 4775.94

> = 1000 x P Π x (Ø/2)^2

= 50.85 (Mpa)

Bulk Density = 2.66 (Mg/m³)

Moisture Content = 0.19 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/36

 Depth (m):
 7.1-7.4m

Sample Description

Colour: Grey

Grain size: Fine grained

Weathering Grade: Fresh
Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

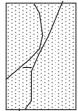
Sketch of Failure Surfaces

 Length
 207

 Diameter (Ø)
 78.1
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 170 kN



Strength Calculations

Uniaxial Compressive Strength = 170000 4788.19385

> = 1000 x P Π x (Ø/2)^2

= 35.49 (Mpa)

Bulk Density = 2.67 (Mg/m³)

Moisture Content = 0.25 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/36

 Depth (m):
 11.9-12.3m

Sample Description

Colour: Grey

Grain size: Fine grained
Weathering Grade: Fresh

Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

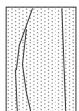
Sketch of Failure Surfaces

 Length
 202

 Diameter (Ø)
 78.1
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 432 kN



Strength Calculations

Uniaxial Compressive Strength = 432000 4788.19385

> 1000 x P Π x (Ø/2)^2

= 90.18 (Mpa)

Bulk Density = 2.66 (Mg/m³)

Moisture Content = 0.26 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/36

 Depth (m):
 18.0-18.3m

Sample Description

Colour: Grey

Grain size: Fine-grained
Weathering Grade: Fresh

Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

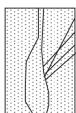
Sketch of Failure Surfaces

 Length
 198

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 211 kN



Strength Calculations

Uniaxial Compressive Strength = 211000 4775.94

> = 1000 x P Π x (Ø/2)^2

= 44.16 (Mpa)

Bulk Density = 2.64 (Mg/m³)

Moisture Content = 0.28 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/38

 Depth (m):
 5.9-6.1m

Sample Description

Colour: Grey

Grain size: Fine-grained
Weathering Grade: Fresh

Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

Sketch of Failure Surfaces

 Length
 200

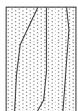
 Diameter (Ø)
 78
 mm

Testing

Load Rate

3.3 kN/min
Load at Failure (P)

339 kN



Strength Calculations

Uniaxial Compressive Strength = 339000 4775.94

> = 1000 x P Π x (Ø/2)^2

= 70.94 (Mpa)

Bulk Density = 2.66 (Mg/m³)

Moisture Content = 0.11 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/39

 Depth (m):
 5.3-5.5m

Sample Description

Colour: Grey

Grain size: Fine grained
Weathering Grade: Fresh
Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

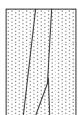
Sketch of Failure Surfaces

 Length
 202

 Diameter (Ø)
 78.1
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 181 kN



Strength Calculations

> = 1000 x P ∏ x (Ø/2)^2

= 37.78 (Mpa)

Bulk Density = 2.66 (Mg/m³)

Moisture Content = 0.15 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/40

 Depth (m):
 8.0-8.2m

Sample Description

Colour: Grey

Grain size: Fine-grained
Weathering Grade: Fresh

Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

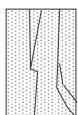
Sketch of Failure Surfaces

 Length
 201

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 134 kN



Strength Calculations

Uniaxial Compressive Strength = 134000 4775.94

> = 1000 x P Π x (Ø/2)^2

= 28.04 (Mpa)

Bulk Density = 2.67 (Mg/m³)

Moisture Content = 0.17 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/41

 Depth (m):
 6.2-6.8m

Sample Description

Colour: Grey

Grain size: Fine-grained
Weathering Grade: Fresh

Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

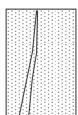
Sketch of Failure Surfaces

 Length
 204

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 271 kN



Strength Calculations

Uniaxial Compressive Strength = 271000 4775.94

> = 1000 x P ∏ x (Ø/2)^2

= 56.71 (Mpa)

Bulk Density = 2.65 (Mg/m³)

Moisture Content = 0.23 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/42

 Depth (m):
 4.5-4.7m

Sample Description

Colour: Grey

Grain size: Fine grained Weathering Grade: Fresh

Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

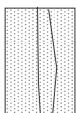
Sketch of Failure Surfaces

 Length
 209

 Diameter (Ø)
 78.1
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 291 kN



Strength Calculations

Uniaxial Compressive Strength = 291000 4788.19385

> = 1000 x P Π x (Ø/2)^2

= 60.74 (Mpa)

Bulk Density = 2.67 (Mg/m³)

Moisture Content = 0.18 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/43

 Depth (m):
 5.5-5.7m

Sample Description

Colour: Grey

Grain size: Fine grained
Weathering Grade: Fresh

Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

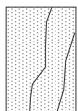
Sketch of Failure Surfaces

 Length
 199

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 344 kN



Strength Calculations

Uniaxial Compressive Strength = 344000 4775.94

> 1000 x P Π x (Ø/2)^2

= 71.99 (Mpa)

Bulk Density = 2.66 (Mg/m³)

Moisture Content = 0.26 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/47

 Depth (m):
 6.0-6.1m

Sample Description

Colour: Grey

Grain size: Fine-grained
Weathering Grade: Fresh

Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

Sketch of Failure Surfaces

 Length
 210

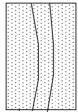
 Diameter (Ø)
 78
 mm

Testing

Load Rate

3.3 kN/min
Load at Failure (P)

122 kN



Strength Calculations

Uniaxial Compressive Strength = 122000 4775.94

= 25.53 (Mpa)

Bulk Density = 2.66 (Mg/m³)

Moisture Content = 0.21 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/48

 Depth (m):
 8.0-8.2m

Sample Description

Colour: Grey

Grain size: Fine-grained
Weathering Grade: Fresh

Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

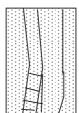
Sketch of Failure Surfaces

 Length
 199

 Diameter (Ø)
 78.1
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 248 kN



Strength Calculations

Uniaxial Compressive Strength = 248000 4788.19385

> = 1000 x P Π x (Ø/2)^2

= 51.77 (Mpa)

Bulk Density = 2.67 (Mg/m³)

Moisture Content = 0.23 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/52

 Depth (m):
 8.6-8.9m

Sample Description

Colour: Grey

Grain size: Fine-grained

Weathering Grade: Fresh
Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

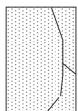
Sketch of Failure Surfaces

 Length
 201

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 237 kN



Strength Calculations

Uniaxial Compressive Strength = 237000 4775.94

> _____1000 x P ∏ x (Ø/2)^2

= 49.60 (Mpa)

Bulk Density = 2.66 (Mg/m³)

Moisture Content = 0.24 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/53

 Depth (m):
 6.4-6.6m

Sample Description

Colour: Grey

Grain size: Fine-grained Weathering Grade: Fresh

Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

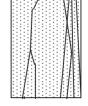
Sketch of Failure Surfaces

 Length
 212

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 294 kN



Strength Calculations

Uniaxial Compressive Strength = 294000 4775.94

> = 1000 x P Π x (Ø/2)^2

= 61.53 (Mpa)

Bulk Density = 2.67 (Mg/m³)

Moisture Content = 0.21 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/53

 Depth (m):
 13.55-13.70m

Sample Description

Colour: Grey

Grain size: Fine grained
Weathering Grade: Fresh
Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

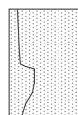
Sketch of Failure Surfaces

 Length
 206

 Diameter (Ø)
 78.1
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 151 kN



Strength Calculations

Uniaxial Compressive Strength = 151000 4788.19385

> = 1000 x P Π x (Ø/2)^2

= 31.52 (Mpa)

Bulk Density = 2.66 (Mg/m³)

Moisture Content = 0.18 (%)

I.G.S.L.

Sample Identification

Contract Name: N6 Galway City Transport Project

 Job Number:
 18963

 Hole No:
 BH3/54

 Depth (m):
 7.6-7.8m

Sample Description

Colour: Grey

Grain size: Fine-grained

Weathering Grade: Fresh

Rock Type: LIMESTONE

Weathering Grade Criteria

I. Fresh: Unchanged from original state

II. Slightly weathered: Slight discolouration, slight weakening

III. Moderately weathered: Considerable weakening, penetrative discolouration

IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

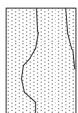
Sketch of Failure Surfaces

 Length
 202

 Diameter (Ø)
 78
 mm

Testing

Load Rate 3.3 kN/min
Load at Failure (P) 282 kN



Strength Calculations

Uniaxial Compressive Strength = 282000 4775.94

> = 1000 x P ∏ x (Ø/2)^2

= 59.02 (Mpa)

Bulk Density = 2.66 (Mg/m³)

Moisture Content = 0.20 (%)

Test Report

Resistance to Fragmentation - Los Angeles Test



Tested in accordance with BS EN1097-2:2010

Report No.	R73037
Report No.	R/303

Client: Arup, 50 Ringsend Rd, Dublin 4

Contract: N6 Galway City Transport Project Phase 3

Contract No: 18963

Sample No. A16/1996

Client Ref: 3/34 5.8-8.8m

Location: N/A

Source: N/A

Material Type: Core

Sample Received: 22-04-16

Date tested: 11-05-16

Sample Cert: Attached / Provided

Size of Material: 1 <14mm >12.5mm

2 <12.5mm >10mm

Los Angeles Coefficient: 27

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 report

J Barrett (Quality Manager) H Byrne (Laboratory Manager)

Test Report

Resistance to Fragmentation - Los Angeles Test



Tested in accordance with BS EN1097-2:2010

Report No.	R73038

Client: Arup, 50 Ringsend Rd, Dublin 4

Contract: N6 Galway City Transport Project Phase 3

Contract No: 18963

Sample No. A16/1999

Client Ref: 3/36 10.8-13.7m

Location: N/A

Source: N/A

Material Type: Core

Sample Received: 22-04-16

Date tested: 23-05-16

Sample Cert: Attached / Provided

Size of Material: 1 <14mm >12.5mm 2 <12.5mm >10mm

Los Angeles Coefficient: 28

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 report

J Barrett (Quality Manager) H Byrne (Laboratory Manager)

IGSL Materials Laboratory

Approved by

Date Page
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File: R73038.LA.xls

Test Report

Resistance to Fragmentation - Los Angeles Test



Tested in accordance with BS EN1097-2:2010

Report No.	R73039
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Client: Arup, 50 Ringsend Rd, Dublin 4

Contract: N6 Galway City Transport Project Phase 3

Contract No: 18963

Sample No. A16/2000

Client Ref: 3/38 7.4-10.2m

Location: N/A

Source: N/A

Material Type: Core

Sample Received: 22-04-16

Date tested: 23-05-16

Sample Cert: Attached / Provided

Size of Material: 1 <14mm >12.5mm 2 <12.5mm >10mm

Los Angeles Coefficient: 28

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 report

J Barrett (Quality Manager) H Byrne (Laboratory Manager)

Test Report

Resistance to Fragmentation - Los Angeles Test



Tested in accordance with BS EN1097-2:2010

Report No.	R73990
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Client: Arup, 50 Ringsend Rd, Dublin 4

Contract: N6 Galway City Transport Project Phase 3

Contract No: 18963

Sample No. A16/2314

Client Ref: 3/40 2.8-5.75m

Location: N/A

Source: N/A

Material Type: Core

Sample Received: 02-06-16

Date tested: 15-06-16

Sample Cert: Attached / Provided

Size of Material: 1 <14mm >12.5mm 2 <12.5mm >10mm

Los Angeles Coefficient: 28

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 report

J Barrett (Quality Manager) H Byrne (Laboratory Manager)

Test Report

Resistance to Fragmentation - Los Angeles Test



Tested in accordance with BS EN1097-2:2010

Report No.	R73991
Report No.	K/3331

Client: Arup, 50 Ringsend Rd, Dublin 4

Contract: N6 Galway City Transport Project Phase 3

Contract No: 18963

Sample No. A16/2315

Client Ref: 3/20 7.1-10m

Location: N/A

Source: N/A

Material Type: Core

Sample Received: 02-06-16

Date tested: 16-06-16

Sample Cert: Attached / Provided

Size of Material: 1 <14mm >12.5mm

2 <12.5mm >10mm

Los Angeles Coefficient: 26

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 report

J Barrett (Quality Manager) H Byrne (Laboratory Manager)

Test Report

Slake Durability



Tested in accordance with ISRM Part 2 (1981)

Report No. R73033

Contract No. 18963

Contract Name: N6 Galway City Transport Project Phase 3

Client: Arup, 50 Ringsend Rd, Dublin 4

Sample No. A16/1992

Client Ref BH3/040 @ 0.8-5.60m

Location N/A

Sample Certificate Approved / Not Provided

Date Received 22-04-2016

Date Tested 04-05-16

Slake Durability

Cycle 1 99.4

Cycle 2 99.2

Description of the rock

Pre Test: See Logs

Post Test: See Logs

The slaking fluid is tap water at 20°C unless otherwise stated in this report.

The results relate to the specimens 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 report

J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

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Test Report

Slake Durability



Tested in accordance with ISRM Part 2 (1981)

Report No. R73034

Contract No. 18963

Contract Name: N6 Galway City Transport Project Phase 3

Client: Arup, 50 Ringsend Rd, Dublin 4

Sample No. A16/2001

Client Ref BH3/41 @ 4.2-7.2m

Location N/A

Sample Certificate Approved / Not Provided

Date Received 22/4/16

Date Tested 04-05-16

Slake Durability

Cycle 1 99.6

Cycle 2 99.5

Description of the rock

Pre Test: See Logs

Post Test: See Logs

The slaking fluid is tap water at 20°C unless otherwise stated in this report.

The results relate to the specimens 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 report

J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

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Test Report

Slake Durability



Tested in accordance with ISRM Part 2 (1981)

Report No. R73035

Contract No. 18963

Contract Name: N6 Galway City Transport Project Phase 3

Client: Arup, 50 Ringsend Rd, Dublin 4

Sample No. A16/1998

Client Ref BH3/36 @ 7.85 10.8m

Location N/A

Sample Certificate Approved / Not Provided

Date Received 22/4/16

Date Tested 04-05-16

Slake Durability

Cycle 1 99.3

Cycle 2 99.1

Description of the rock

Pre Test: See Logs

Post Test: See Logs

The slaking fluid is tap water at 20°C unless otherwise stated in this report.

The results relate to the specimens 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 report

J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

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Test Report

Slake Durability



Tested in accordance with ISRM Part 2 (1981)

Report No. R73036

Contract No. 18963

Contract Name: N6 Galway City Transport Project Phase 3

Client: Arup, 50 Ringsend Rd, Dublin 4

Sample No. A16/1994

Client Ref BH3/33 @ 11.5 12.5m

Location N/A

Sample Certificate Approved / Not Provided

Date Received 22/4/16

Date Tested 04-05-16

Slake Durability

Cycle 1 99.6

Cycle 2 99.4

Description of the rock

Pre Test: See Logs

Post Test: See Logs

The slaking fluid is tap water at 20°C unless otherwise stated in this report.

The results relate to the specimens 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 report

J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

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Test Report

Slake Durability



Tested in accordance with ISRM Part 2 (1981)

Report No. R73986

Contract No. 18963

Contract Name: N6 Galway City Transport Project Phase 3

Client: Arup, 50 Ringsend Rd, Dublin 4

Sample No. A16/2310

Client Ref BH3/19 @ 3.2-4.2m

Location N/A

Sample Certificate Approved / Not Provided

Date Received 02-06-16

Date Tested 17-06-16

Slake Durability

Cycle 1 99.5

Cycle 2 99.2

Description of the rock

Pre Test: See Logs

Post Test: See Logs

The slaking fluid is tap water at 20°C unless otherwise stated in this report.

The results relate to the specimens 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 report

J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

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Test Report

Slake Durability



Tested in accordance with ISRM Part 2 (1981)

Report No. R73987

Contract No. 18963

Contract Name: N6 Galway City Transport Project Phase 3

Client: Arup, 50 Ringsend Rd, Dublin 4

Sample No. A16/2311

Client Ref BH3/19 @ 12.5-13.5m

Location N/A

Sample Certificate Approved / Not Provided

Date Received 02-06-16

Date Tested 17-06-16

Slake Durability

Cycle 1 99.3

Cycle 2 99.1

Description of the rock

Pre Test: See Logs

Post Test: See Logs

The slaking fluid is tap water at 20°C unless otherwise stated in this report.

The results relate to the specimens 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 report

J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

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Test Report

Slake Durability



Tested in accordance with ISRM Part 2 (1981)

Report No. R73988

Contract No. 18963

Contract Name: N6 Galway City Transport Project Phase 3

Client: Arup, 50 Ringsend Rd, Dublin 4

Sample No. A16/2312

Client Ref BH3/22 @ 9.7-10.7m

Location N/A

Sample Certificate Approved / Not Provided

Date Received 02-06-16

Date Tested 16-06-16

Slake Durability

Cycle 1 99.5

Cycle 2 99.3

Description of the rock

Pre Test: See Logs

Post Test: See Logs

The slaking fluid is tap water at 20°C unless otherwise stated in this report.

The results relate to the specimens 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 report

J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

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Test Report

Slake Durability



Tested in accordance with ISRM Part 2 (1981)

Report No. R73989

Contract No. 18963

Contract Name: N6 Galway City Transport Project Phase 3

Client: Arup, 50 Ringsend Rd, Dublin 4

Sample No. A16/2316

Client Ref BH3/20 @ 6.1-7.1m

Location N/A

Sample Certificate Approved / Not Provided

Date Received 02-06-16

Date Tested 20-06-16

Slake Durability

Cycle 1 99.5

Cycle 2 99.4

Description of the rock

Pre Test: See Logs

Post Test: See Logs

The slaking fluid is tap water at 20°C unless otherwise stated in this report.

The results relate to the specimens 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 report

J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

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Test Report

Ten per cent Fines Value



Tested in accordance with BS812:Part 111:1990

Report No. R73040

Customer: Arup, 50 Ringsend Rd, Dublin 4

Contract No. 18963

Contract Name: N6 Galway City Transport Project Phase 3

Sample No. A16/1995

Customer Ref. Bh 3/33 @ 8.0-10.6m

Material Type: Core

Date Received: 22-04-16

Date Tested: 23-05-16

Location: N/A

Sample Certificate: Not Provided

Description: 14-10mm aggregate

Condition of aggregate

tested: Soaked

Ten per cent Fines

Value (kN): 180

The result relates to the specimens tested.

Any remaining material will be retained for one month.

Sampling and opinions and interpretations are outside the scope of accreditation.

Approved signatories

H Byrne (Laboratory Manager)

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Test Report

Ten per cent Fines Value



Tested in accordance with BS812:Part 111:1990

Report No. R73041

Customer: Arup, 50 Ringsend Rd, Dublin 4

Contract No. 18963

Contract Name: N6 Galway City Transport Project Phase 3

Sample No. A16/1997

Customer Ref. Bh 3/36 @ 5.0-7.85m

Material Type: Core

Date Received: 22-04-16

Date Tested: 13-05-16

Location: N/A

Sample Certificate: Not Provided

Description: 14-10mm aggregate

Condition of aggregate

tested: Soaked

Ten per cent Fines

Value (kN): 170

The result relates to the specimens tested.

Any remaining material will be retained for one month.

Sampling and opinions and interpretations are outside the scope of accreditation.

Approved signatories

H Byrne (Laboratory Manager)

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Test Report

Ten per cent Fines Value



Tested in accordance with BS812:Part 111:1990

Report No. R73042

Customer: Arup, 50 Ringsend Rd, Dublin 4

Contract No. 18963

Contract Name: N6 Galway City Transport Project Phase 3

Sample No. A16/1992

Customer Ref. Bh 3/04 @ 0.8-3.7m

Material Type: Core

Date Received: 22-04-16

Date Tested: 16-05-16

Location: N/A

Sample Certificate: Not Provided

Description: 14-10mm aggregate

Condition of aggregate

tested: Soaked

Ten per cent Fines

Value (kN): 140

The result relates to the specimens tested.

Any remaining material will be retained for one month.

Sampling and opinions and interpretations are outside the scope of accreditation.

Approved signatories

H Byrne (Laboratory Manager)

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Test Report

Ten per cent Fines Value



Tested in accordance with BS812:Part 111:1990

Report No. R73043

Customer: Arup, 50 Ringsend Rd, Dublin 4

Contract No. 18963

Contract Name: N6 Galway City Transport Project Phase 3

Sample No. A16/1995

Customer Ref. Bh 3/18 @ 12.5-15.2m

Material Type: Core

Date Received: 22-04-16

Date Tested: 26-05-16

Location: N/A

Sample Certificate: Not Provided

Description: 14-10mm aggregate

Condition of aggregate

tested: Soaked

Ten per cent Fines

Value (kN): 210

The result relates to the specimens tested.

Any remaining material will be retained for one month.

Sampling and opinions and interpretations are outside the scope of accreditation.

Approved signatories

H Byrne (Laboratory Manager)

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Test Report

Ten per cent Fines Value



Tested in accordance with BS812:Part 111:1990

Report No. R73992

Customer: Arup, 50 Ringsend Rd, Dublin 4

Contract No. 18963

Contract Name: N6 Galway City Transport Project Phase 3

Sample No. A16/313

Customer Ref. Bh 3/48 @ 4.3-7.3m

Material Type: Core

Date Received: 02-06-16

Date Tested: 23-06-16

Location: N/A

Sample Certificate: Not Provided

Description: 14-10mm aggregate

Condition of aggregate

tested: Soaked

Ten per cent Fines

Value (kN): 170

The result relates to the specimens tested.

Any remaining material will be retained for one month.

Sampling and opinions and interpretations are outside the scope of accreditation.

Approved signatories

H Byrne (Laboratory Manager)

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Appendix 17

Exploratory Hole Location Plan

