Appendix A.5.1.4

Phase 3 Contract 1

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

January to April 2016

A.5.1.4

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

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 1331

Report No. **R70975** Contract No. 18963 Contract Name: GCTP Phase 3 Contract 1 GI

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	B	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	B	246								Dark brown/blackvery fibrous PEAT
BH3/14	AA39959	0.1	A16/0979	B	18								Dark brown clayey/silty, very sandy, GRAVEL
BH3/15	AA39960	0.2	A16/0980	B	13								Dark brown clayey/silty, sandy, GRAVEL with many cobbles
BH3/15	AA39961	0.4	A16/0981	B	13								Brown silty/clayey sandy GRAVEL
BH3/15	AA39962	0.8	A16/0982	B	8.5								Dark brown slightly clayey/silty, very sandy, GRAVEL
BH3/21	N/A	0.5	A16/0983	B	458	523	NP	NP	N/A	AR	4.4		Dark brown sandy, very gravelly PEAT
BH3/21	N/A	1.0	A16/0984	B	33	62	NP	NP	28	WS	4.4		Light brown silty, sandy, GRAVEL with many cobbles
BH3/21	N/A	1.7	A16/0985	B	14	24	NP	NP	15	WS	4.4		Reddish/brown slightly silty, very sandy, GRAVEL
BH3/22	AA49472	0.5	A16/0986	B	11								Brown slightly clayey/silty, sandy, GRAVEL with many cobbles
BH3/27	AA48872	0.5	A16/0987	B	19	34	18	16	65	WS	4.4	C L	Brown slightly sandy, slightly gravelly, CLAY

Notes: Preparation: WS - Wet sieved; AR - As received; NP - Non plastic

Sample Type: B - bulk disturbed; U - Undisturbed

Liquid Limit Clause: 4.3 Cone Penetrometer definitive method; 4.4 Cone Penetrometer one point method

Remarks:

NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014

Opinions and interpretations are outside the scope of accreditation.

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

IGSL Ltd Materials Laboratory

Persons authorized to approve reports

H Byrne (Quality Manager)

Approved by: H Byrne

Date: 20-04-16

Page: 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

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 1331

Report No. **R70976** Contract No. 18963 Contract Name: GCTP Phase 3 Contract 1 GI

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
BH3/27	AA48873	1.0	A16/0988	B	12	34	18	16	53	WS	4.4	C L	Brown slightly sandy, gravelly, CLAY
BH3/28	AA39957	0.2	A16/0989	B	19	34	NP	NP	51	WS	4.4		Brown slightly sandy, gravelly, SILT
BH3/35	AA39963	0.5	A16/0990	B	13	20	NP	NP	66	WS	4.4		Mottled brown slightly sandy, slightly gravelly, SILT
BH3/35	AA39964	1.0	A16/0991	B	11	23	15	8	62	WS	4.4	C L	Mottled brown slightly sandy, gravelly, CLAY
BH3/36	AA49479	0.1	A16/0992	B	31	48	NP	NP	64	WS	4.4		Brown sandy, slightly gravelly, SILT with some cobbles
BH3/40	AA49469	0.2	A16/0993	B	12	29	16	13	62	WS	4.4	C L	Brown slightly sandy, gravelly, CLAY
BH3/40	AA49470	0.5	A16/0994	B	25	42	NP	NP	46	WS	4.4		Brown slightly sandy, gravelly, SILT with some cobbles
BH3/48	AA49471	0.1	A16/0995	B	29	40	26	14	73	WS	4.4	M I	Light brown slightly sandy, slightly gravelly, SILT

Notes: Preparation: WS - Wet sieved; AR - As received; NP - Non plastic
Liquid Limit Clause: 4.3 Cone Penetrometer definitive method; 4.4 Cone Penetrometer one point method
Sample Type: B - bulk disturbed; U - Undisturbed

Remarks:

NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014
Opinions and interpretations are outside the scope of accreditation.
The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory

Persons authorized to approve reports

H Byrne (Quality Manager)

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	89	GRAVEL
37.5	80	
28	77	
20	70	
14	64	
10	60	
6.3	55	
5	53	
3.35	48	
2	42	
1.18	35	SAND
0.6	28	
0.425	25	
0.3	21	
0.15	16	
0.063	13	SILT/CLAY

Contract No: 18963 Report No. R71741

Contract: GCTP Phase 3 - Contact 1

BH: BH3/14

Sample No. AA39959 Lab. Sample No. A16/0979

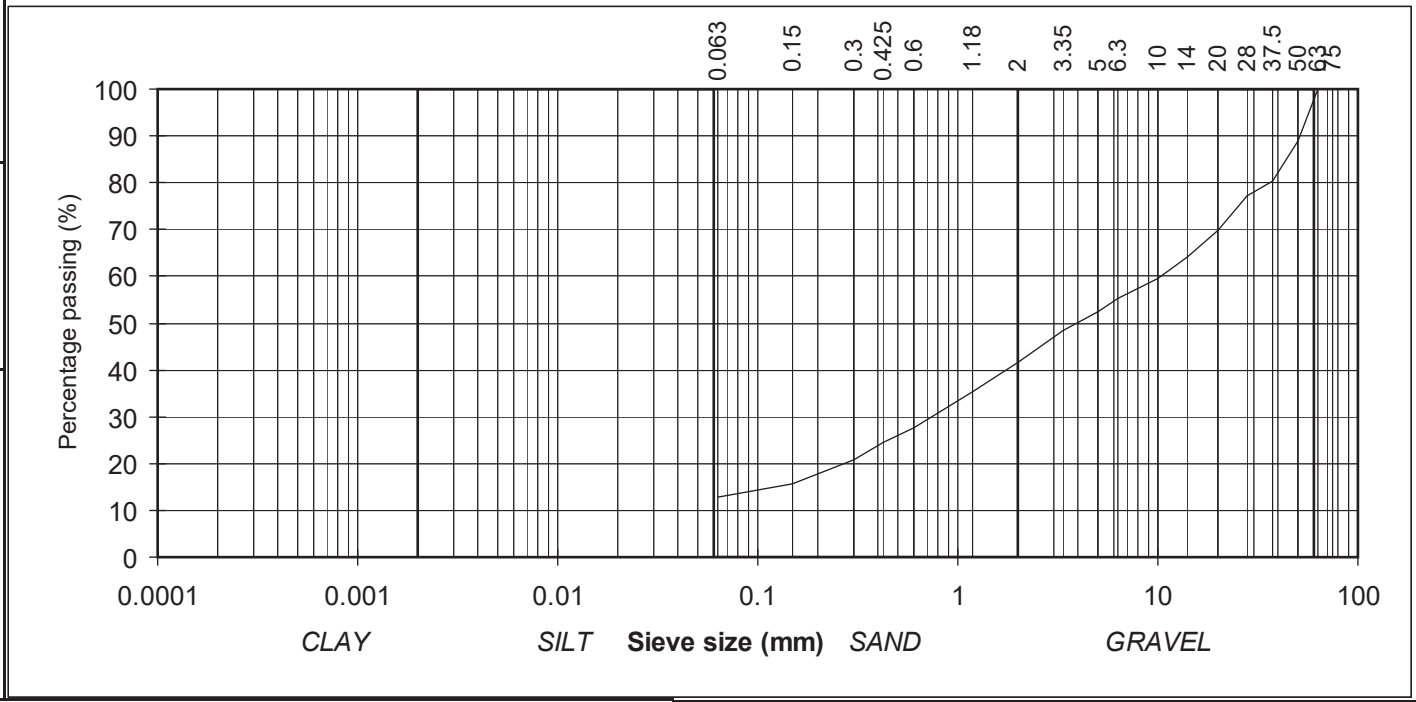
Sample Type: B

Depth (m) 0.10 Customer: Galway Co.Co.

Date Received 22-02-16 Date Testing started 30-03-16

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

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	28-04-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	87	COBBLES
63	72	
50	65	GRAVEL
37.5	56	
28	49	
20	42	
14	37	
10	32	
6.3	27	
5	25	
3.35	21	
2	17	
1.18	13	SAND
0.6	10	
0.425	9	
0.3	8	
0.15	7	
0.063	6	SILT/CLAY

Contract No: 18963 Report No. R71578

Contract: GCTP Phase 3 - Contact 1

BH: BH3/15

Sample No. AA39960 Lab. Sample No. A16/0980

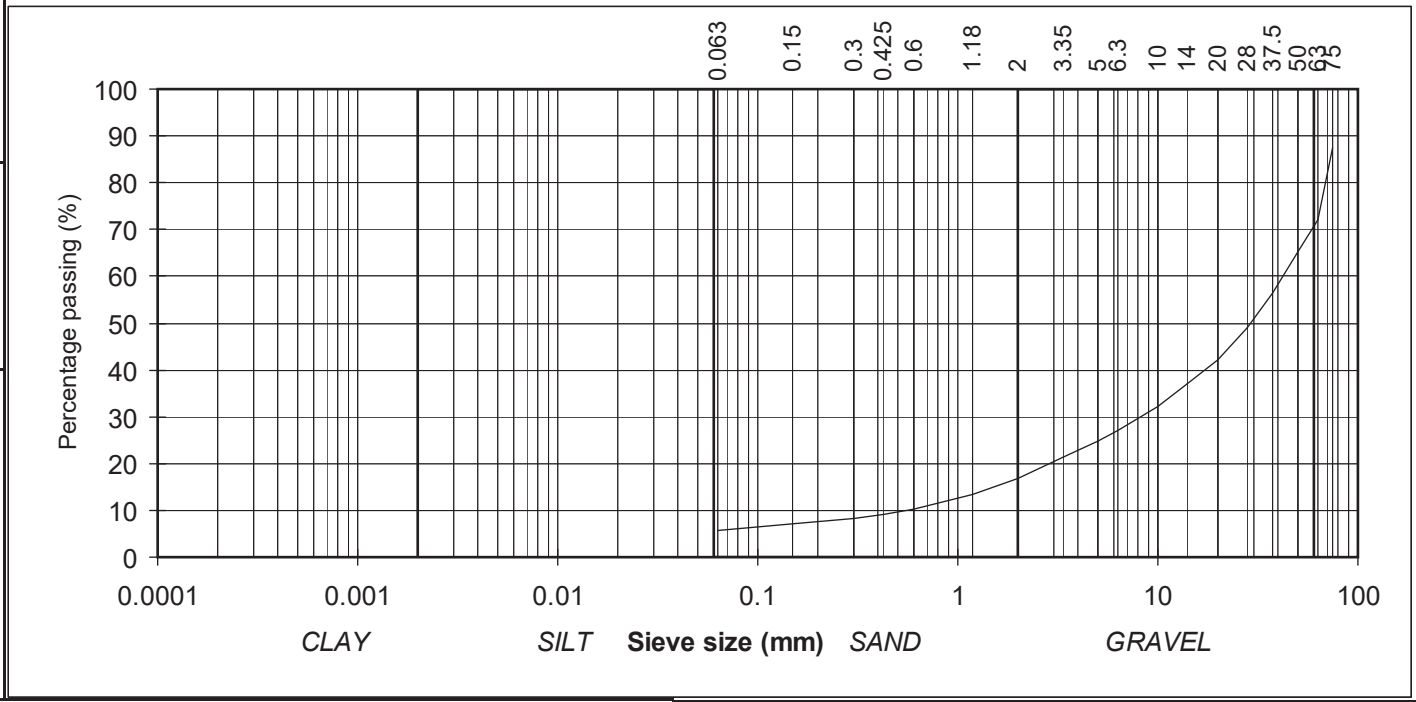
Sample Type: B

Depth (m) 0.20 Customer: Galway Co.Co.

Date Received 22-02-16 Date Testing started 30-03-16

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

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	19-04-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	92	GRAVEL
37.5	89	
28	84	
20	77	
14	68	
10	59	
6.3	46	
5	40	
3.35	35	
2	27	
1.18	20	SAND
0.6	14	
0.425	11	
0.3	8	
0.15	4	
0.063	3	SILT/CLAY

Contract No: 18963 Report No. R71492

Contract: GCTP Phase 3 - Contact 1

BH: BH3/15

Sample No. AA39962 Lab. Sample No. A16/0982

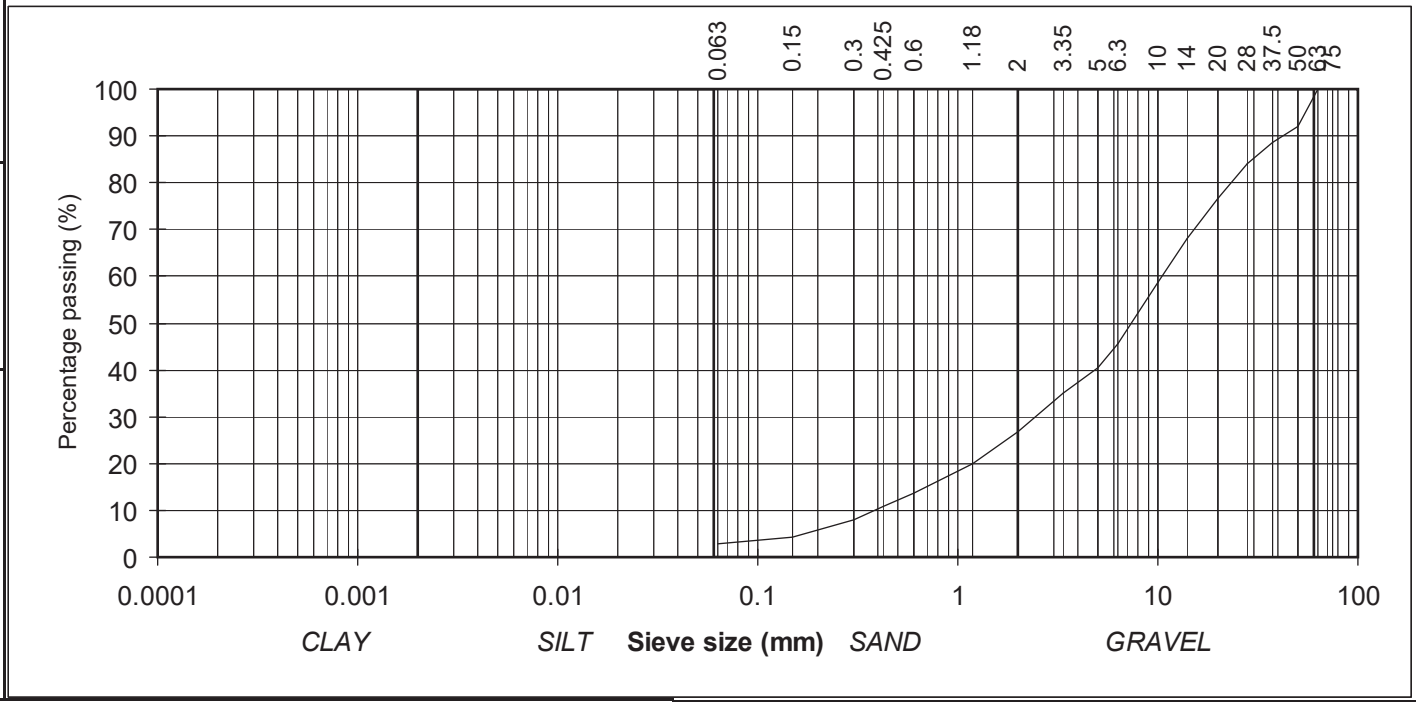
Sample Type: B

Depth (m) 0.80 Customer: Galway Co.Co.

Date Received 22-02-16 Date Testing started 30-03-16

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

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	13-04-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	100	
14	100	
10	97	
6.3	58	
5	45	
3.35	27	
2	14	
1.18	7	SAND
0.6	2	
0.425	1	
0.3	1	
0.15	0	
0.063	0	SILT/CLAY

Contract No: 18963 Report No. R71127

Contract: GCTP Phase 3 - Contact 1

BH: BH3/21

Sample No. N/A Lab. Sample No. A16/0983

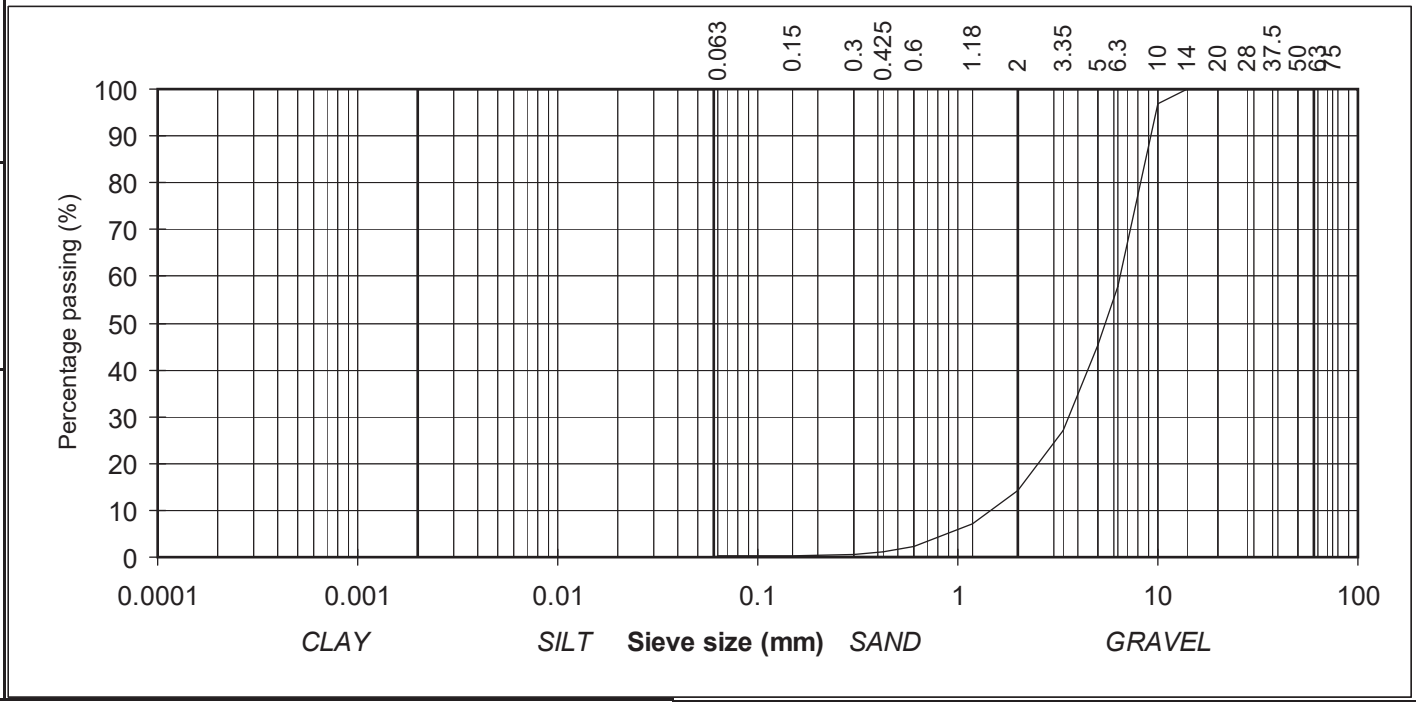
Sample Type: B

Depth (m) 0.50 Customer: Galway Co.Co.

Date Received 22-02-16 Date Testing started 15-03-16

Description: Dark brown sandy, GRAVEL

Remarks Peat



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	04-04-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	73	COBBLES
63	73	
50	61	GRAVEL
37.5	56	
28	50	
20	44	
14	39	
10	36	
6.3	32	
5	31	
3.35	26	
2	22	
1.18	19	SAND
0.6	14	
0.425	11	
0.3	10	
0.15	9	
0.063	8	SILT/CLAY

Contract No: 18963 Report No. R71178

Contract: GCTP Phase 3 - Contact 1

BH: BH03/21

Sample No. N/A Lab. Sample No. A16/0984

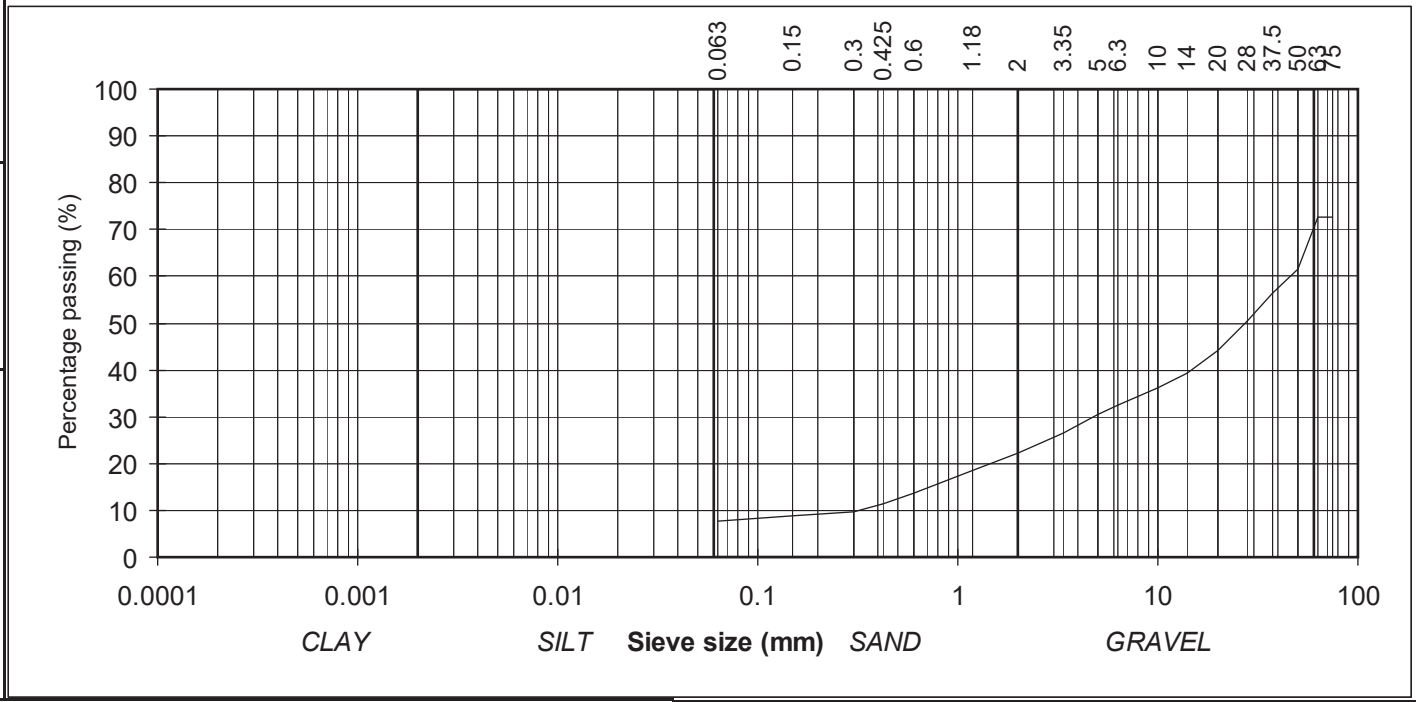
Sample Type: B

Depth (m) 1.00 Customer: Galway Co.Co.

Date Received 22-02-16 Date Testing started 14-03-16

Description: Light brown silty, sandy, GRAVEL with many cobbles

Remarks PEAT Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	01-04-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	98	
20	95	
14	89	
10	83	
6.3	75	
5	71	
3.35	61	
2	49	
1.18	36	SAND
0.6	18	
0.425	11	
0.3	6	
0.15	4	
0.063	2	SILT/CLAY

Contract No: 18963 Report No. R71179

Contract: GCTP Phase 3 - Contact 1

BH: BH03/21

Sample No. N/A Lab. Sample No. A16/0985

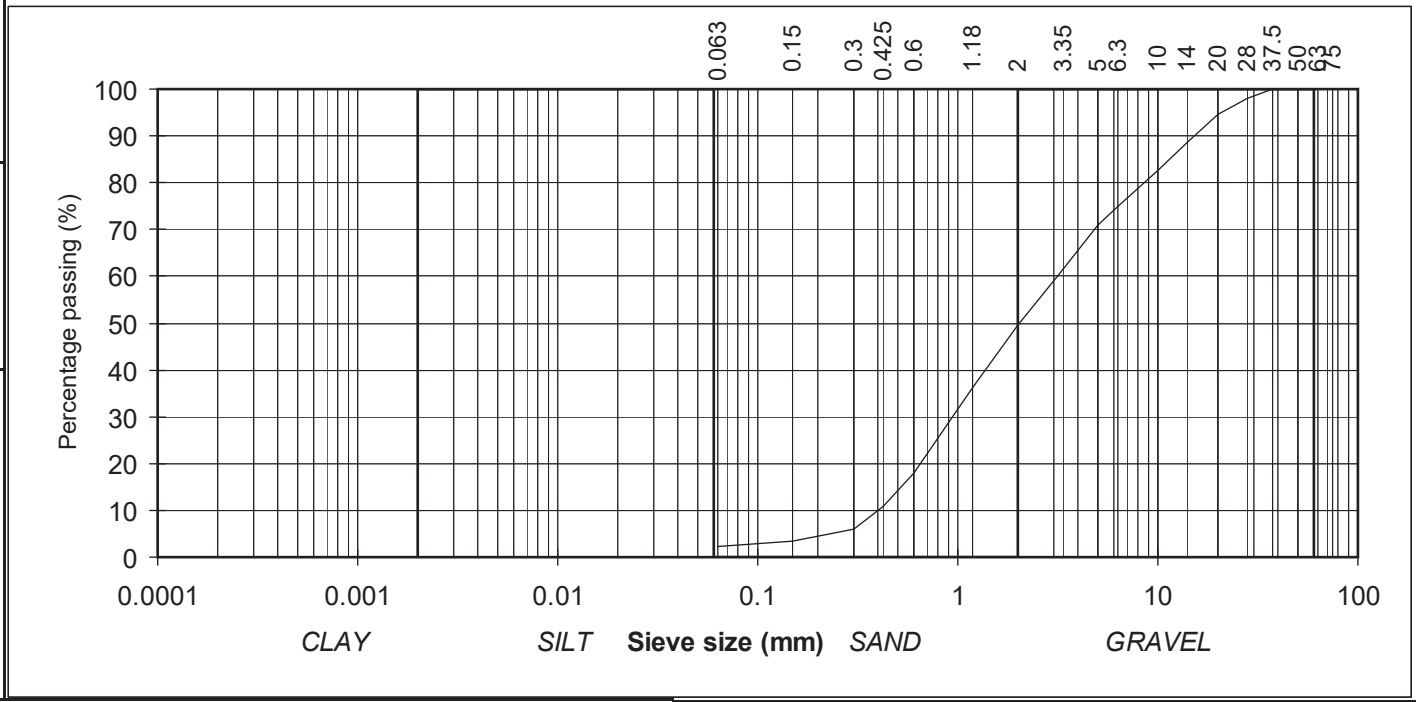
Sample Type: B

Depth (m) 1.70 Customer: Galway Co.Co.

Date Received 22-02-16 Date Testing started 14-03-16

Description: Reddish/brown slightly silty, very sandy, GRAVEL

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	04-04-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	72	COBBLES
63	68	
50	62	GRAVEL
37.5	59	
28	50	
20	44	
14	40	
10	37	
6.3	33	
5	31	
3.35	27	
2	21	
1.18	17	SAND
0.6	12	
0.425	10	
0.3	9	
0.15	6	
0.063	3	SILT/CLAY

Contract No: 18963 Report No. R71178

Contract: GCTP Phase 3 - Contact 1

BH: BH03/22

Sample No. AA49472 Lab. Sample No. A16/0986

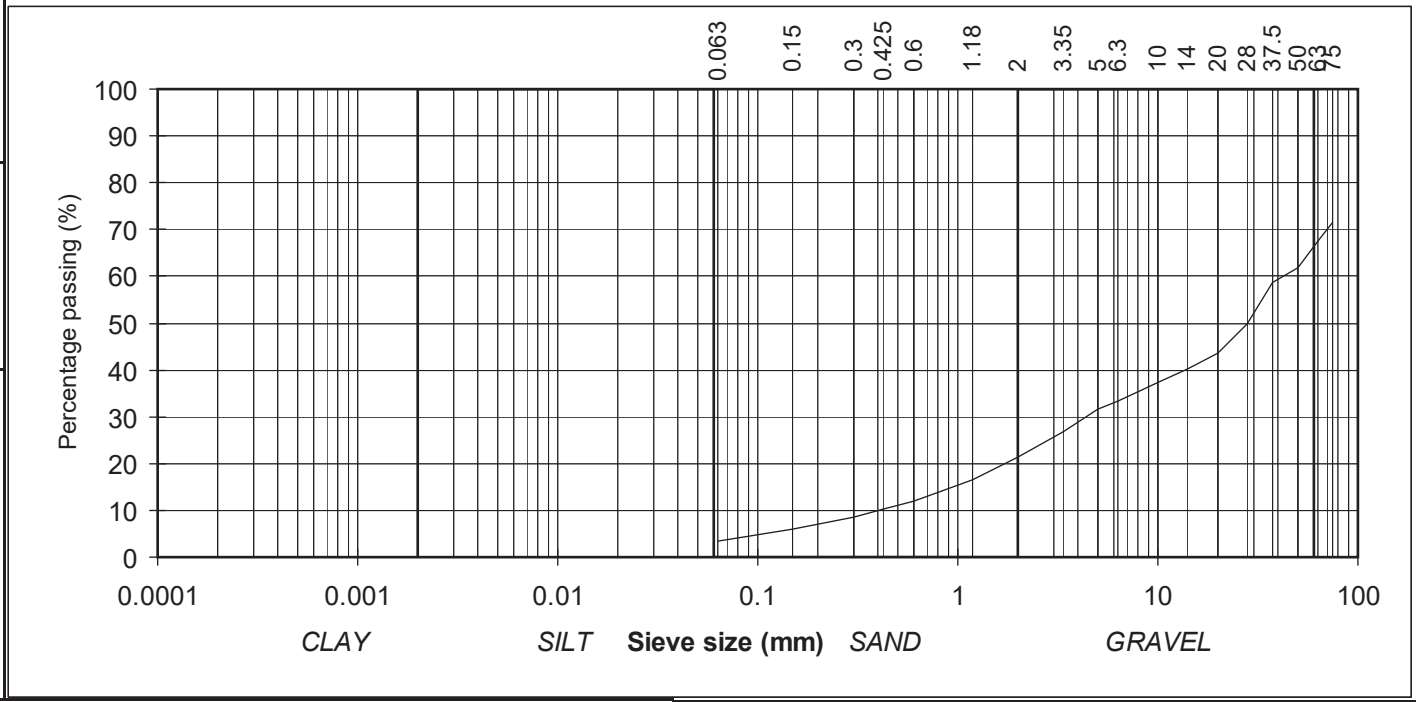
Sample Type: B

Depth (m) 0.30 Customer: Galway Co.Co.

Date Received 22-02-16 Date Testing started 15-03-16

Description: Brown slightly clayey/silty, sandy, GRAVEL with many cobbles

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	30-03-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	97	
28	93	
20	90	
14	87	
10	84	
6.3	80	
5	78	
3.35	75	
2	71	
1.18	67	SAND
0.6	62	
0.425	59	
0.3	57	
0.15	51	
0.063	44	SILT/CLAY
0.037	38	
0.026	36	
0.017	34	
0.010	29	
0.007	27	
0.005	23	
0.001	17	

Contract No: 18963 Report No. R71493

Contract: GCTP Phase 3 - Contact 1

BH: BH3/27

Sample No. AA48872 Lab. Sample No. A16/0987

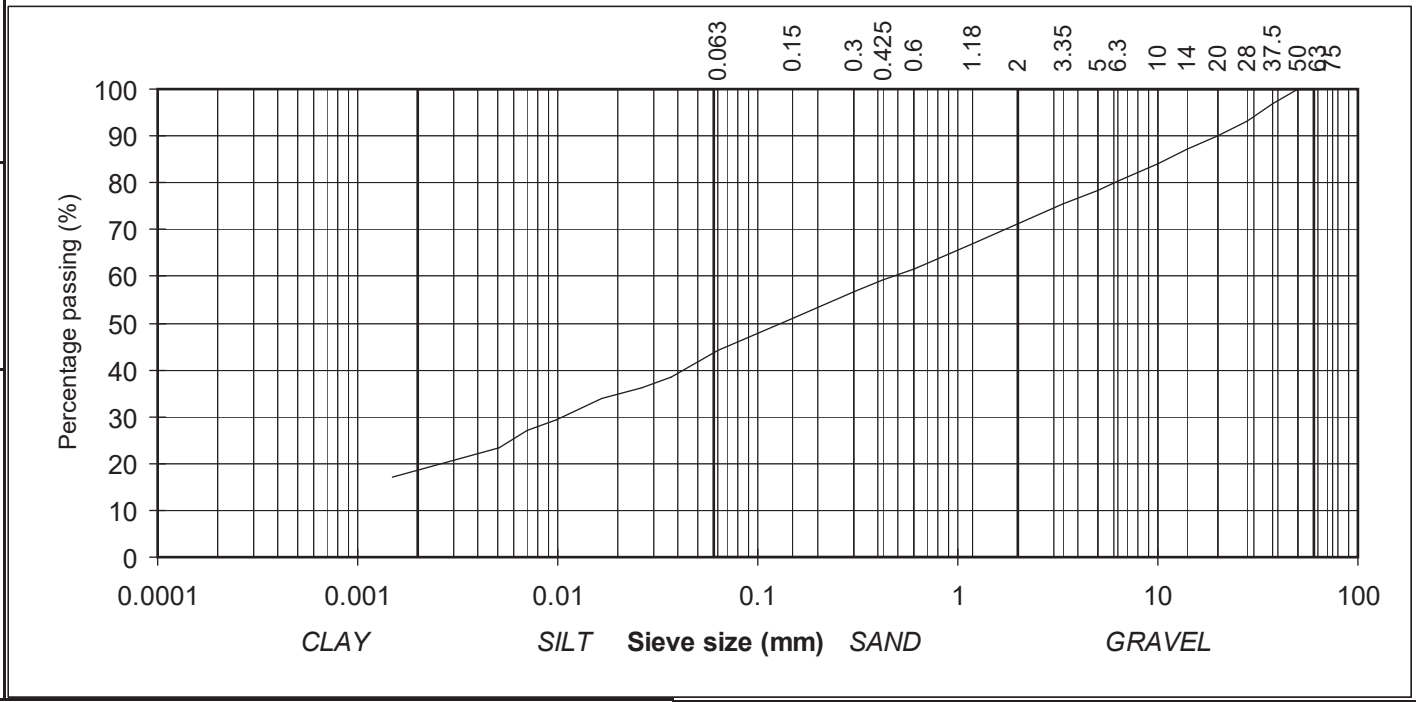
Sample Type: B

Depth (m) 0.50 Customer: Galway Co.Co.

Date Received 22-02-16 Date Testing started 05-04-16

Description: Brown slightly sandy, slightly gravelly, CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	20-04-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	93	
28	84	
20	74	
14	71	
10	68	
6.3	63	
5	61	
3.35	57	
2	53	
1.18	49	SAND
0.6	45	
0.425	44	
0.3	42	
0.15	37	
0.063	29	SILT/CLAY
0.036	26	
0.026	25	
0.017	23	
0.010	20	
0.007	18	
0.005	16	
0.001	11	

Contract No: 18963 Report No. R71579

Contract: GCTP Phase 3 - Contact 1

BH: BH3/27

Sample No. AA48873 Lab. Sample No. A16/0988

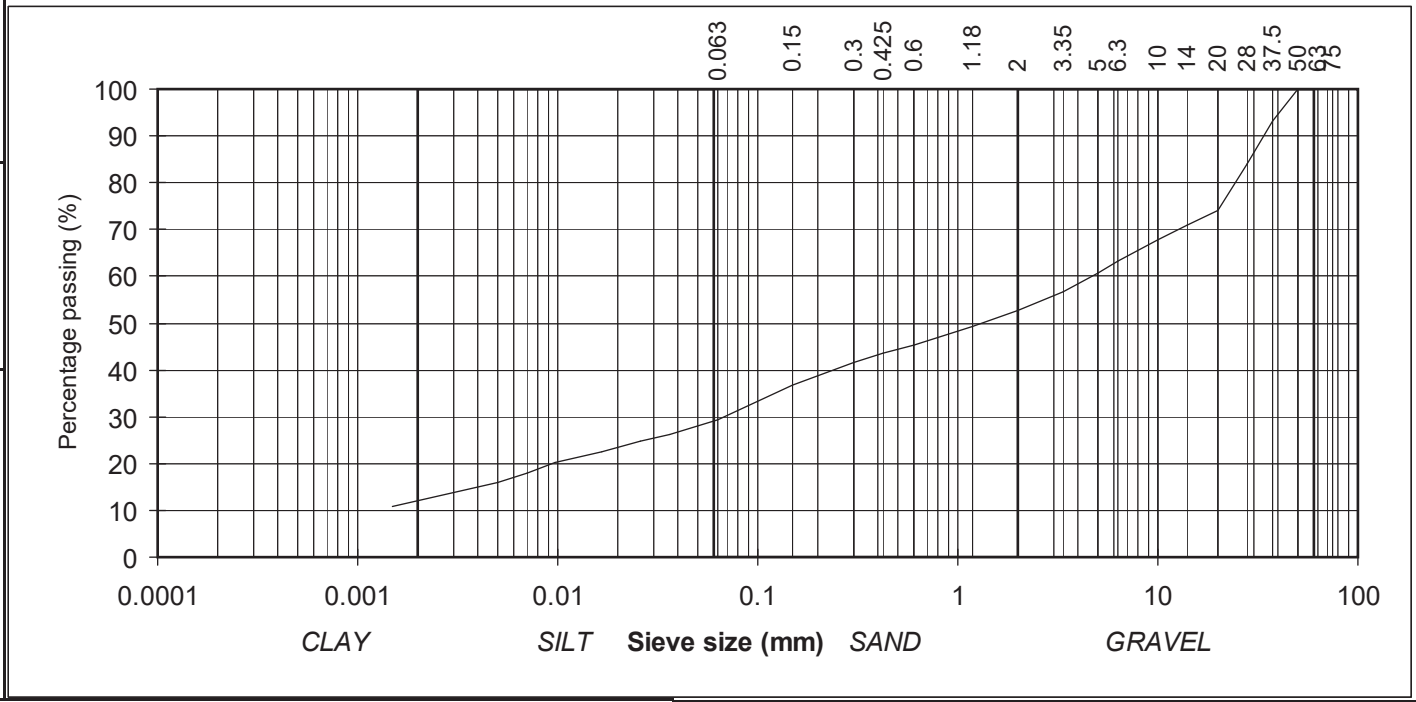
Sample Type: B

Depth (m) 1.00 Customer: Galway Co.Co.

Date Received 22-02-16 Date Testing started 05-04-16

Description: Brown slightly sandy, gravelly, CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	20-04-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	84	
28	79	
20	77	
14	72	
10	70	
6.3	68	
5	66	
3.35	64	
2	61	
1.18	58	SAND
0.6	52	
0.425	50	
0.3	47	
0.15	41	
0.063	34	SILT/CLAY
0.038	27	
0.027	24	
0.017	22	
0.010	19	
0.007	15	
0.005	13	
0.002	7	

Contract No: 18963 Report No. R71580

Contract: GCTP Phase 3 - Contact 1

BH: BH3/28

Sample No. AA39957 Lab. Sample No. A16/0989

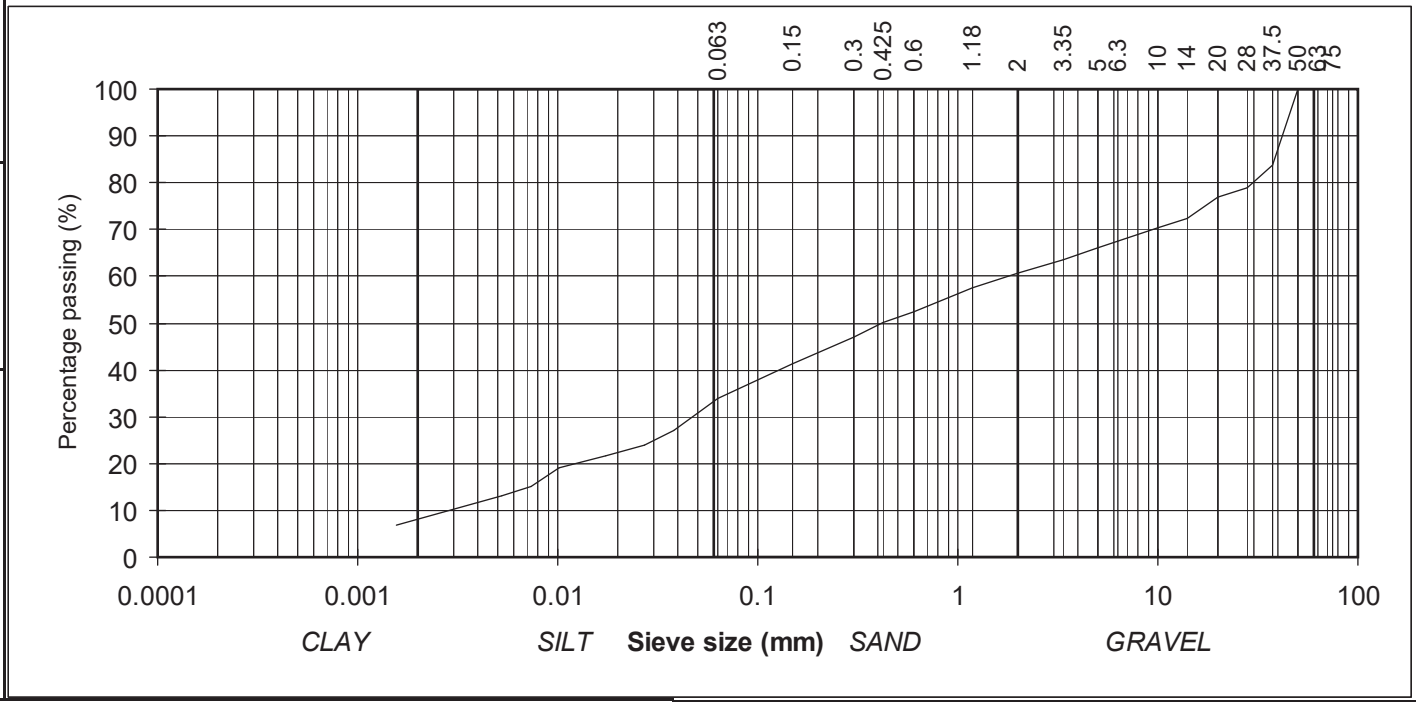
Sample Type: B

Depth (m) 0.20 Customer: Galway Co.Co.

Date Received 22-02-16 Date Testing started 30-03-16

Description: Brown slightly sandy, gravelly, SILT

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	19-04-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	95	GRAVEL
37.5	90	
28	87	
20	85	
14	82	
10	80	
6.3	77	
5	75	
3.35	72	
2	68	
1.18	64	SAND
0.6	60	
0.425	58	
0.3	56	
0.15	50	
0.063	39	SILT/CLAY
0.036	34	
0.026	33	
0.017	29	
0.010	25	
0.007	22	
0.005	20	
0.002	13	

Contract No: 18963 Report No. R71582

Contract: GCTP Phase 3 - Contact 1

BH: BH3/35

Sample No. AA39963 Lab. Sample No. A16/0990

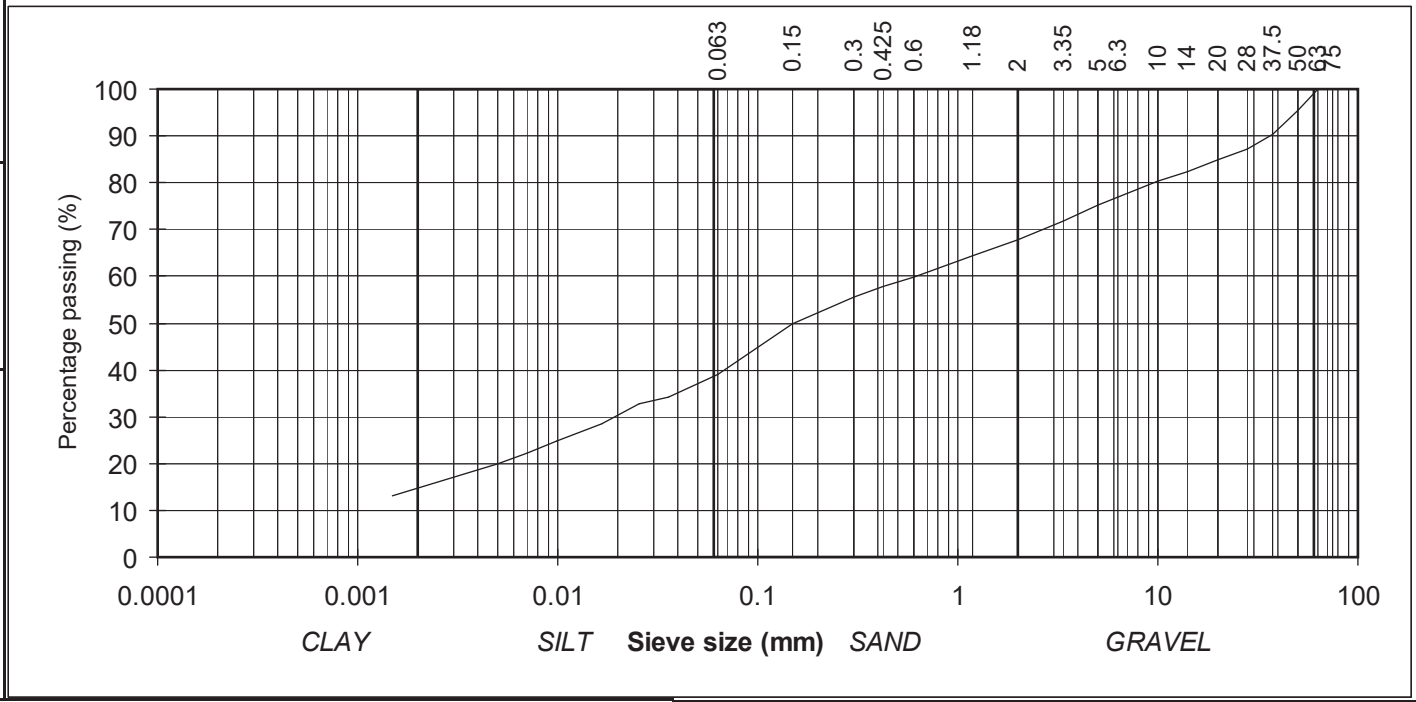
Sample Type: B

Depth (m) 0.50 Customer: Galway Co.Co.

Date Received 22-02-16 Date Testing started 05-04-16

Description: Mottled brown slightly sandy, slightly gravelly, SILT

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	20-04-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	92	GRAVEL
37.5	87	
28	78	
20	75	
14	72	
10	68	
6.3	65	
5	64	
3.35	60	
2	56	
1.18	53	SAND
0.6	49	
0.425	48	
0.3	45	
0.15	40	
0.063	32	SILT/CLAY
0.037	28	
0.026	26	
0.017	24	
0.010	21	
0.007	19	
0.005	16	
0.002	12	

Contract No: 18963 Report No. R71496

Contract: GCTP Phase 3 - Contact 1

BH: BH3/35

Sample No. AA39964 Lab. Sample No. A16/0991

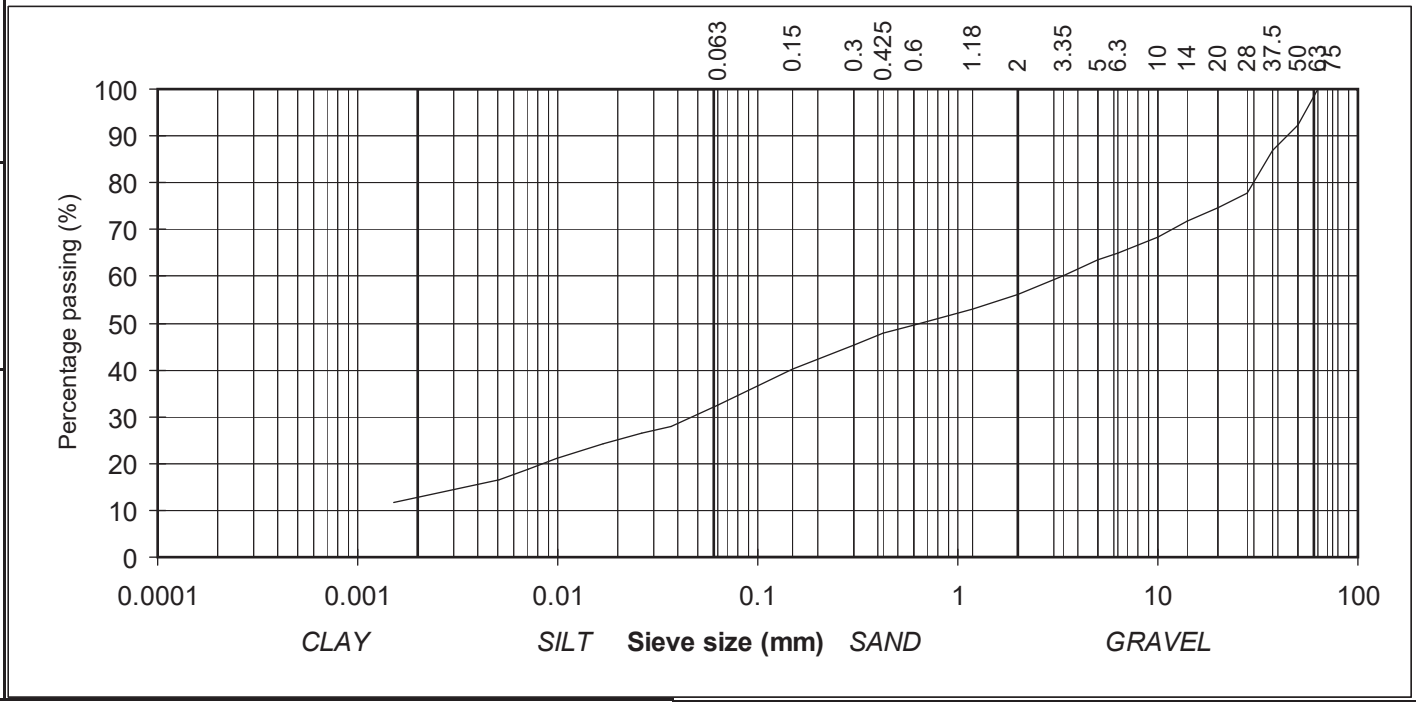
Sample Type: B

Depth (m) 1.00 Customer: Galway Co.Co.

Date Received 22-02-16 Date Testing started 05-04-16

Description: Mottled brown slightly sandy, gravelly, CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	20-04-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	88	
50	88	GRAVEL
37.5	88	
28	87	
20	83	
14	81	
10	79	
6.3	77	
5	76	
3.35	72	
2	70	
1.18	68	SAND
0.6	66	
0.425	64	
0.3	61	
0.15	44	
0.063	32	SILT/CLAY
0.039	25	
0.028	21	
0.018	19	
0.010	16	
0.007	13	
0.005	11	
0.002	7	

Contract No: 18963 Report No. R71250

Contract: GCTP Phase 3 - Contact 1

BH: BH3/36

Sample No. AA49749 Lab. Sample No. A16/0992

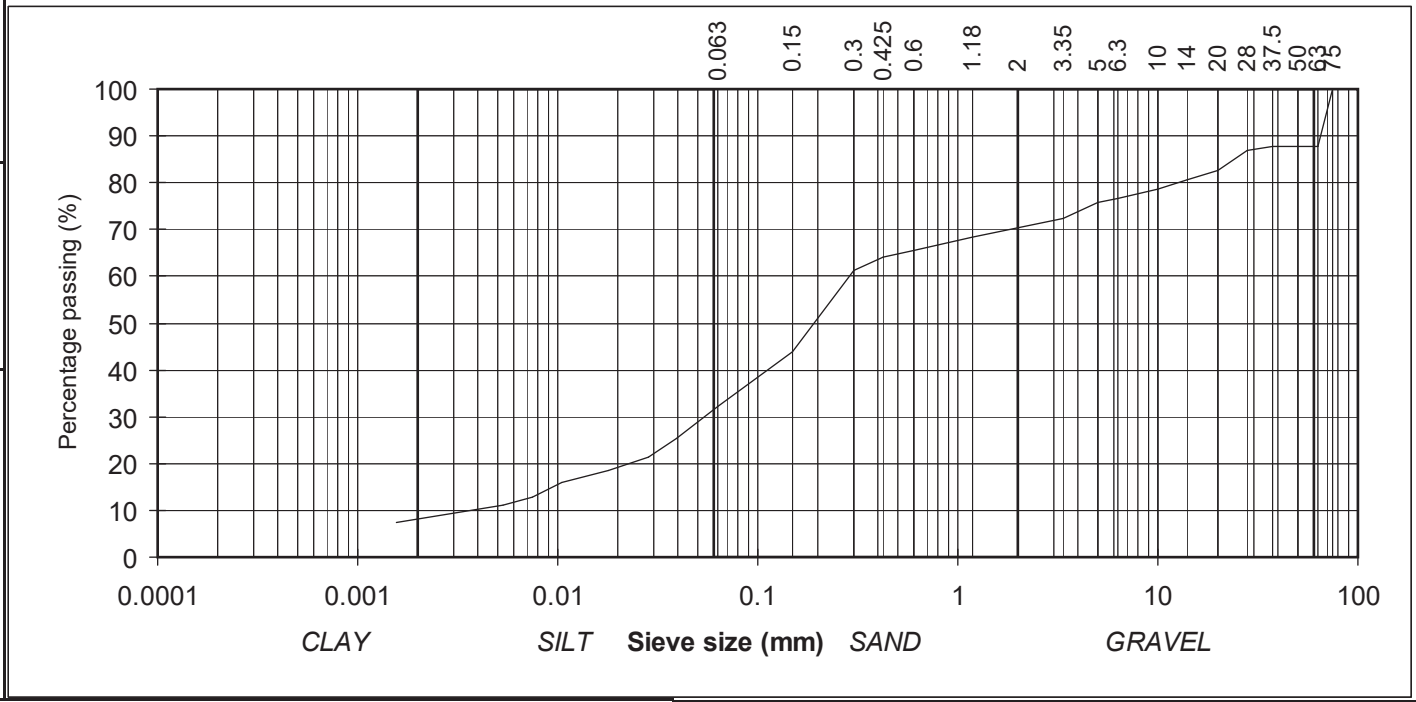
Sample Type: B

Depth (m) 0.10 Customer: Galway Co.Co.

Date Received 22-02-16 Date Testing started 15-03-16

Description: Brown sandy, slightly gravelly, SILT with some cobbles

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	01-04-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	98	
28	91	
20	81	
14	79	
10	76	
6.3	73	
5	71	
3.35	66	
2	61	
1.18	57	SAND
0.6	52	
0.425	50	
0.3	48	
0.15	43	
0.063	38	SILT/CLAY
0.036	36	
0.026	34	
0.016	32	
0.010	28	
0.007	26	
0.005	25	
0.001	16	

Contract No: 18963 Report No. R71497

Contract: GCTP Phase 3 - Contact 1

BH: BH3/40

Sample No. AA49469 Lab. Sample No. A16/0993

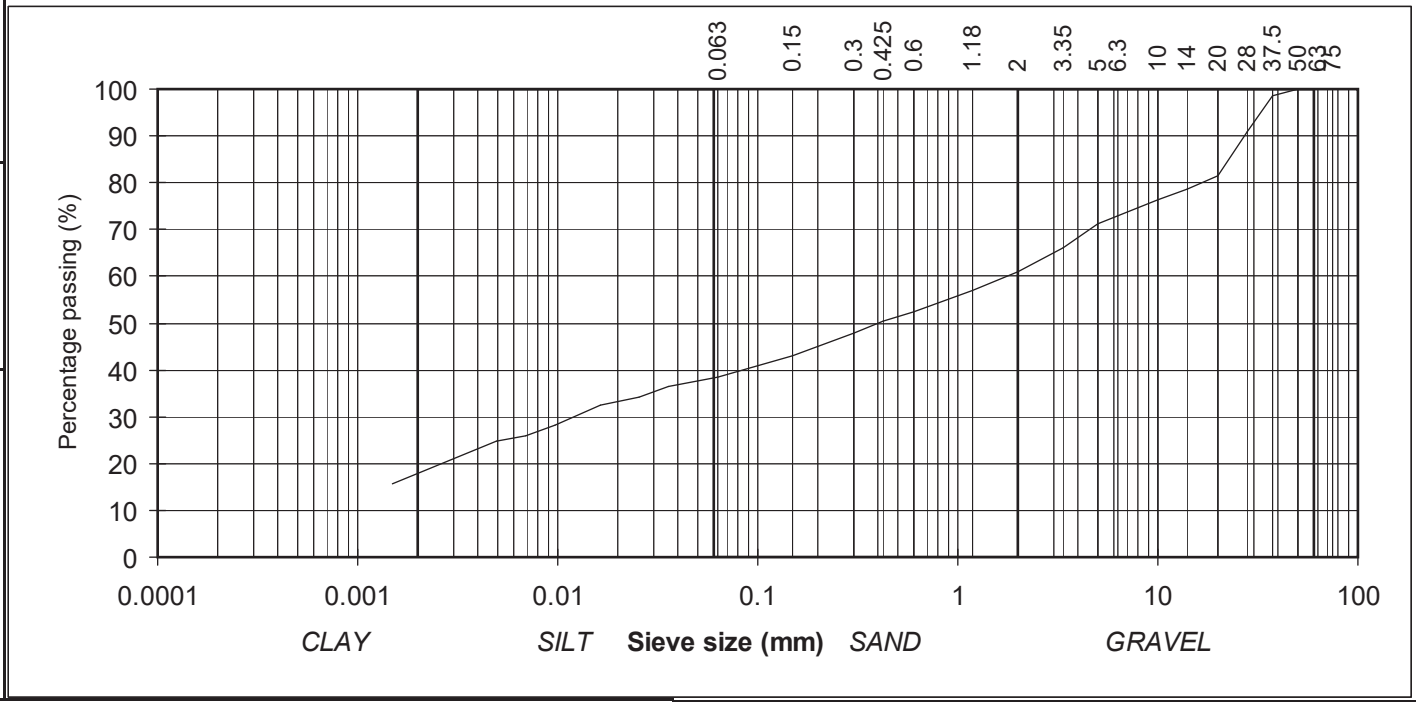
Sample Type: B

Depth (m) 0.15 Customer: Galway Co.Co.

Date Received 22-02-16 Date Testing started 05-04-16

Description: Brown slightly sandy, gravelly, CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	20-04-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	91	COBBLES
63	91	
50	91	GRAVEL
37.5	86	
28	83	
20	80	
14	77	
10	76	
6.3	70	
5	68	
3.35	60	
2	55	
1.18	52	SAND
0.6	47	
0.425	44	
0.3	40	
0.15	31	
0.063	22	SILT/CLAY
0.040	19	
0.028	17	
0.018	17	
0.010	14	
0.007	13	
0.005	11	
0.002	8	

Contract No: 18963 Report No. R71188

Contract: GCTP Phase 3 - Contact 1

BH: BH3/40

Sample No. AA49469 Lab. Sample No. A16/0994

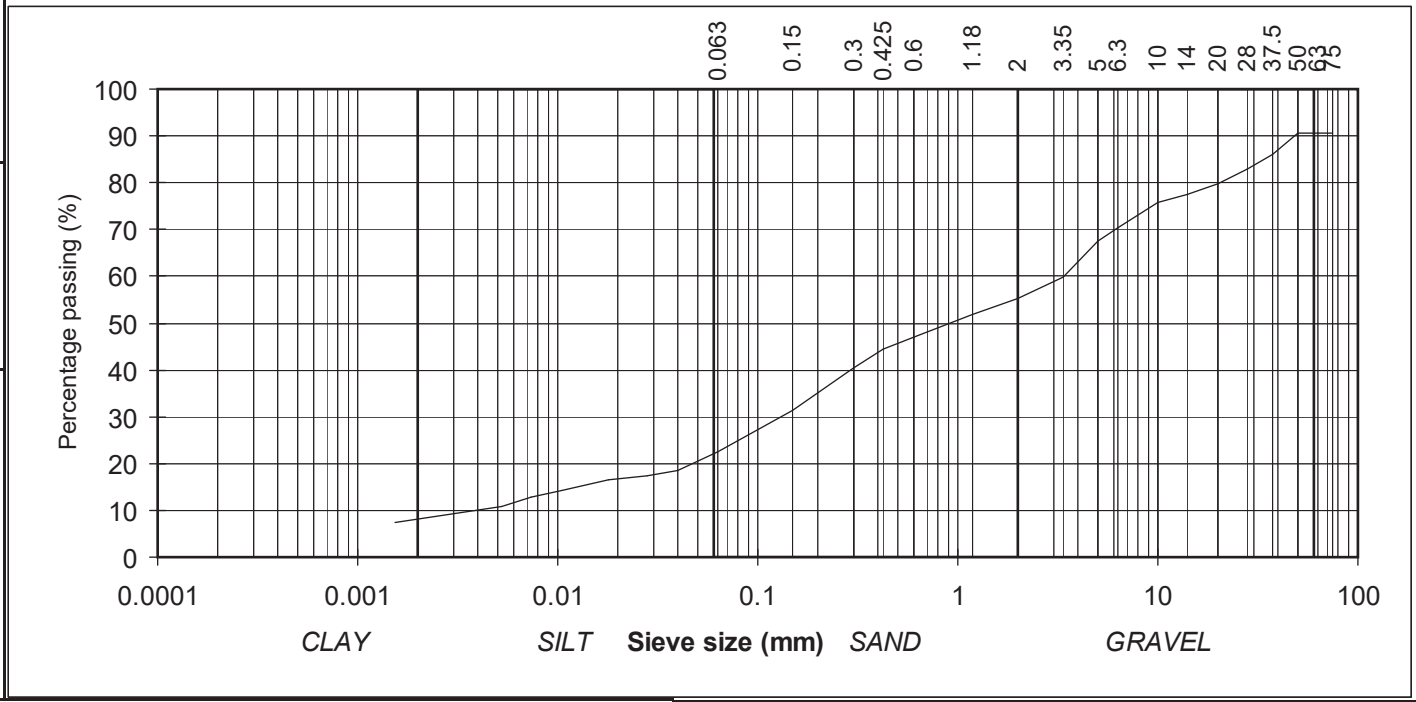
Sample Type: B

Depth (m) 0.50 Customer: Galway Co.Co.

Date Received 22-02-16 Date Testing started 05-04-16

Description: Brown slightly sandy, gravelly, SILT with some cobbles

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	20-04-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	95	
28	84	
20	80	
14	79	
10	77	
6.3	75	
5	74	
3.35	72	
2	70	
1.18	68	SAND
0.6	65	
0.425	64	
0.3	61	
0.15	53	
0.063	42	SILT/CLAY
0.037	36	
0.026	33	
0.017	32	
0.010	27	
0.007	24	
0.005	22	
0.002	13	

Contract No: 18963 Report No. R71618

Contract: GCTP Phase 3 - Contact 1

BH: BH3/48

Sample No. AA49471 Lab. Sample No. A16/0995

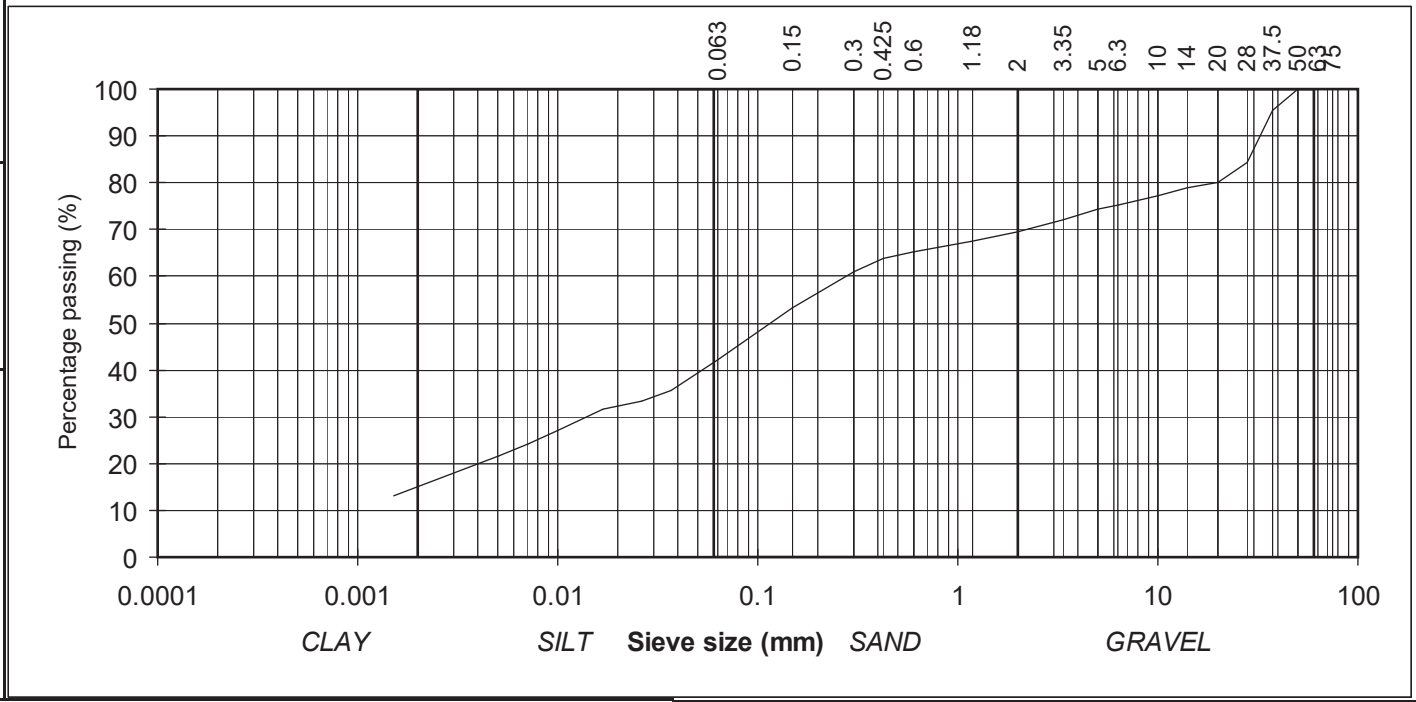
Sample Type: B

Depth (m) 0.10 Customer: Galway Co.Co.

Date Received 22-02-16 Date Testing started 05-04-16

Description: Light brown slightly sandy, slightly gravelly, SILT

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	21-04-16	1 of 1

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

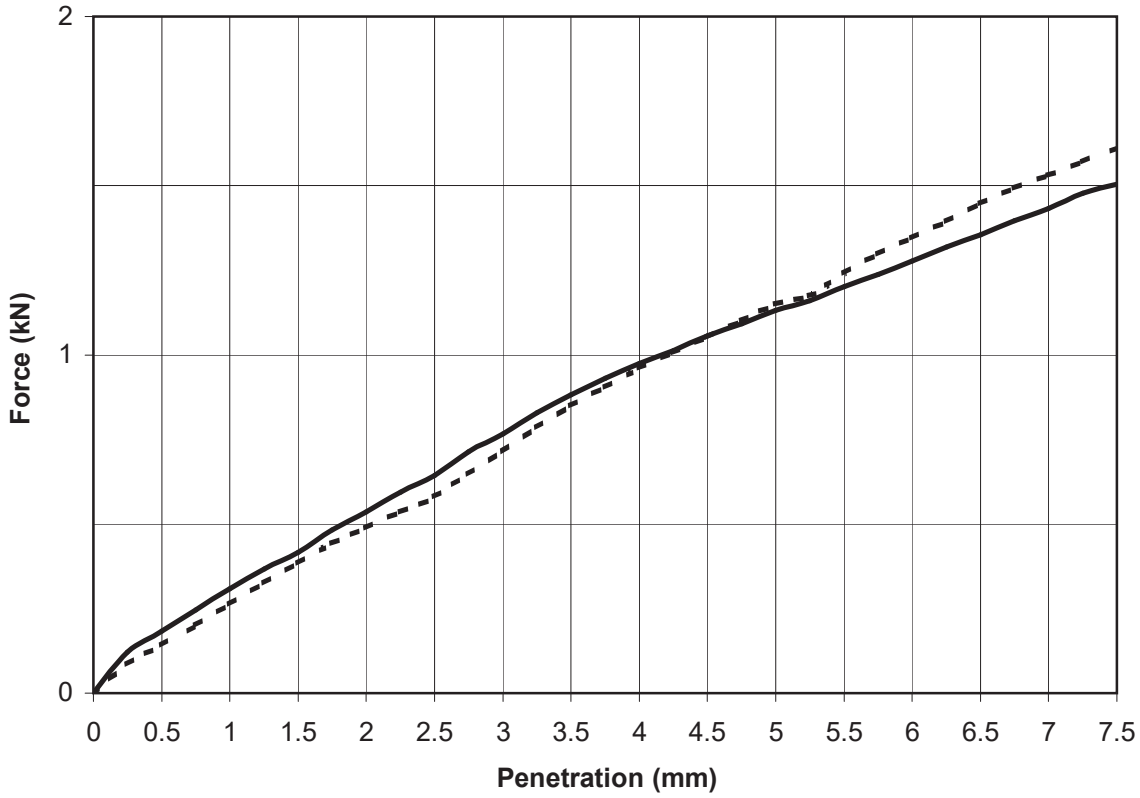
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)

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

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

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: ———— Top ---------- 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	Top	Base
CBR %	**5.7**	**5.8**
Moisture Content %	28	27

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

IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
H Byrne	11-04-16	1 of 1

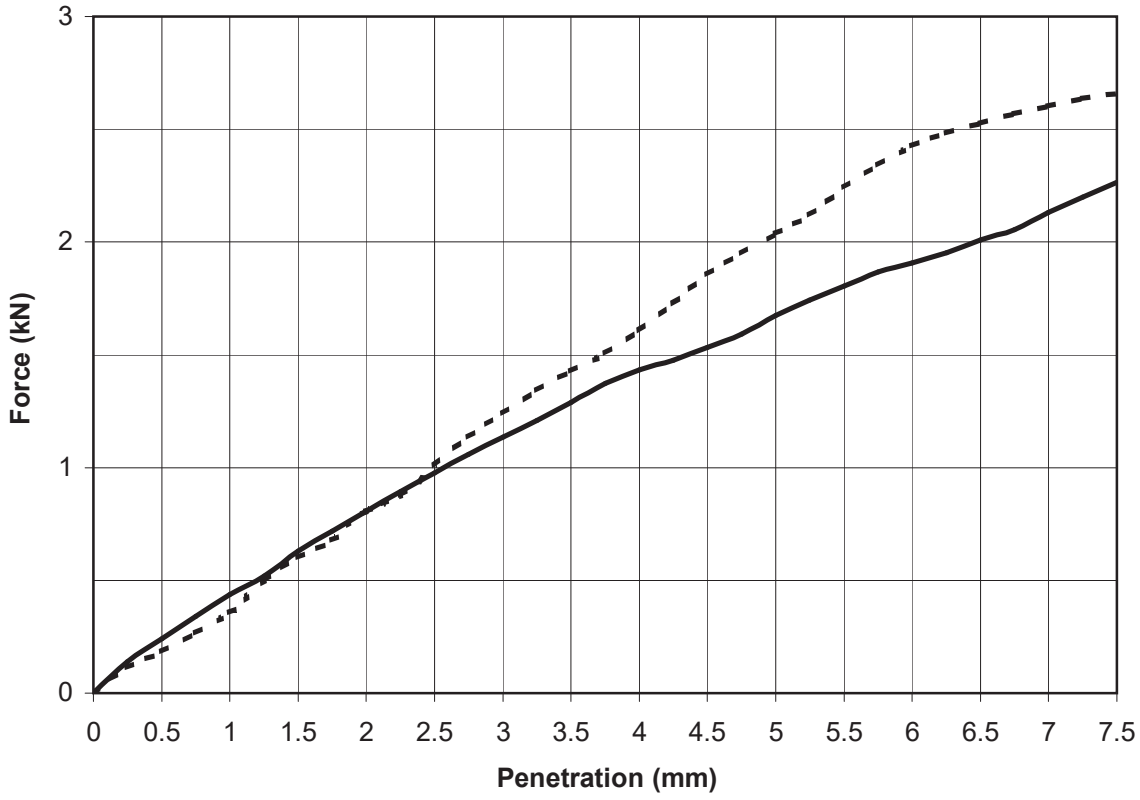
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)

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

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

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.	BH3/15	Sample No.	AA39961	Type:	B
Depth (m)	0.40	Lab sample No.	A16/0981		



Key: ———— Top ---------- Base

Description:	Brown silty/clayey sandy GRAVEL		
Initial Condition:	Soaked 4 Days		
Moisture Content (%):	19	Bulk Density (Mg/m^3):	1.97
Surcharge (kg):	4	Dry Density (Mg/m^3):	1.66
% Material >20mm:	23		
Method of compaction:	Static Compaction Method 2		

Test Result	Top	Base
CBR %	**8**	**10**
Moisture Content %	19	18

Persons authorized to approve reports

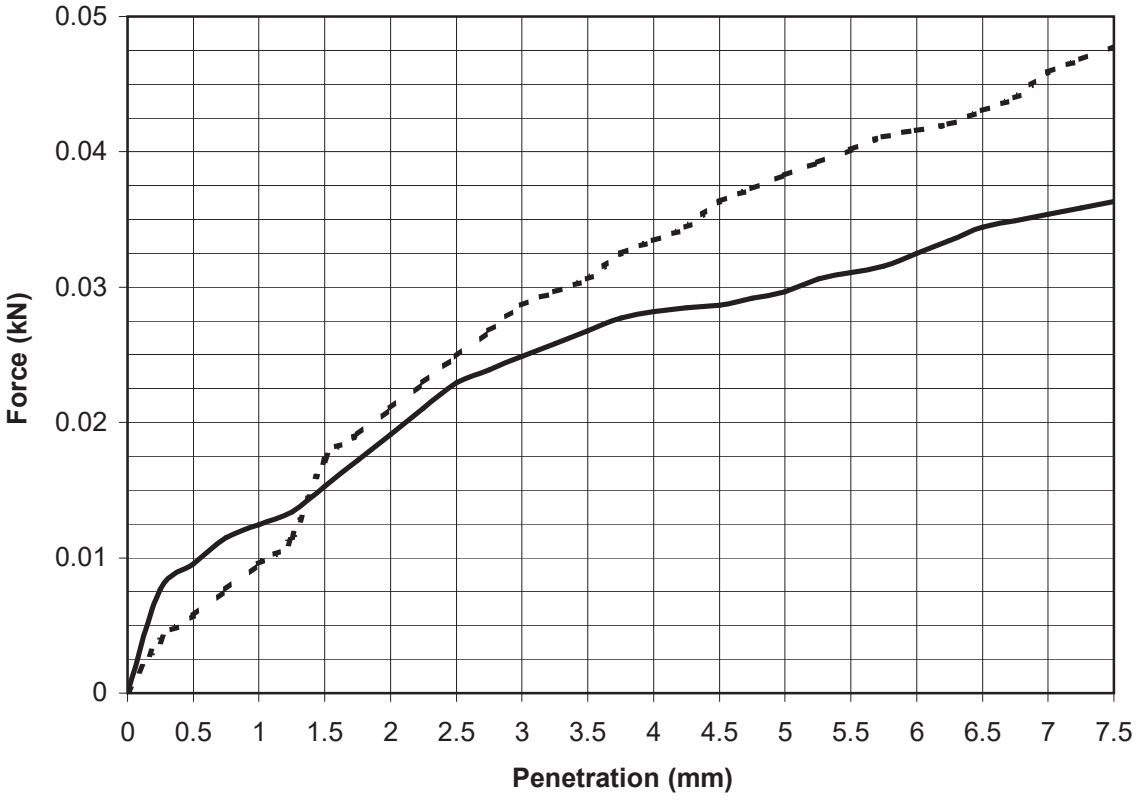
J Barrett (Dep. Quality Manager)
H Byrne (Quality Manager)

IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
H Byrne	11-04-16	1 of 1

IGSL Ltd Materials Laboratory Unit J5,M7 Business Park Naas Co.Kildare 045 899324	TEST REPORT Determination of California Bearing Ratio (CBR) Tested in accordance with BS1377:Part 4:1990, clause 7	ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1337

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: ———— Top ---------- 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 Compaction Method 2		

Test Result	Top	Base
CBR %	**0.2**	**0.2**
Moisture Content %	278	272

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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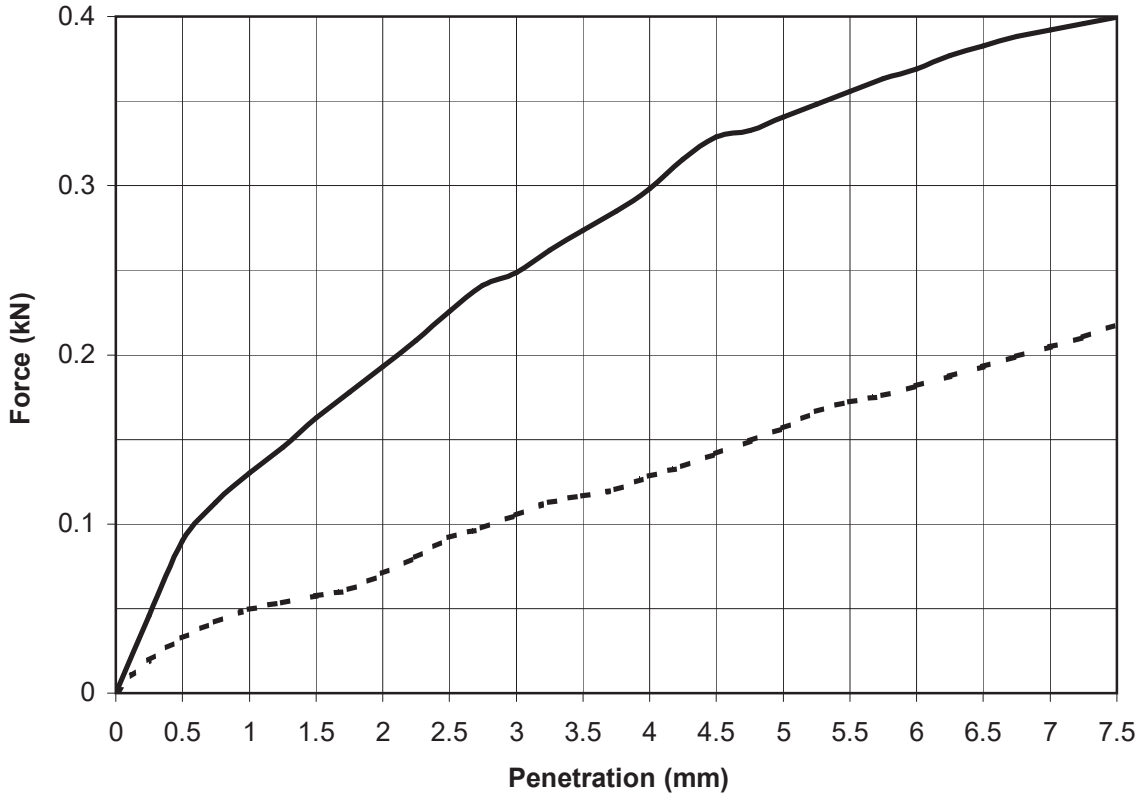
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)

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

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

Report No.	R71417	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.	BH3/27	Sample No.	AA48873	Type:	B
Depth (m)	1.00	Lab sample No.	A16/0988		



Key: ———— Top ---------- Base

Description:	Brown slightly sandy, gravelly, CLAY		
Initial Condition:	Soaked 4 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 Compaction Method 2		

Test Result	Top	Base
CBR %	**1.7**	**0.8**
Moisture Content %	12	12

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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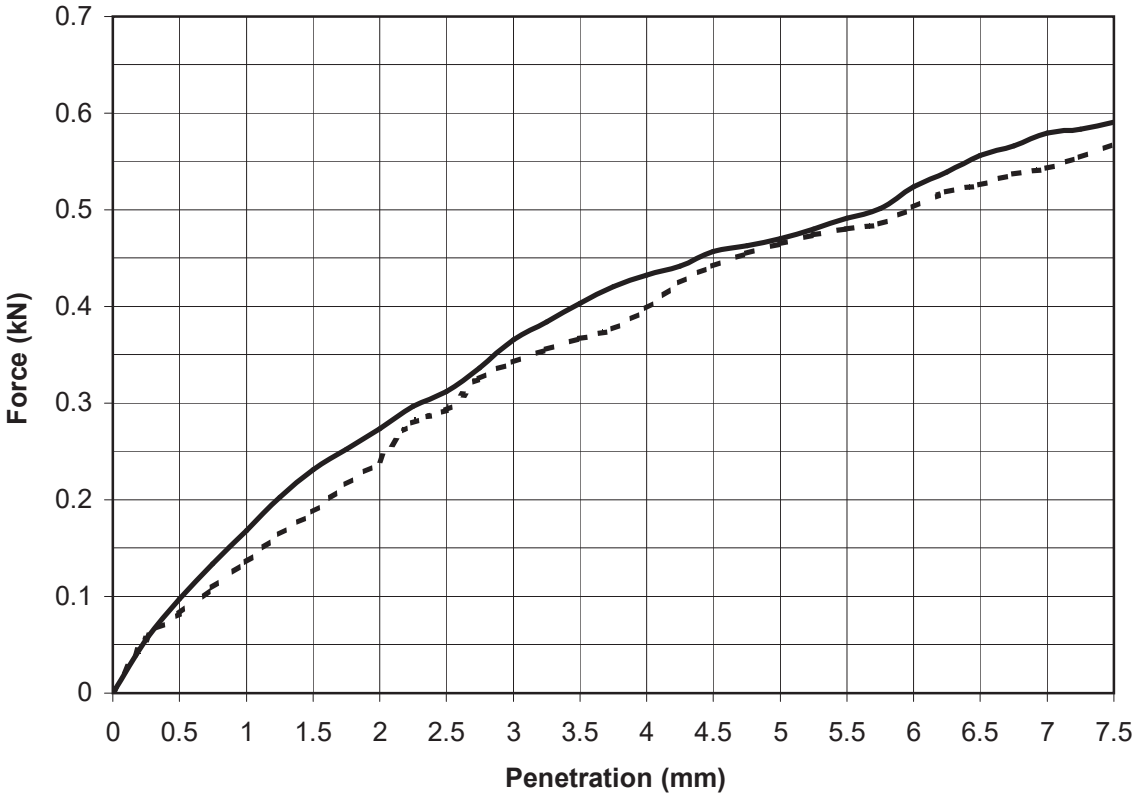
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)

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

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1337

Report No.	R71418	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.	BH3/28	Sample No.	AA39957 Type: B
Depth (m)	0.20	Lab sample No.	A16/39957



Key: ———— Top ---------- Base

Description:	Brown slightly sandy, gravelly, SILT		
Initial Condition:	Soaked 4Days		
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 Compaction Method 2		

Test Result	Top	Base
CBR %	**2.4**	**2.3**
Moisture Content %	24	26

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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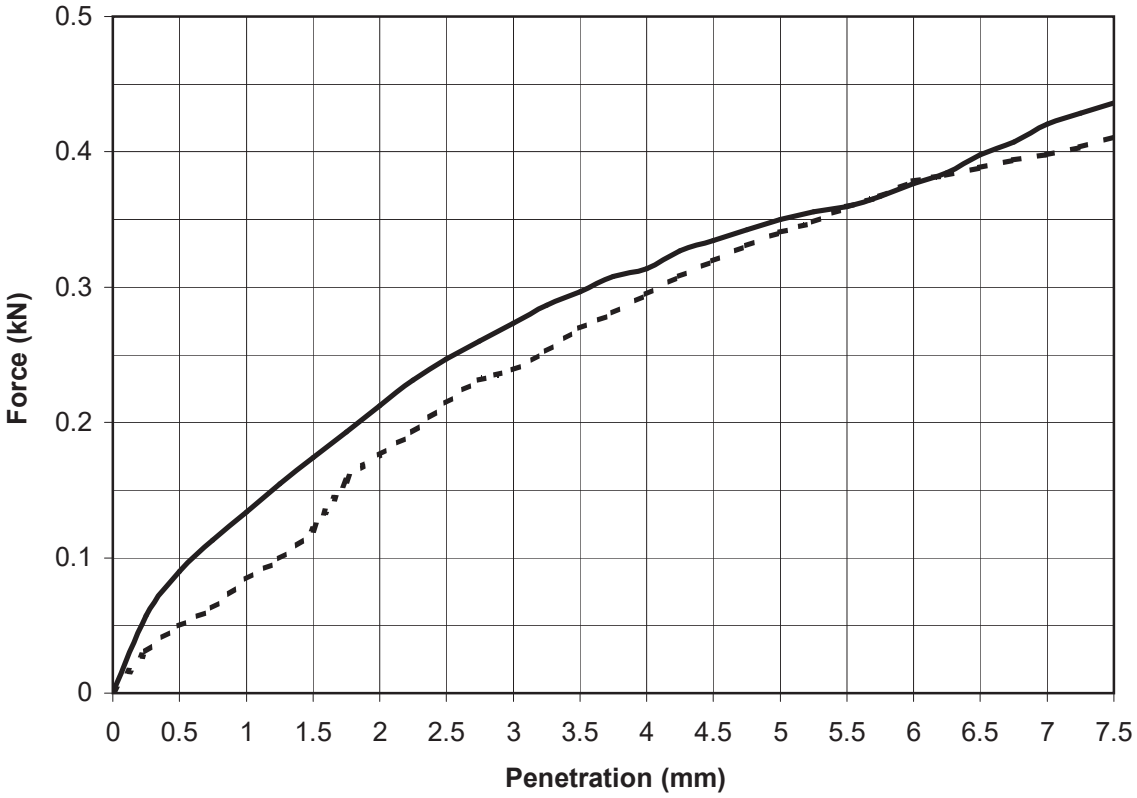
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)

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

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

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 slightly sandy, gravelly, CLAY		
Initial Condition:	Soaked 4 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 Compaction Method 2		

Test Result	Top	Base
CBR %	**1.9**	**1.7**
Moisture Content %	28	27

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

IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
H Byrne	12-04-16	1 of 1

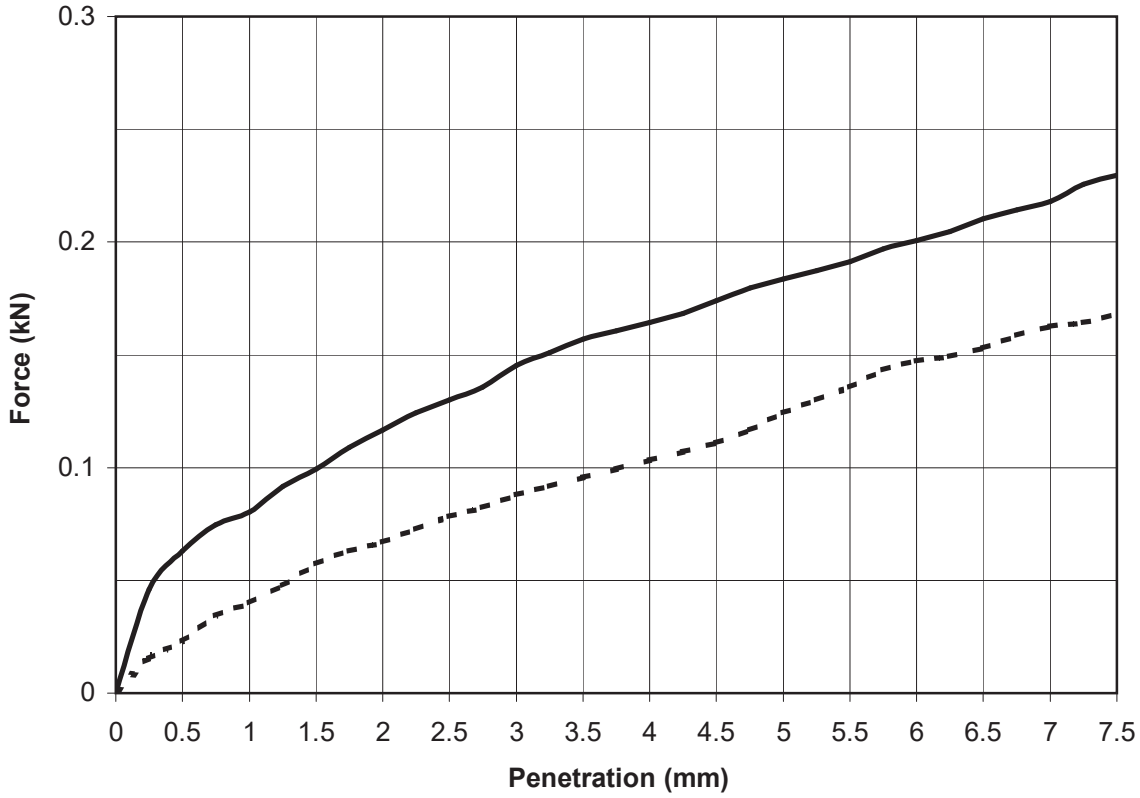
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)

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

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

Report No.	R71422	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.	BH3/48	Sample No.	AA49471	Type:	B
Depth (m)	0.15	Lab sample No.	A16/49471		



Key: ———— Top ---------- Base

Description:	Light brown slightly sandy, slightly gravelly, SILT		
Initial Condition:	Soaked 14 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 Compaction Method 2		

Test Result	Top	Base
CBR %	**1.0**	**0.6**
Moisture Content %	33	34

Persons authorized to approve reports

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

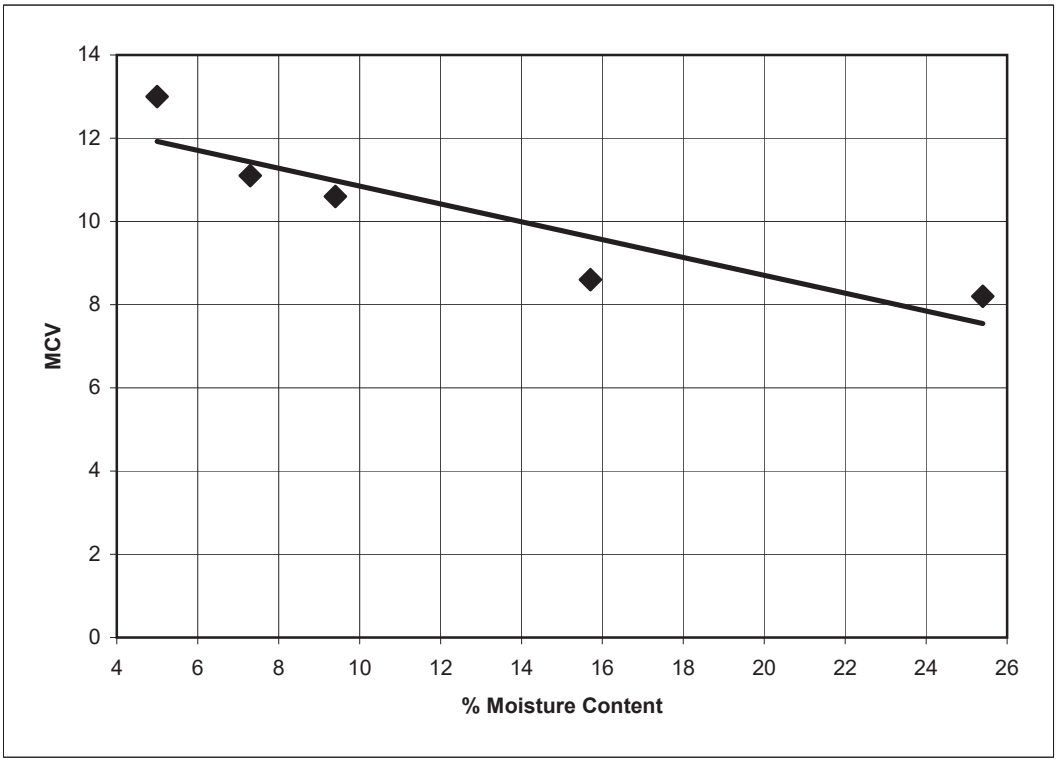
IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
H Byrne	12-04-16	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.	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	Approved by	Date	Page No.
	H Byrne	15-04-16	1 of 1

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

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

Report No.	**R71423**
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):	B
Sample Received:	12-02-16
Date Tested:	08-04-16
Sample Cert:	N/A
Moisture Content (%):	28
% Particles > 20mm (By dry mass):	22
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
	H Byrne	12-04-16	1 of 1

Laboratory Report

2788

GEO Site & Testing Services Ltd

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	Qty
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	2
Remoulding Specimen - @ Non Accredited Test	2
Extra over items for test duration in excess of four days.	17
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

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

Consolidated Undrained Triaxial Compression Test

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/m^3	2.31

D P Rand

Checked and Approved By

26/04/16
Date

Client Ref

18963

G.C.T.P

Contract No

30537

GSTL
GEO SITE & TESTING SERVICES LTD

Consolidated Undrained Triaxial Compression Test

BS 1377 : Part 8 : 1990

Specimen Details

Borehole		BH3/27
Sample No.		A16/0987
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	y
Base Drain Used	y
Side Drains Used	y
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.	$m^2/yr.$	0.11726	0.12759	0.18629

D P Grant

Checked and Approved By

26/04/16
Date

Client Ref

18963

G.C.T.P

Contract No

30537

GSTL
GEO SITE & TESTING SERVICES LTD

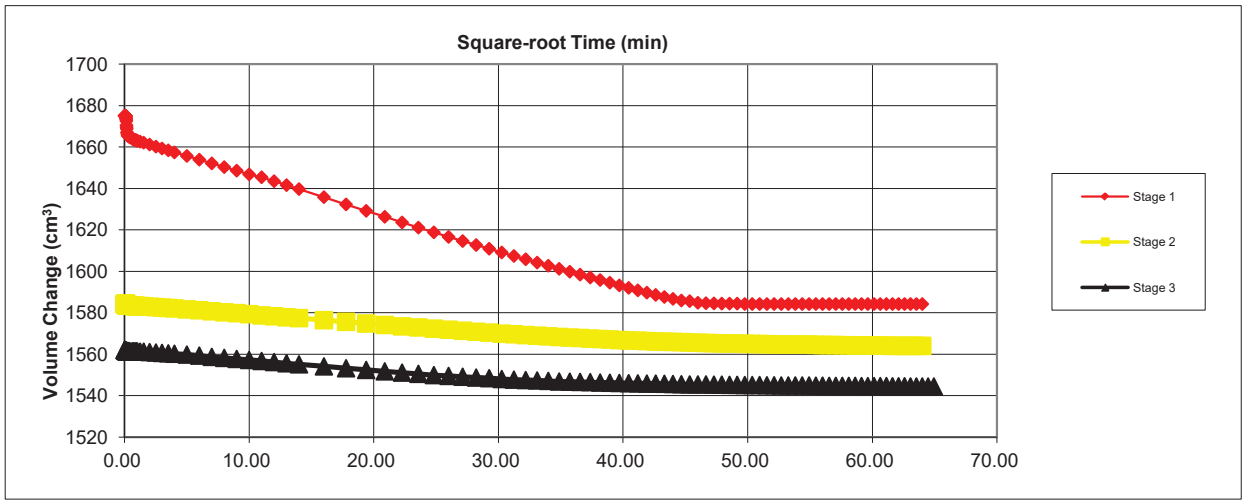
Consolidated Undrained Triaxial Compression Test

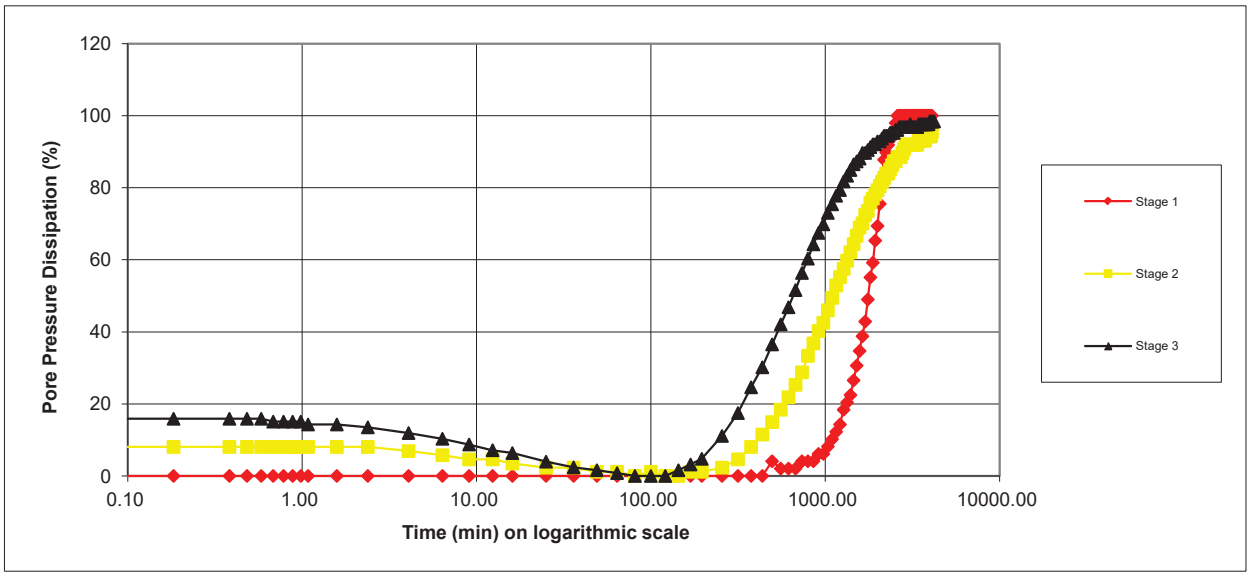
BS 1377 : Part 8 : 1990

Specimen Details

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

Consolidation Stage





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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

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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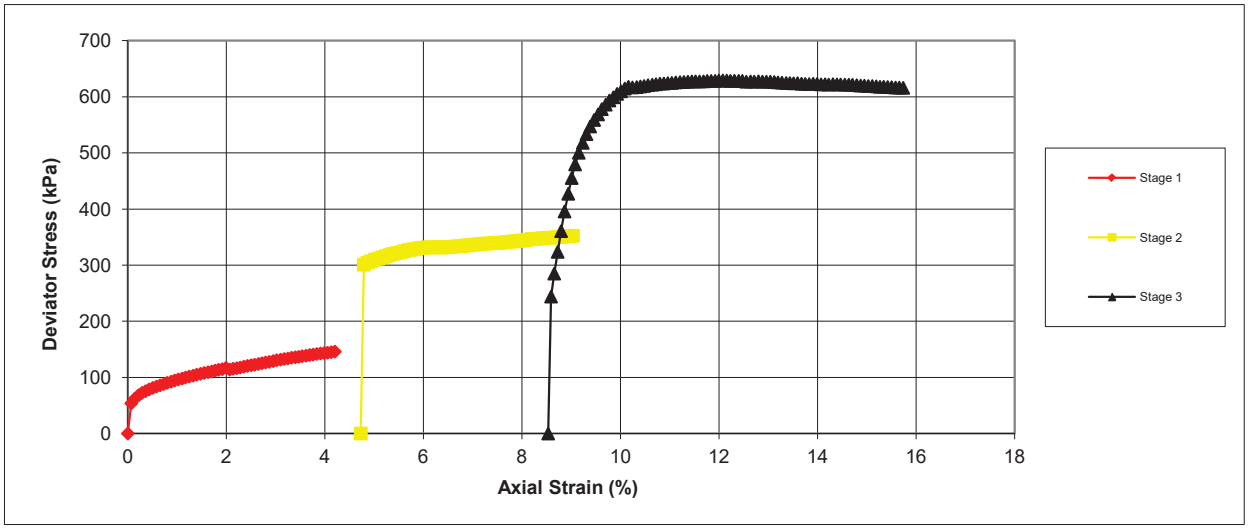
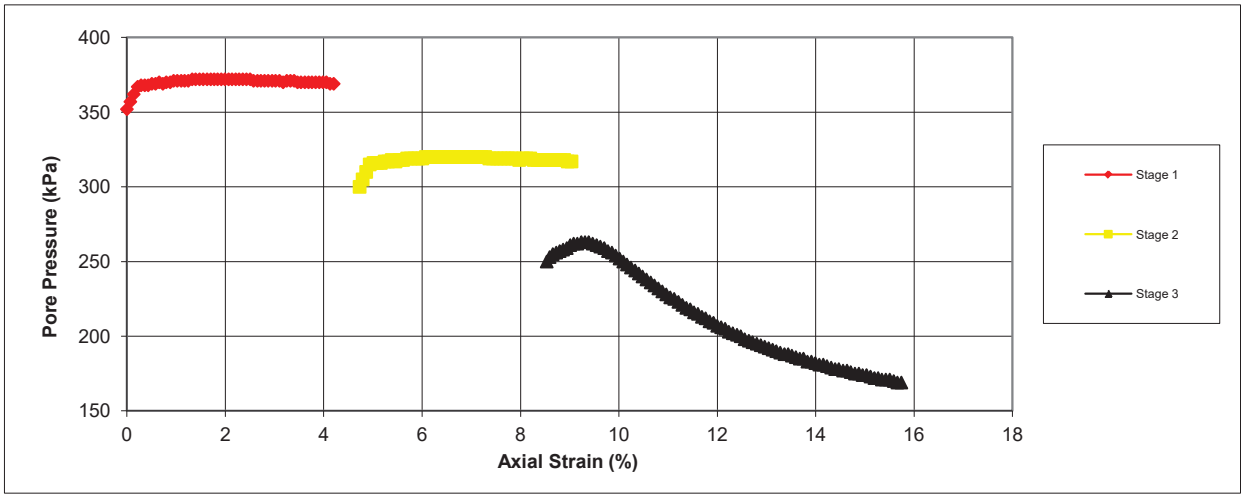
Specimen Details

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
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Client Ref

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Contract No

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G.C.T.P

GSTL
GEO SITE & TESTING SERVICES LTD

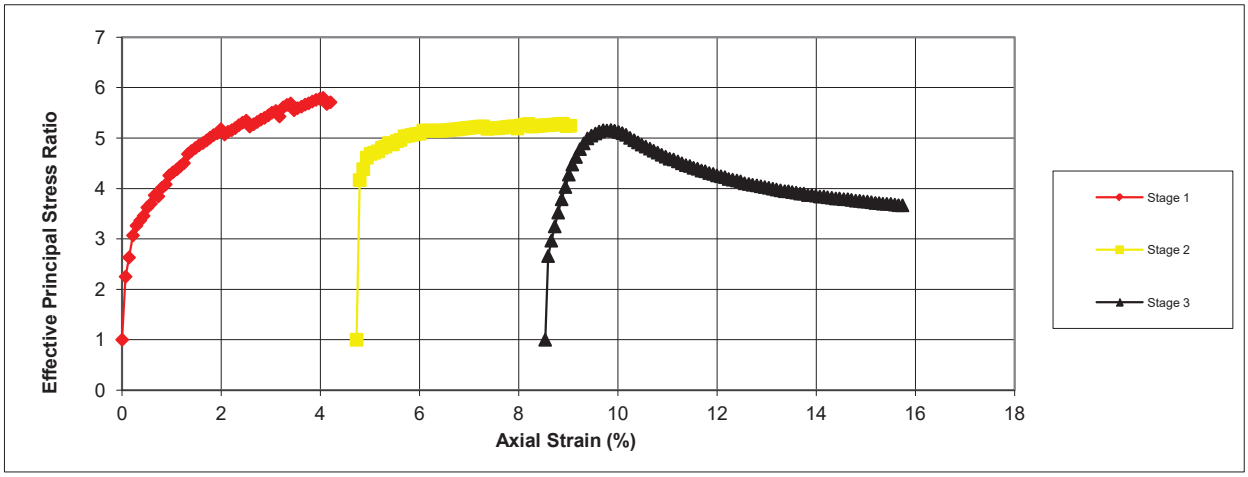
Consolidated Undrained Triaxial Compression Test

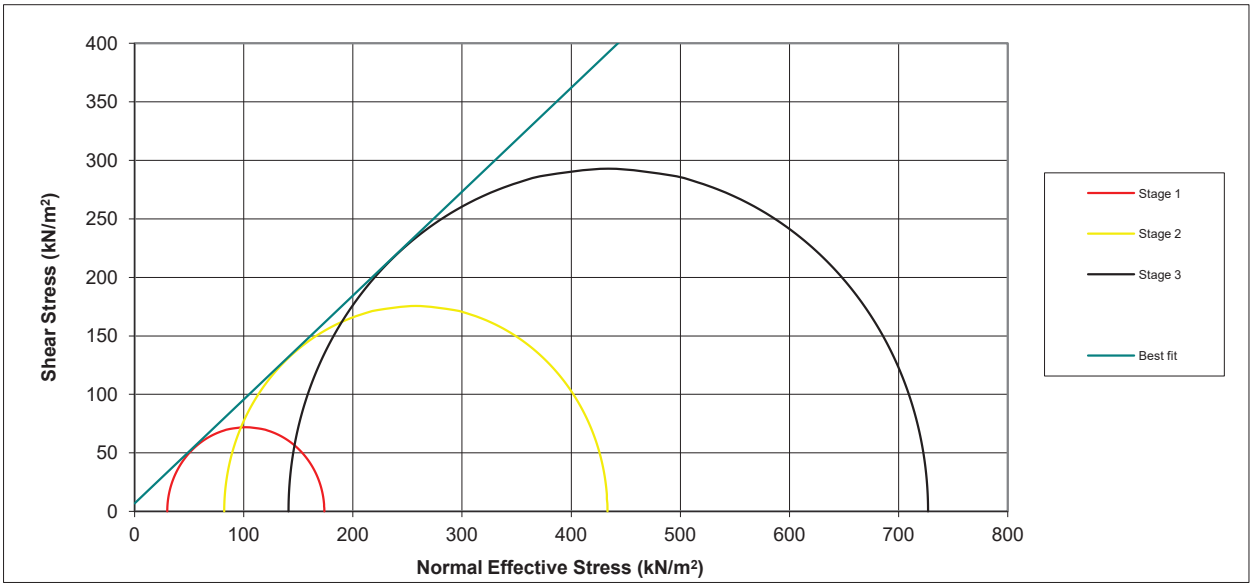
BS 1377 : Part 8 : 1990

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
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Contract No

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GSTL
GEO SITE & TESTING SERVICES LTD

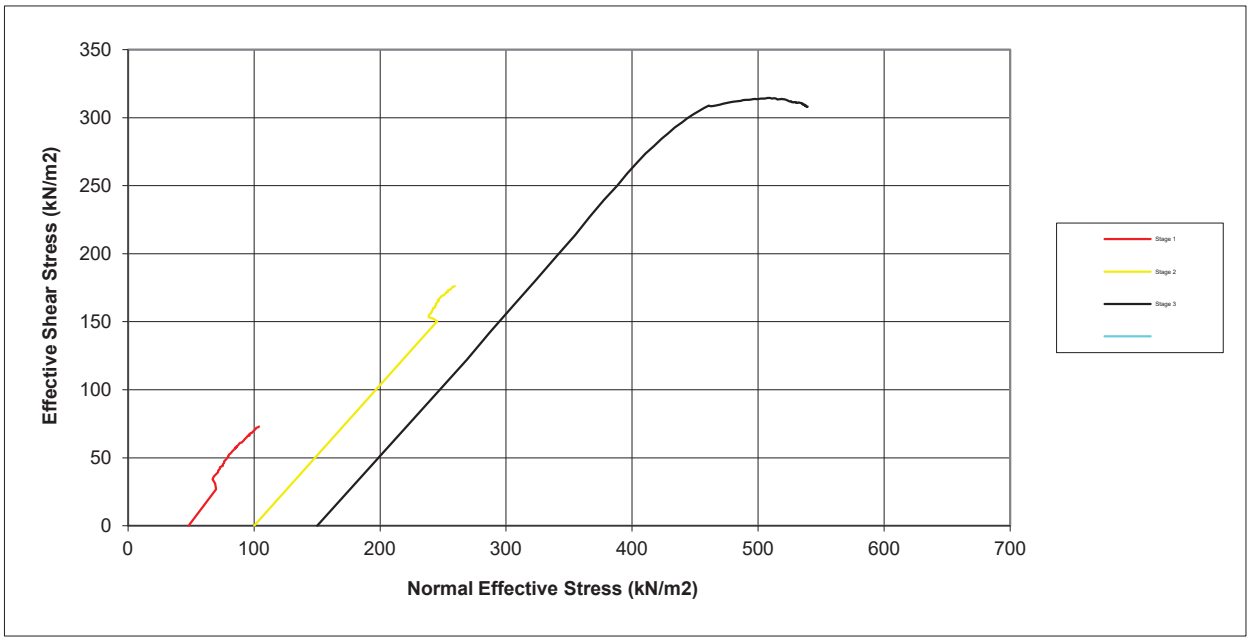
Consolidated Undrained Triaxial Compression Test

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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Consolidated Undrained Triaxial Compression Test

BS 1377 : Part 8 : 1990

Specimen Details

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

D P Evans

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GSTL
GEO SITE & TESTING SERVICES LTD

Consolidated Undrained Triaxial Compression Test

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/m^3	2.65
(assumed/measured)		assumed

Final Specimen Conditions

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

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26/04/16
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GEO SITE & TESTING SERVICES LTD

Consolidated Undrained Triaxial Compression Test

BS 1377 : Part 8 : 1990

Specimen Details

Borehole		BH3/35
Sample No.		A16/0990
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	y
Base Drain Used	y
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.	$m^2/yr.$	0.15669	0.18841	0.27855

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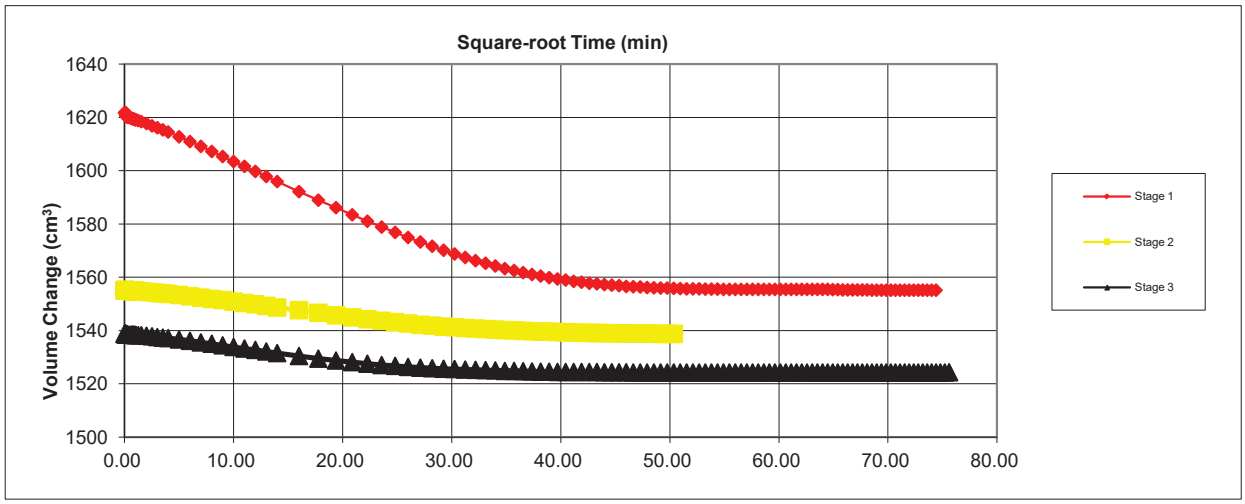
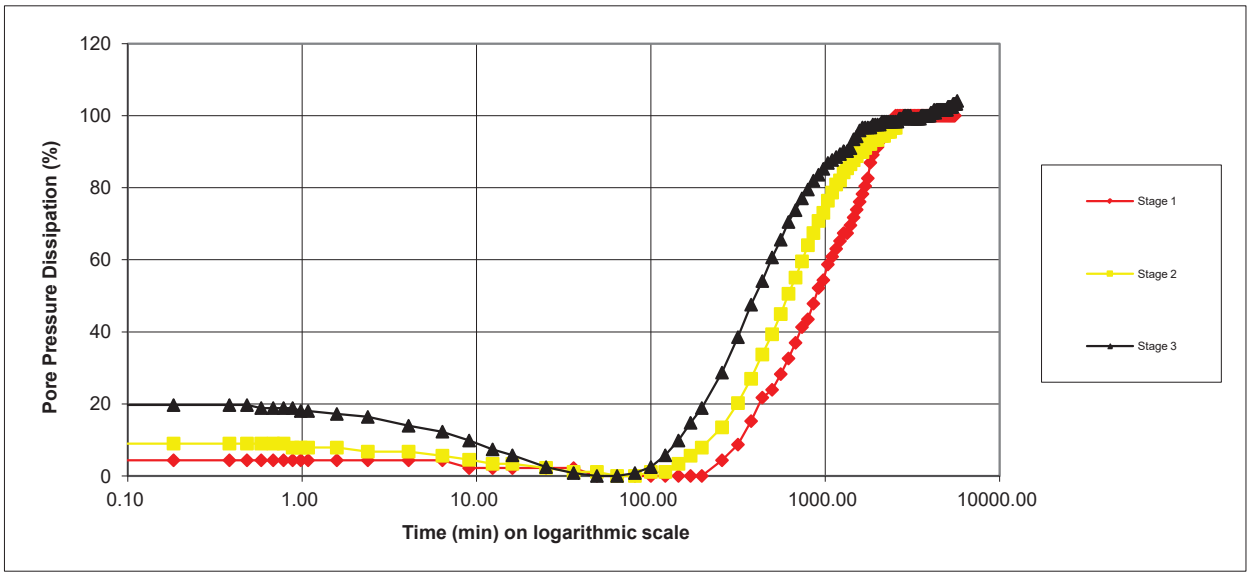
BS 1377 : Part 8 : 1990

Specimen Details

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

Consolidation Stage





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Consolidated Undrained Triaxial Compression Test

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 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

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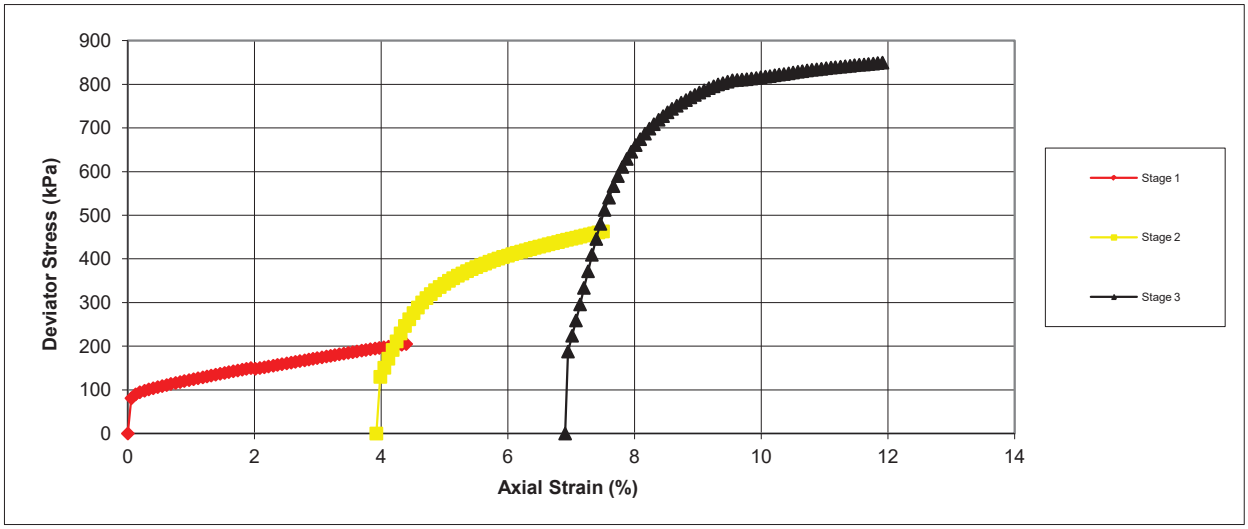
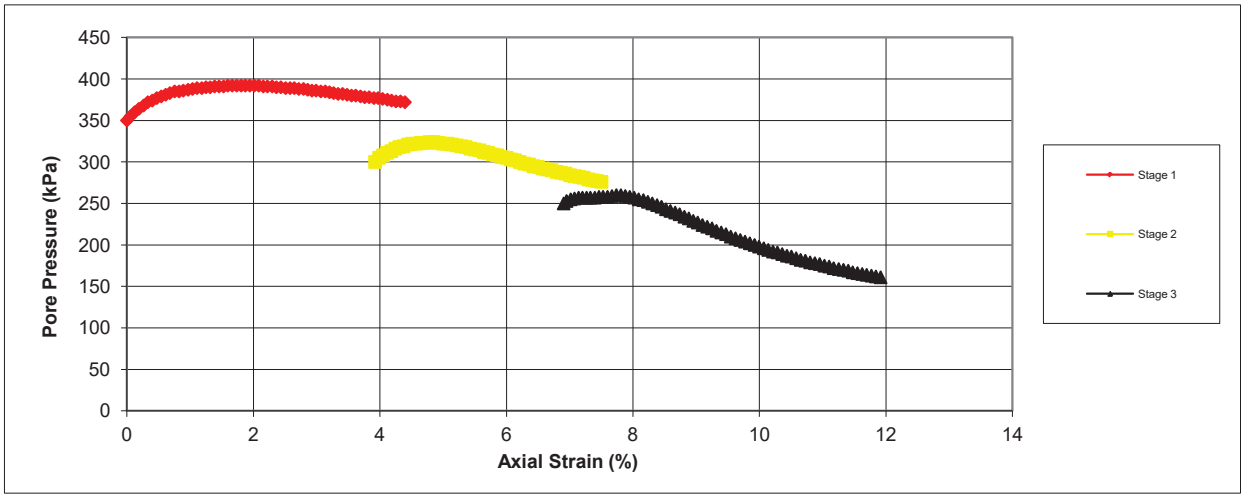
Borehole		BH3/35
Sample No.		A16/0990
Depth	from(m)	0.5
Depth	to(m)	0.50

Shearing Stage





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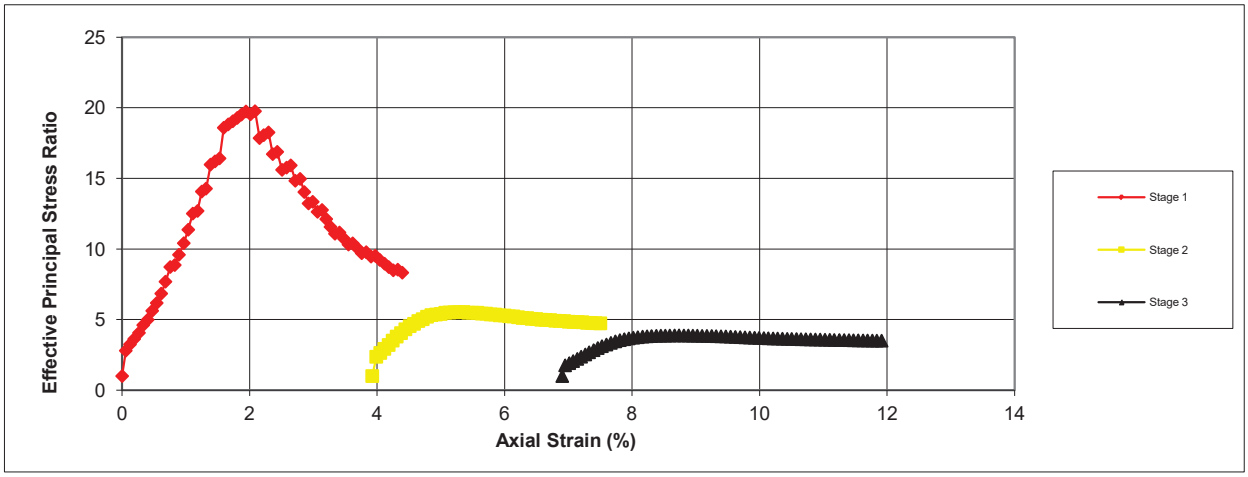
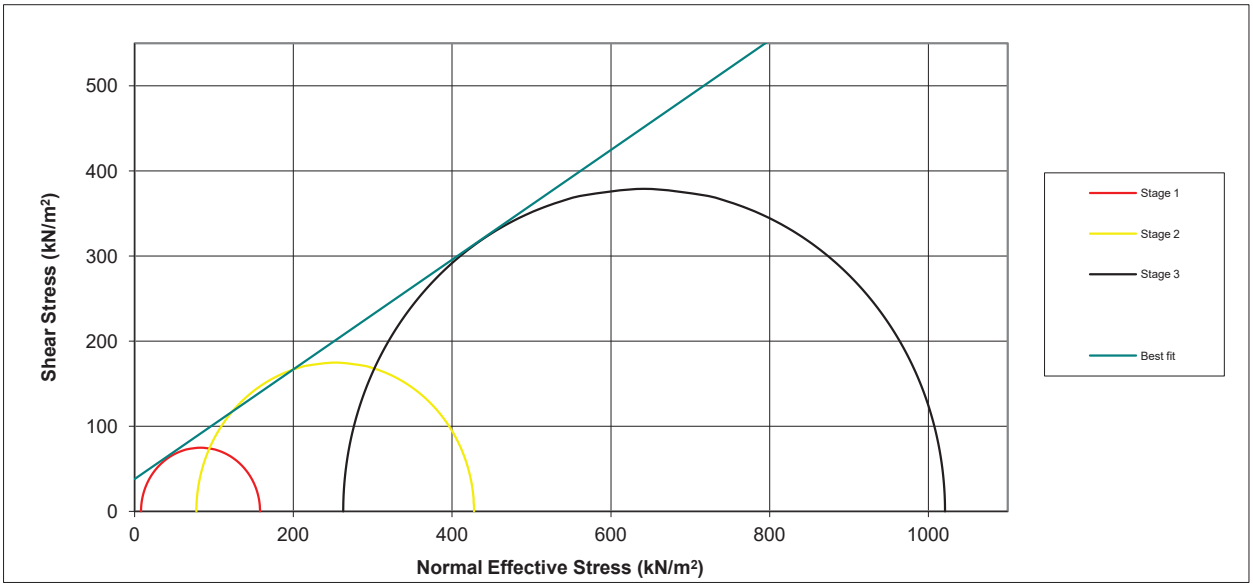
BS 1377 : Part 8 : 1990

Specimen Details

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

Shearing Stage





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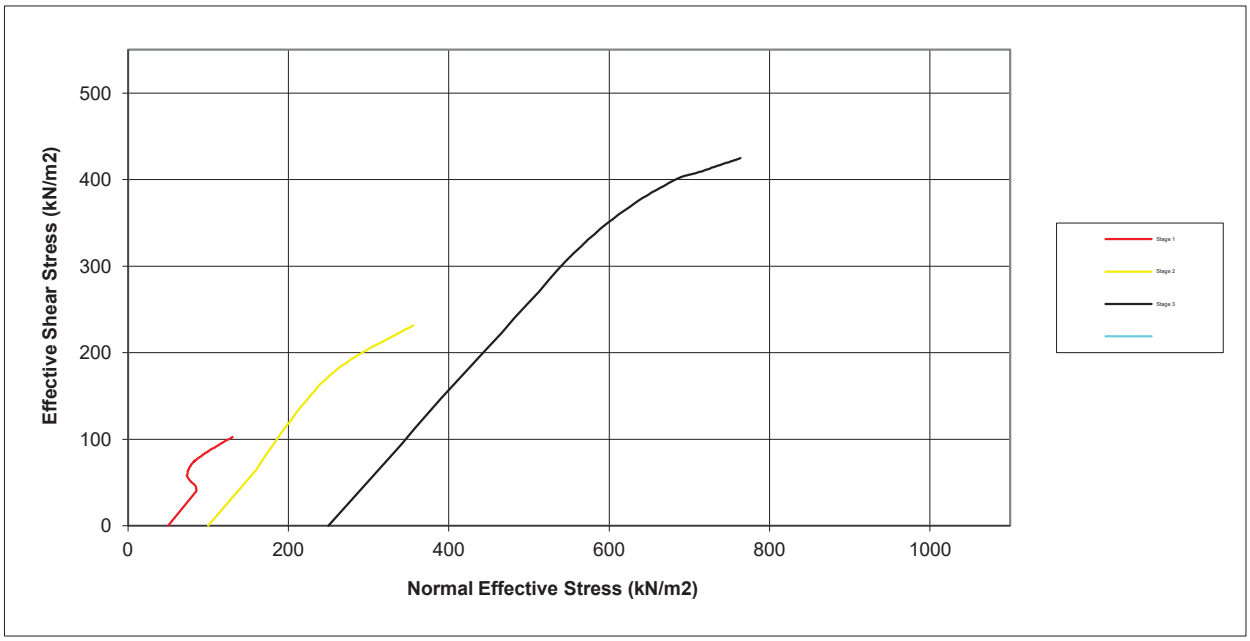
Consolidated Undrained Triaxial Compression Test

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



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Consolidated Undrained Triaxial Compression Test

BS 1377 : Part 8 : 1990

Specimen Details

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

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Checked and Approved By

26/04/16
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Contract No

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GEO SITE & TESTING SERVICES LTD

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

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 1331

Report No. **R70977** Contract No. 18963 Contract Name: GCTP Phase 3 Contract 1 GI

Customer Galway Co.Co.

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

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

Notes: Preparation: WS - Wet sieved; AR - As received; NP - Non plastic

Liquid Limit Clause: 4.3 Cone Penetrometer definitive method; 4.4 Cone Penetrometer one point method

Sample Type: B - bulk disturbed; U - Undisturbed

Remarks:

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

Opinions and interpretations are outside the scope of accreditation.

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	Date	Page
H Byrne	05-01-16	1 of 1

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	92	GRAVEL
37.5	79	
28	61	
20	57	
14	51	
10	46	
6.3	41	
5	39	
3.35	34	
2	30	
1.18	26	SAND
0.6	22	
0.425	20	
0.3	18	
0.15	14	
0.063	11	SILT/CLAY

Contract No: 18963 Report No. R71792

Contract: GCTP Phase 3 - Contact 1

BH: BH3/18

Sample No. AA39965 Lab. Sample No. A16/0998

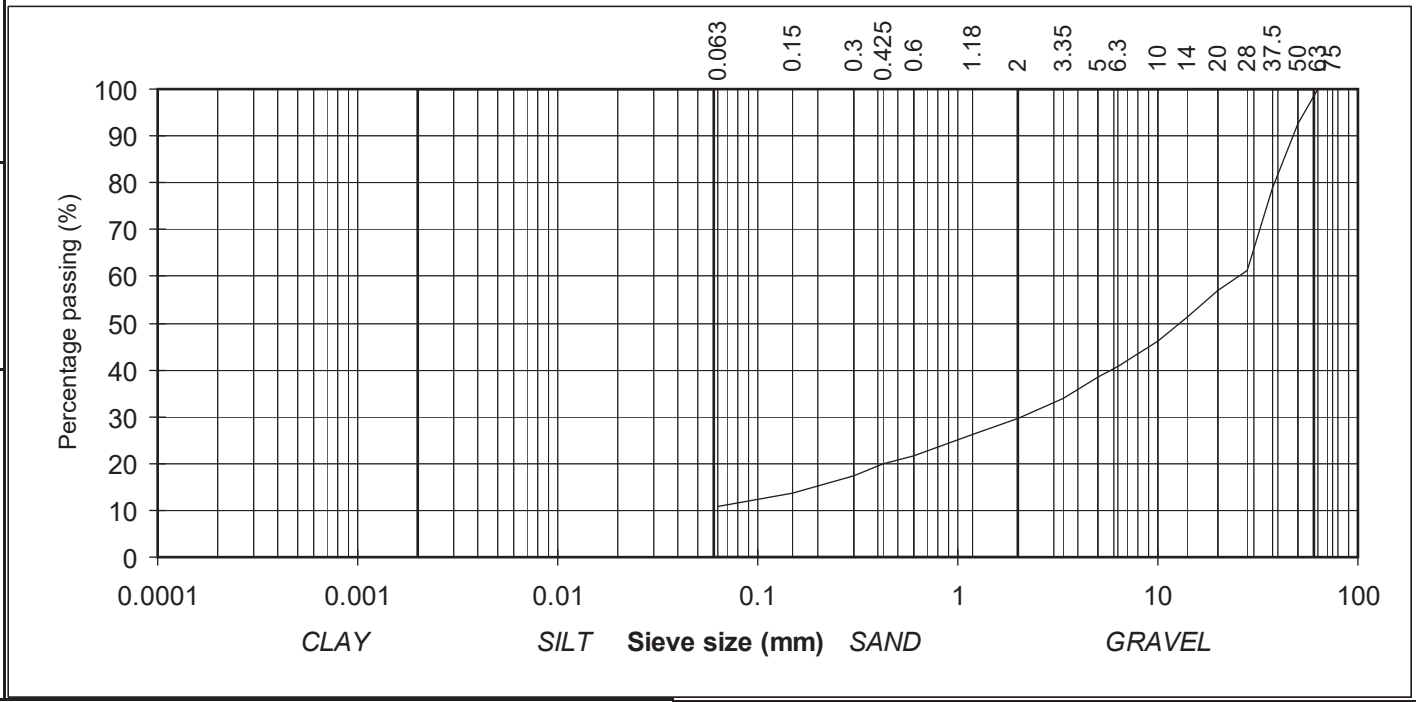
Sample Type: B

Depth (m) 0.50 Customer: Galway Co.Co.

Date Received 26-02-16 Date Testing started 30-03-16

Description: Dark brown clayey/silty, sandy, GRAVEL

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	28-04-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	87	
28	81	
20	73	
14	67	
10	61	
6.3	53	
5	51	
3.35	46	
2	40	
1.18	35	SAND
0.6	29	
0.425	28	
0.3	25	
0.15	20	
0.063	15	SILT/CLAY

Contract No: 18963 Report No. R71494

Contract: GCTP Phase 3 - Contact 1

BH: BH3/30

Sample No. AA39968 Lab. Sample No. A16/0999

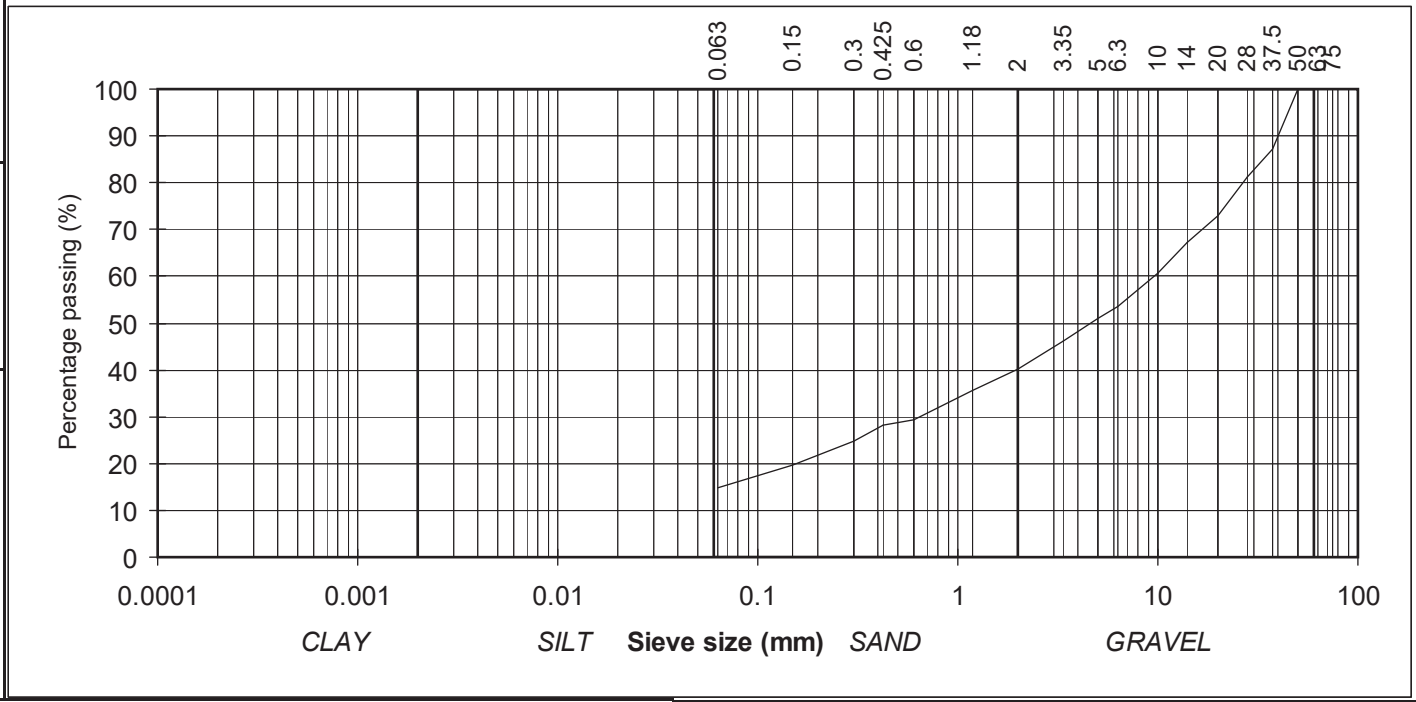
Sample Type: B

Depth (m) 0.15 Customer: Galway Co.Co.

Date Received 26-02-16 Date Testing started 30-03-16

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

Remarks Sample size did not meet the requirements of BS1377 . Red brick and plastic in sample



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	13-04-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	91	
28	91	
20	91	
14	90	
10	89	
6.3	88	
5	87	
3.35	86	
2	85	
1.18	83	SAND
0.6	80	
0.425	79	
0.3	76	
0.15	69	
0.063	58	SILT/CLAY
0.035	49	
0.025	47	
0.016	42	
0.010	36	
0.007	31	
0.005	27	
0.002	16	

Contract No: 18963 Report No. R71992

Contract: GCTP Phase 3 - Contact 1

BH: BH3/31

Sample No. AA39971 Lab. Sample No. A16/1002

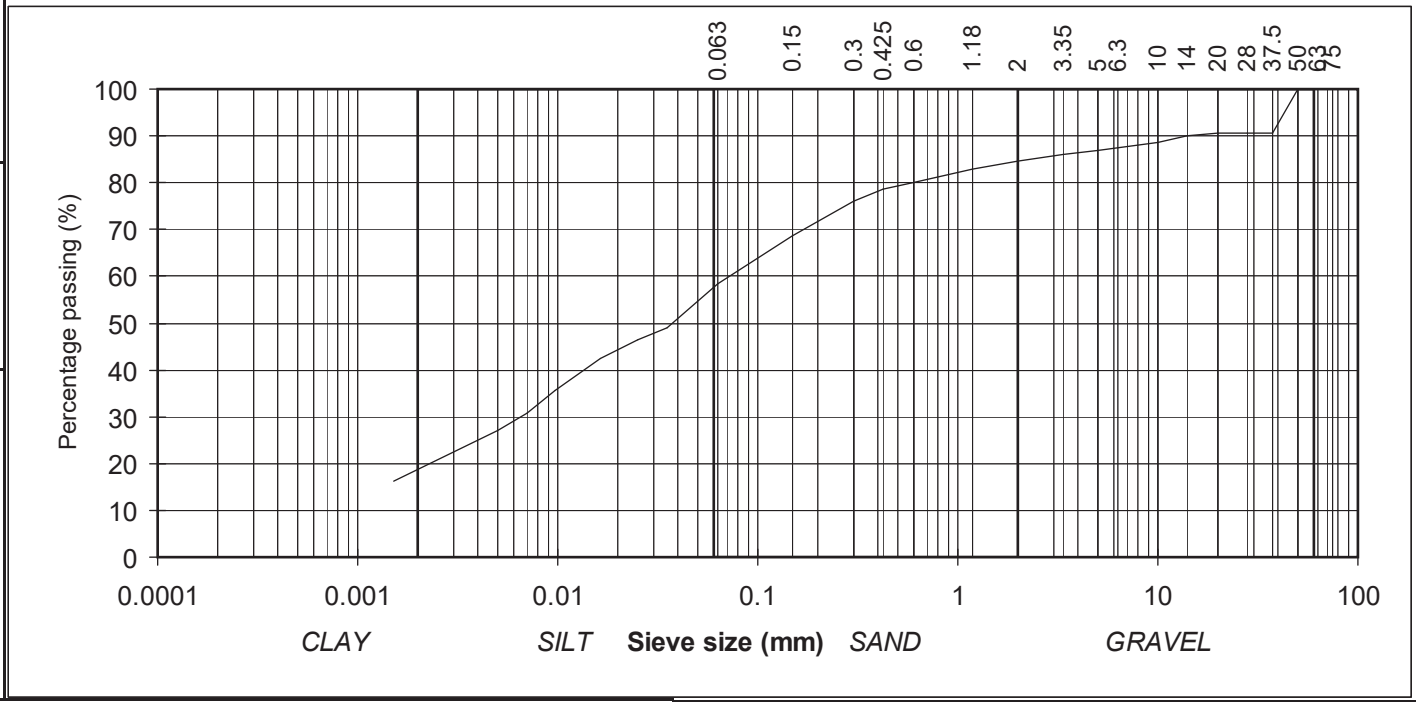
Sample Type: B

Depth (m) 0.30 Customer: Galway Co.Co.

Date Received 26-02-16 Date Testing started 30-03-16

Description: Dark brown slightly sandy, slightly gravelly, SILT

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	13-05-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	92	
50	92	GRAVEL
37.5	87	
28	85	
20	82	
14	78	
10	76	
6.3	71	
5	68	
3.35	61	
2	54	
1.18	49	SAND
0.6	43	
0.425	41	
0.3	39	
0.15	35	
0.063	30	SILT/CLAY
0.037	27	
0.027	26	
0.017	23	
0.010	20	
0.007	17	
0.005	15	
0.002	10	

Contract No: 18963 Report No. R71495

Contract: GCTP Phase 3 - Contact 1

BH: BH3/31

Sample No. AA39972 Lab. Sample No. A16/1003

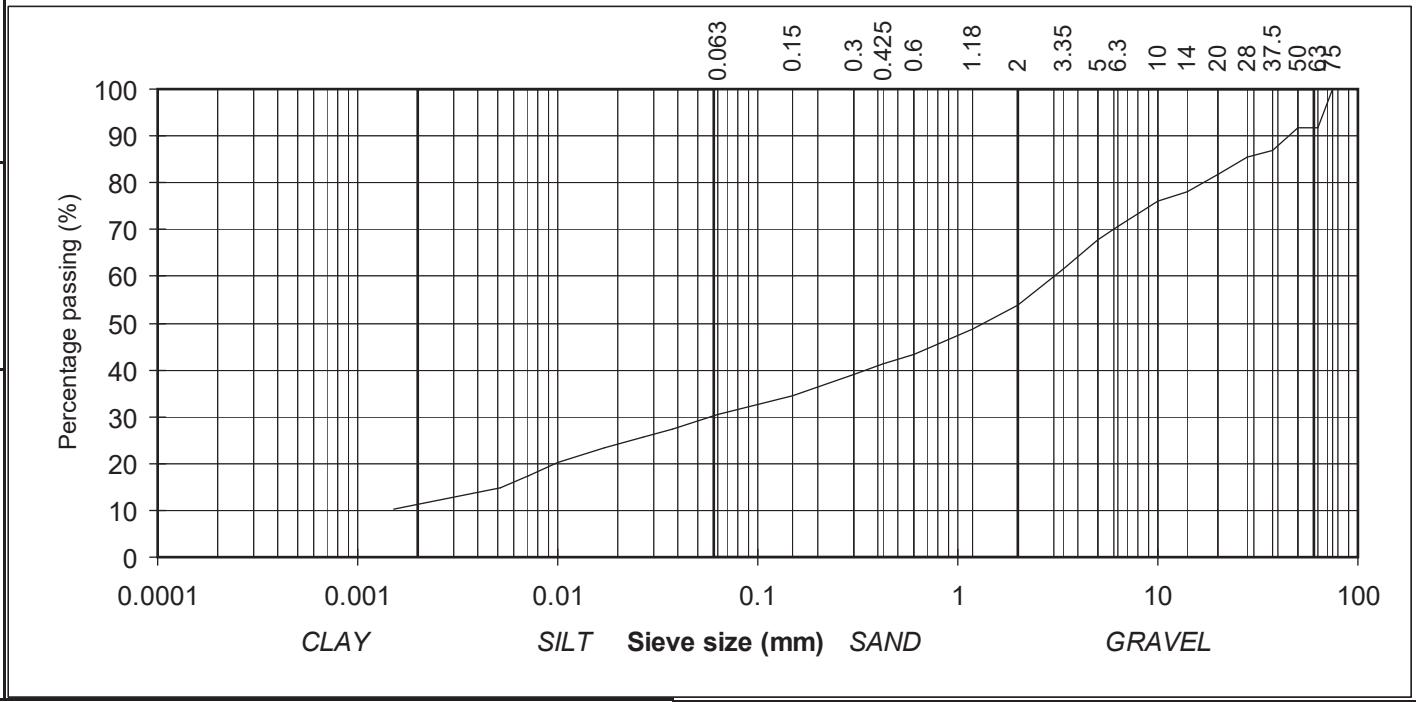
Sample Type: B

Depth (m) 0.60 Customer: Galway Co.Co.

Date Received 26-02-16 Date Testing started 30-03-16

Description: Mottled brown slightly sandy, gravelly, SILT with some cobbles

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	13-04-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	88	
50	84	GRAVEL
37.5	80	
28	79	
20	74	
14	71	
10	68	
6.3	65	
5	63	
3.35	60	
2	56	
1.18	53	SAND
0.6	49	
0.425	47	
0.3	44	
0.15	38	
0.063	31	SILT/CLAY
0.038	25	
0.027	23	
0.018	20	
0.010	16	
0.007	13	
0.005	11	
0.002	6	

Contract No: 18963 Report No. R71333

Contract: GCTP Phase 3 - Contact 1

BH: BH3/43

Sample No. AA39966 Lab. Sample No. A16/1004

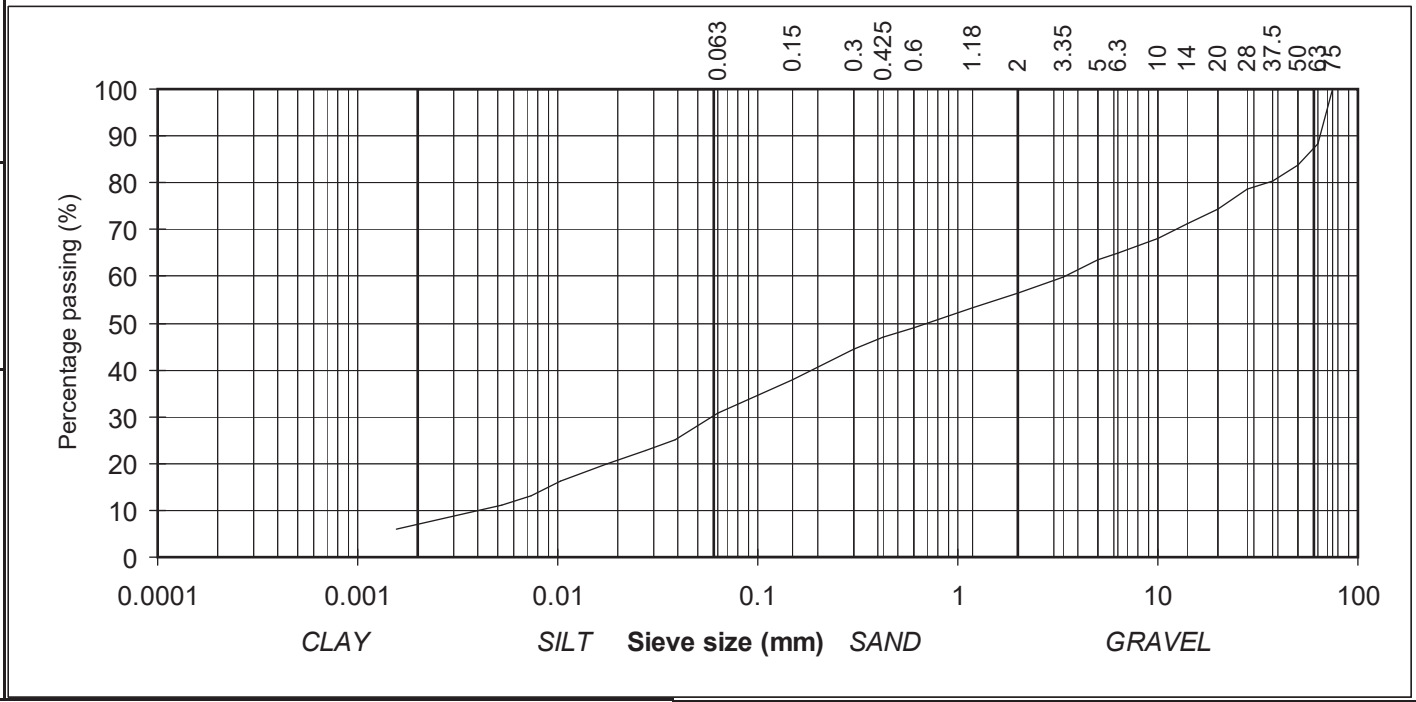
Sample Type: B

Depth (m) 0.20 Customer: Galway Co.Co.

Date Received 12-02-16 Date Testing started 30-03-16

Description: Brown slightly sandy, gravelly, SILT with some cobbles

Remarks Sample size did not meet the sample requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	06-04-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	92	
28	87	
20	84	
14	82	
10	79	
6.3	75	
5	74	
3.35	71	
2	68	
1.18	66	SAND
0.6	62	
0.425	60	
0.3	57	
0.15	49	
0.063	36	SILT/CLAY
0.039	30	
0.028	28	
0.018	25	
0.010	21	
0.007	18	
0.005	16	
0.002	11	

Contract No: 18963 Report No. R71740

Contract: GCTP Phase 3 - Contact 1

BH: BH3/43

Sample No. AA39967 Lab. Sample No. A16/1005

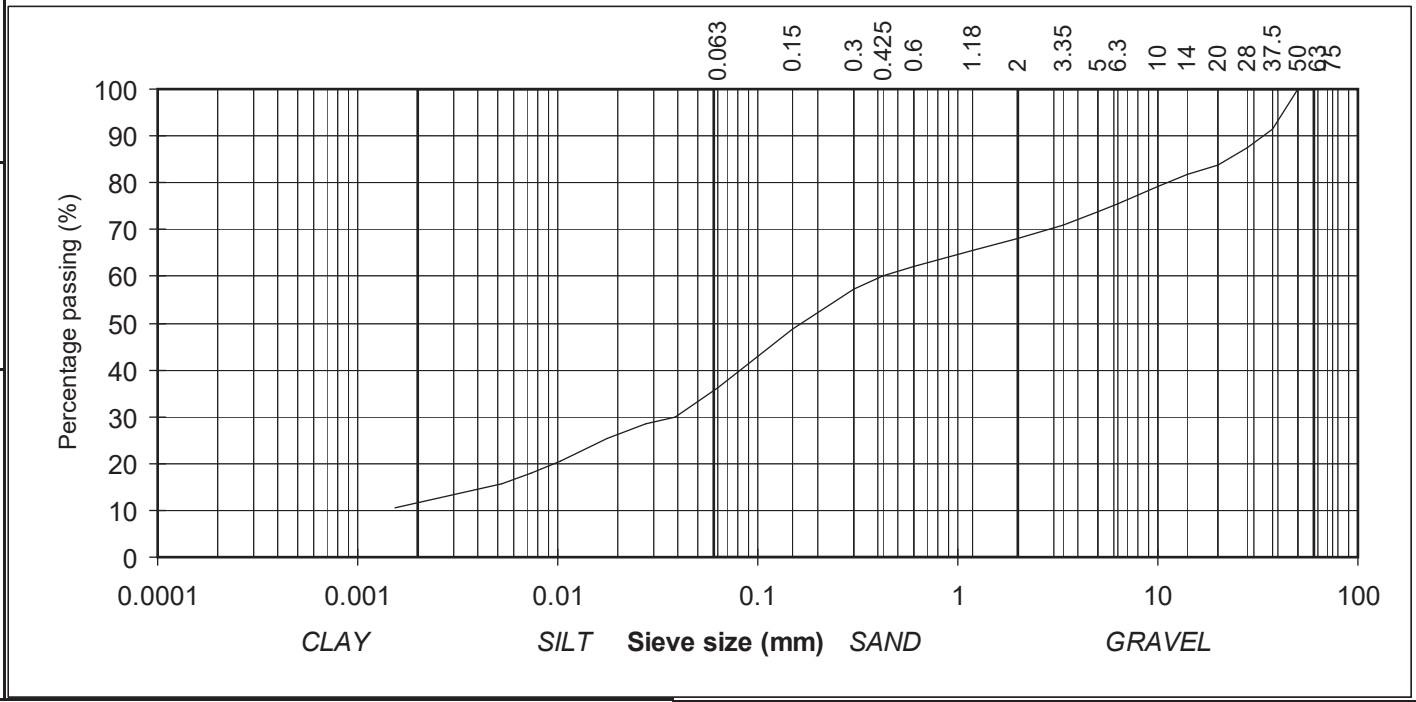
Sample Type: B

Depth (m) 0.30 Customer: Galway Co.Co.

Date Received 26-02-16 Date Testing started 30-03-16

Description: Dark brown slightly sandy, slightly gravelly, SILT

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	28-04-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	86	
28	74	
20	67	
14	59	
10	54	
6.3	47	
5	43	
3.35	34	
2	23	
1.18	16	SAND
0.6	9	
0.425	8	
0.3	7	
0.15	6	
0.063	5	SILT/CLAY

Contract No: 18963 Report No. R71403

Contract: GCTP Phase 3 - Contact 1

TP: TP3/43

Sample No. AA39975 Lab. Sample No. A16/1009

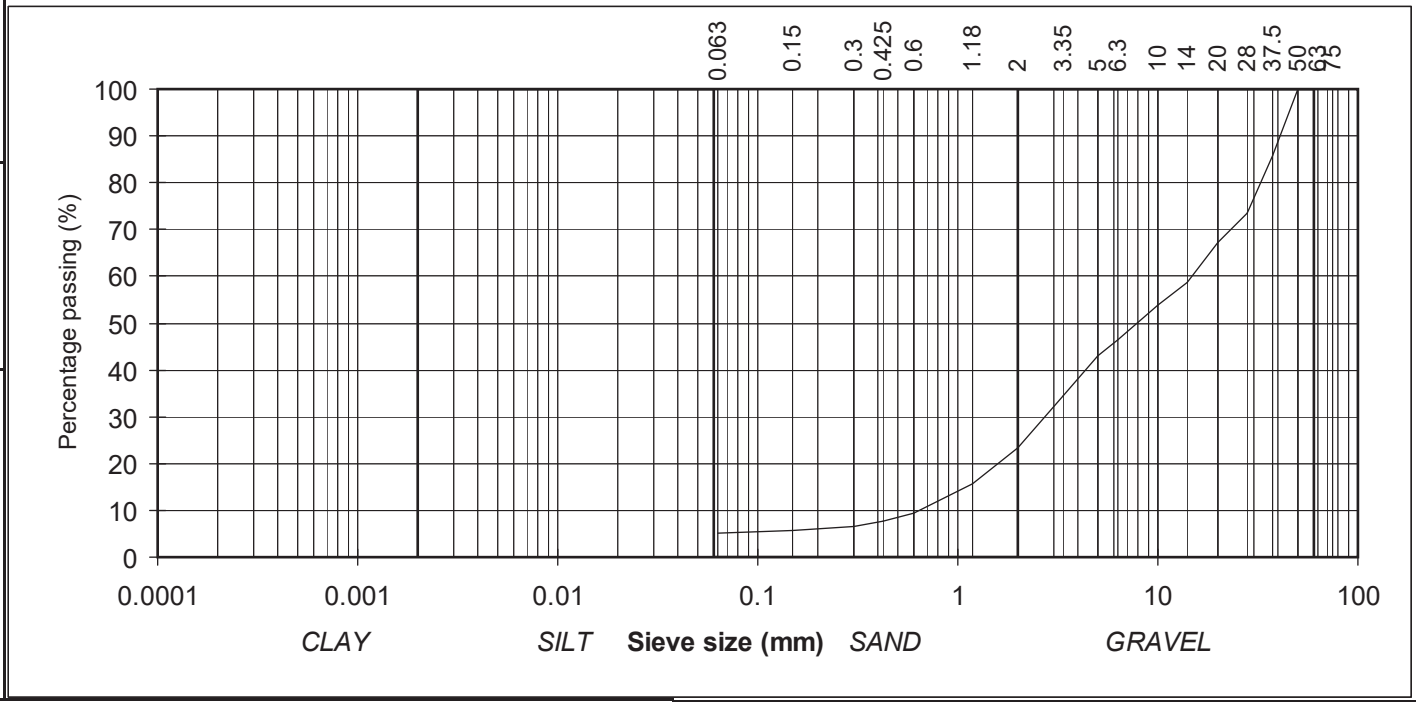
Sample Type: B

Depth (m) 0.45 Customer: Galway Co.Co.

Date Received 26-02-16 Date Testing started 30-03-16

Description: Dark brown clayey/silty, sandy, GRAVEL

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	30-03-16	1 of 1

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

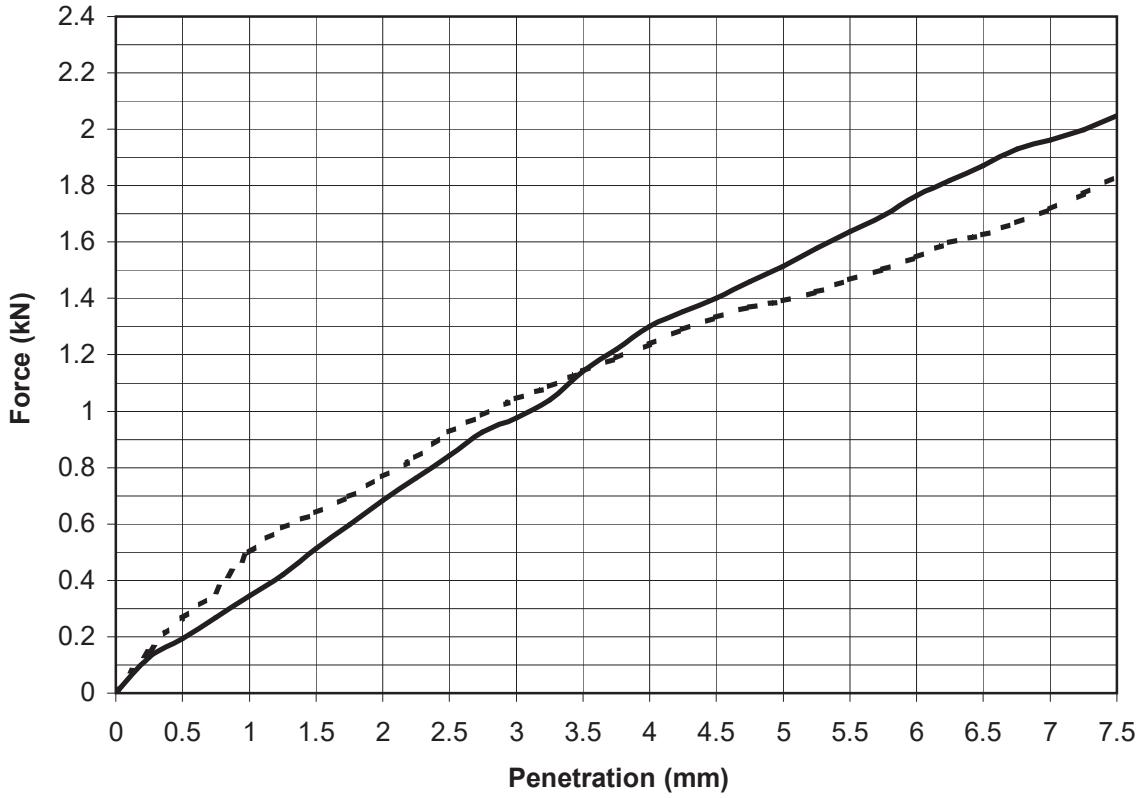
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)

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

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

Report No.	R71511	Contract	GCTP Phase 3 - Contract 1		
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: ———— Top ---------- Base

Description:	Dark brown clayey/silty, sandy, GRAVEL		
Initial Condition:	Unsoaked 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	Top	Base
CBR %	**8**	**7**
Moisture Content %	29	28

Persons authorized to approve reports

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

IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
H Byrne	15-04-16	1 of 5

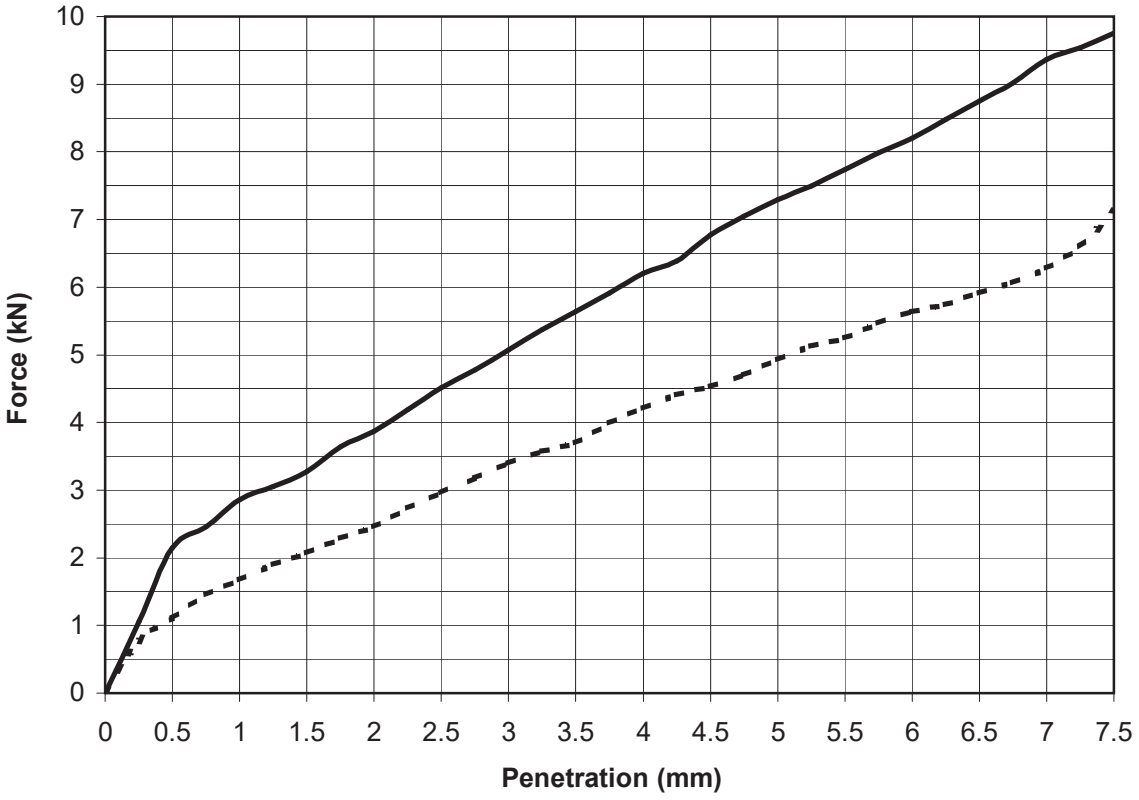
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)

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

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

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: ———— Top ---------- Base

Description:	Dark brown clayey/silty, sandy, GRAVEL		
Initial Condition:	Unsoaked 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	Top	Base
CBR %	**37**	**25**
Moisture Content %	5.0	5.2

Persons authorized to approve reports

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

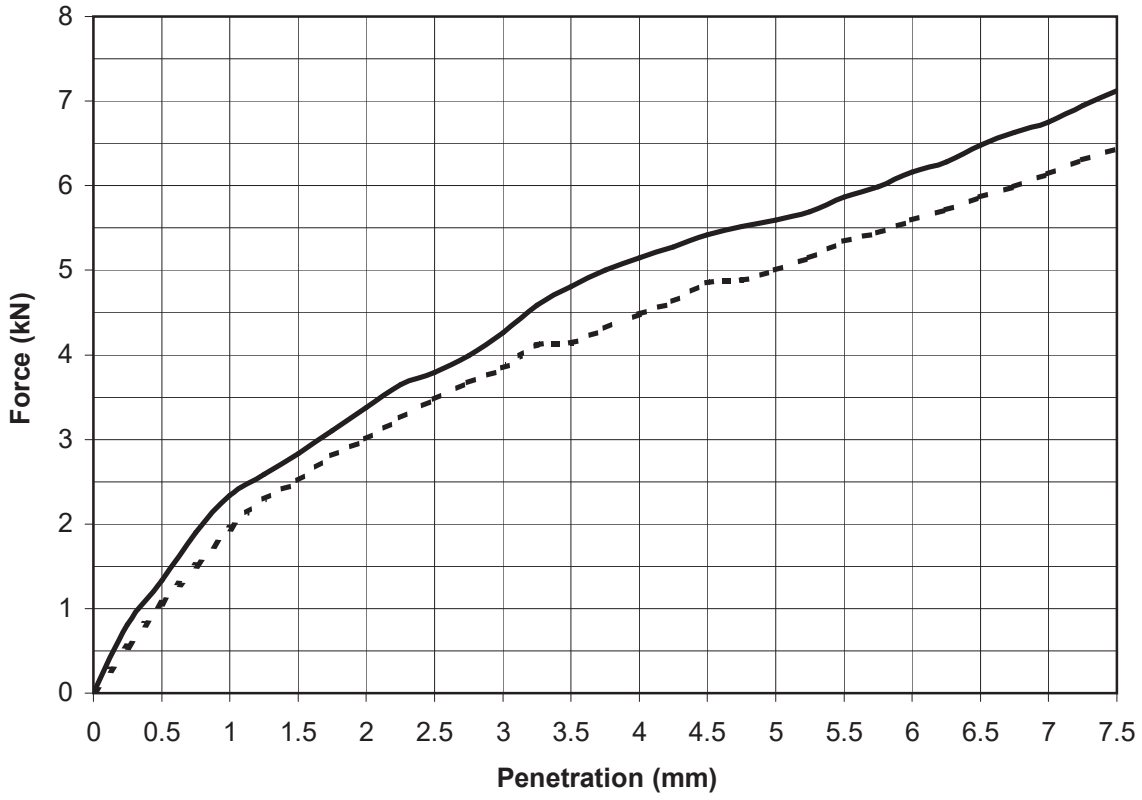
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)

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

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

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: ———— Top ---------- Base

Description:	Dark brown clayey/silty, sandy, GRAVEL		
Initial Condition:	Unsoaked 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	Top	Base
CBR %	**29**	**26**
Moisture Content %	9	10

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

IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
H Byrne	15-04-16	3 of 5

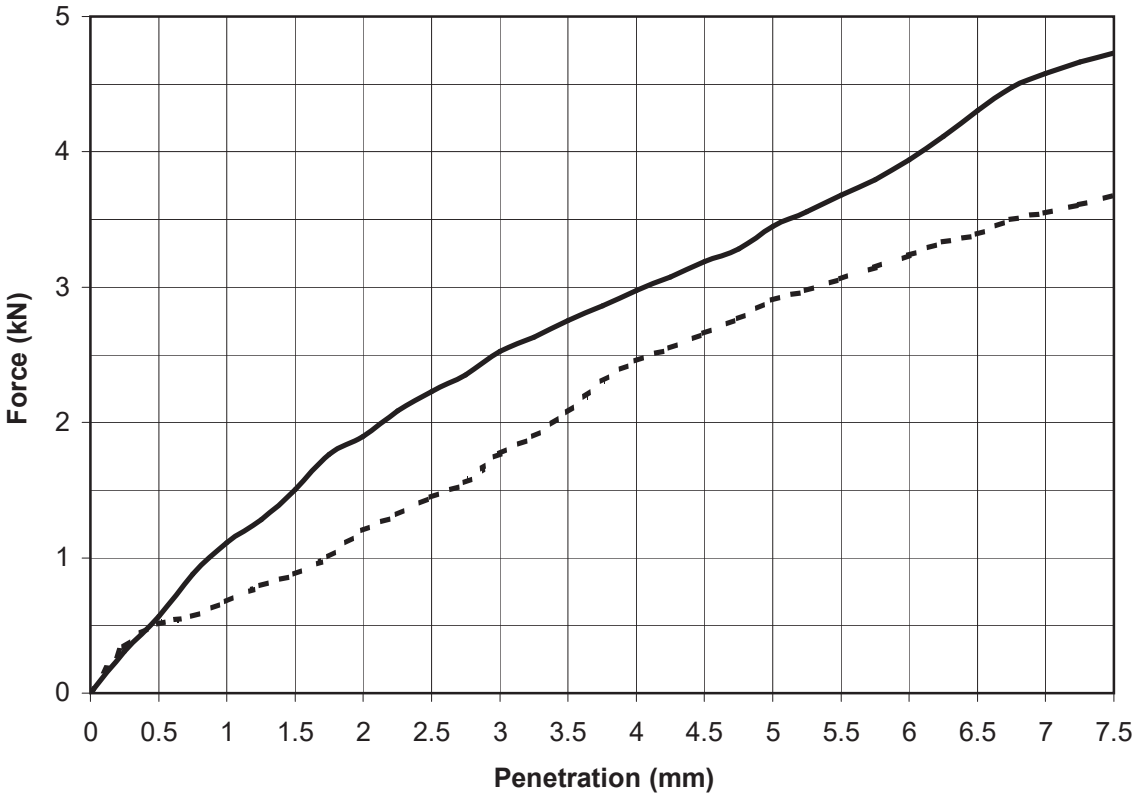
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)

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

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

Report No.	R71508	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: ———— Top ---------- Base

Description:	Dark brown clayey/silty, sandy, GRAVEL		
Initial Condition:	Unsoaked 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 Compaction Method 2		

Test Result	Top	Base
CBR %	**17**	**15**
Moisture Content %	11	13

Persons authorized to approve reports

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

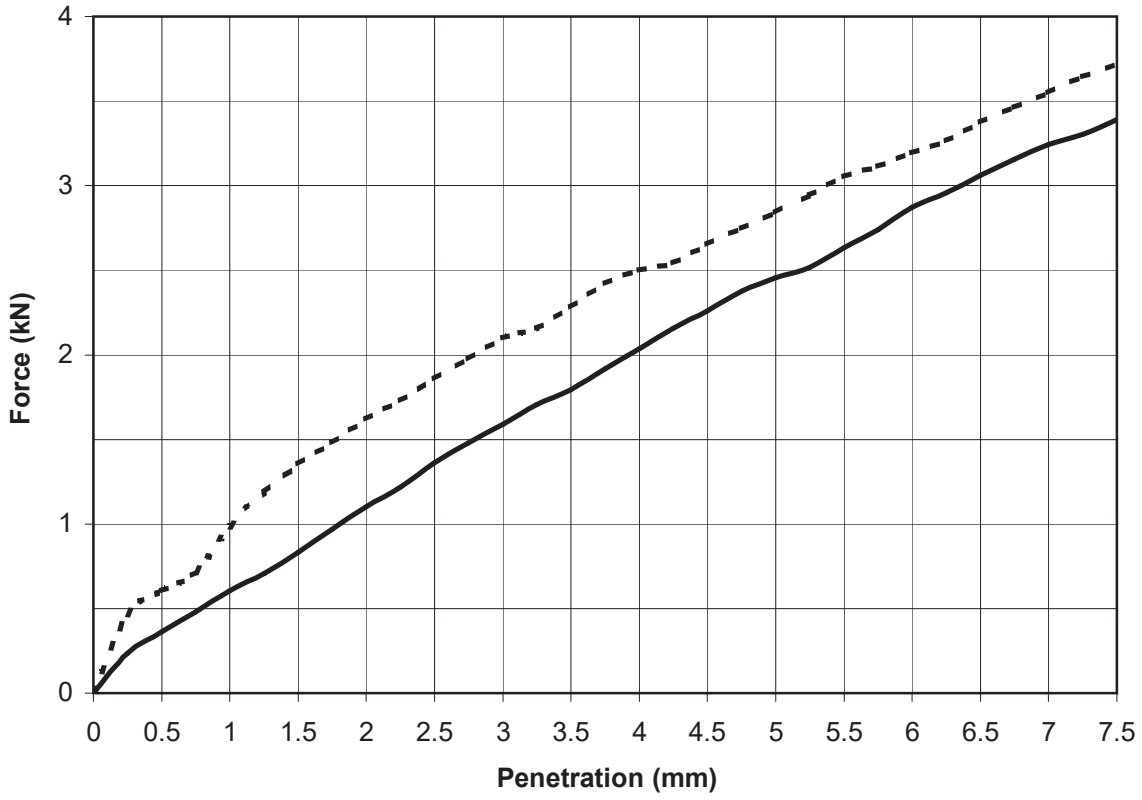
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)

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

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

Report No.	R71507	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: ———— Top ---------- Base

Description:	Dark brown clayey/silty, sandy, GRAVEL		
Initial Condition:	Unsoaked 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 Compaction Method 2		

Test Result	Top	Base
CBR %	**12**	**14**
Moisture Content %	16	16

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

IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
H Byrne	15-04-16	5 of 5

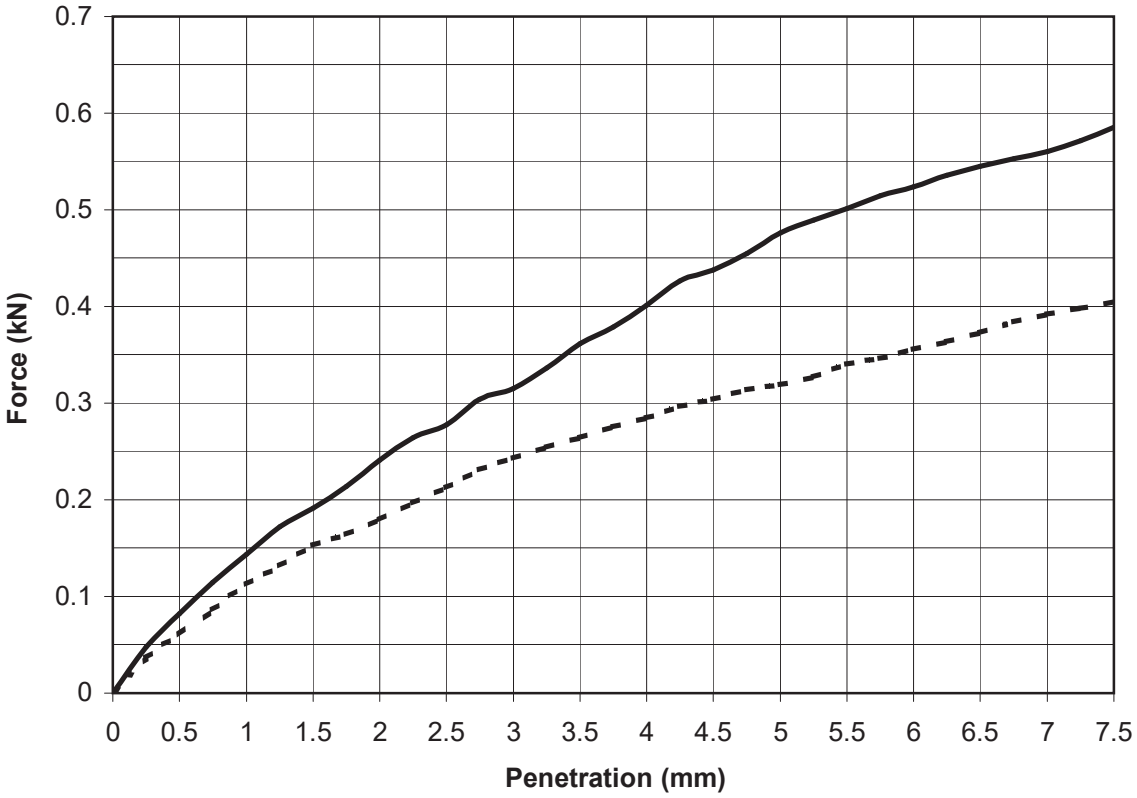
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)

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

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

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: ———— Top ---------- Base

Description:	Brown slightly sandy, gravelly, SILT with some 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 Compaction Method 2		

Test Result	Top	Base
CBR %	**2.4**	**1.6**
Moisture Content %	22	22

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

IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
H Byrne	08-04-16	1 of 1

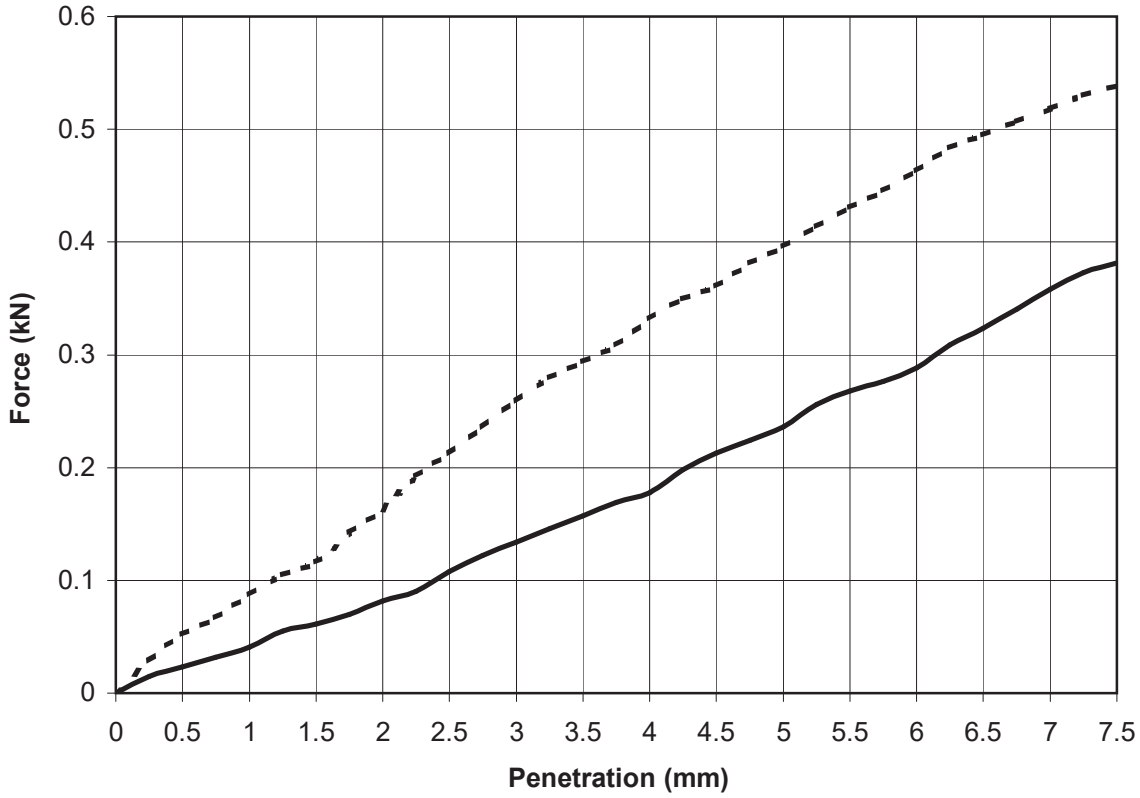
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)

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

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

Report No.	R71375	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:	B
Depth (m)	0.45	Lab sample No.	A16/1009		



Key: ———— Top ---------- Base

Description:	Dark brown clayey/silty, 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 Compaction Method 2		

Test Result	Top	Base
CBR %	**1.2**	**2.0**
Moisture Content %	24	23

Persons authorized to approve reports

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

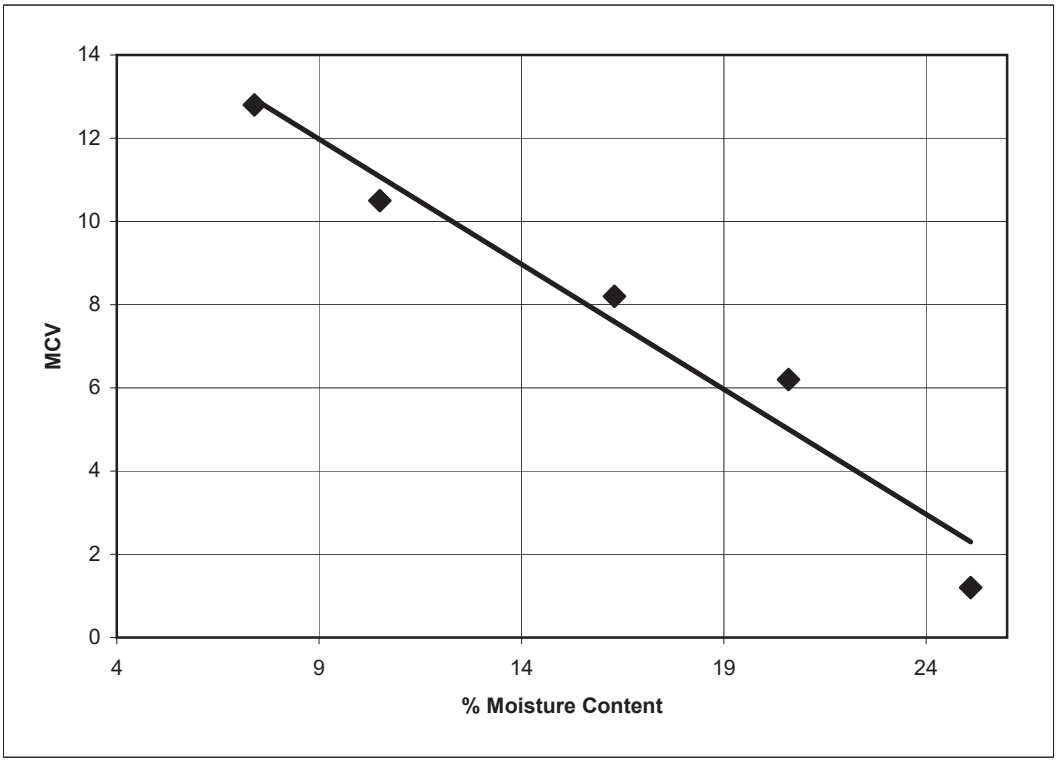
IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
H Byrne	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	Approved by	Date	Page No.
	H Byrne	12-04-16	1 of 1

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

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 1331

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 Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
TP3/30	AA49484	0.1	A16/1314	B	14	40	NP	NP	46	WS	4.4		Brown slightly sandy, gravelly, SILT
BH3/15	AA48883	0.5	A16/1315	B	2.3								Brown slightly clayey/silty, slightly sandy, GRAVEL with many cobbles
BH3/17	AA48880	0.5	A16/1316	B	11	54	NP	NP	17	WS	4.4		Dark brown silty, sandy, GRAVEL with some cobbles
BH3/17	AA48881	1.0	A16/1317	B	9.6	39	NP	NP	30	WS	4.4		Brown silty, sandy, GRAVEL with some cobbles
BH3/17	AA48882	2.0	A16/1318	B	4.3	26	NP	NP	19	WS	4.4		Brown silty, sandy, GRAVEL with many cobbles
BH3/19	AA39978	0.3	A16/1319	B	18								Dark brown clayey/silty, very sandy, GRAVEL
BH3/19	AA39979	0.5	A16/1320	B	13	47	NP	NP	65	WS	4.4		Dark brown silty, sandy, GRAVEL with some cobbles
BH3/20	AA49485	0.1	A16/1321	B	21								Dark brown clayey/silty, very sandy, GRAVEL
BH3/20	AA49486	0.5	A16/1322	B	8.5								Orange/Brown slightly clayey/silty, sandy, GRAVEL with many cobbles
BH3/20	AA49487	0.8	A16/1323	B	5.3								Brown slightly clayey/silty, very sandy, GRAVEL with some cobbles
BH3/31CR	AA48875	0.5	A16/1324	B	14	19	NP	NP	62	WS	4.4		Light brown/grey sandy, slightly gravelly, SILT
BH3/31CR	AA48876	1.0	A16/1325	B	11	30	15	15	51	WS	4.4	C L	Light brown/grey slightly sandy, gravelly, CLAY with some cobbles
BH3/31CR	AA48877	2.0	A16/1326	B	13	25	NP	NP	55	WS	4.4		Light brown slightly sandy, gravelly, SILT with some cobbles

Notes: Preparation: WS - Wet sieved; AR - As received; NP - Non plastic
Liquid Limit Clause: 4.3 Cone Penetrometer definitive method; 4.4 Cone Penetrometer one point method
Sample Type: B - bulk disturbed; U - Undisturbed

Remarks:

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

Date: 14-06-16

Page: 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

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 1331

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 Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
BH3/31 CR	AA48878	3.0	A16/1327	B	14.1	21	NP	NP	54	WS	4.4		Mottled light brown slightly sandy, slightly gravelly, SILT
BH3/31 CR	AA48879	4.0	A16/1328	B	13.6	19	12	7	64	WS	4.4	C L	Light brown/grey slightly sandy, slightly gravelly, CLAY
BH3/47	AA48890	0.5	A16/1629	B	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	B	9.1	20	NP	NP	69	WS	4.4		Light brown slightly sandy, slightly gravelly, SILT
BH3/47	AA48892	2.0	A16/1631	B	9.9	23	13	10	23	WS	4.4	C L	Mottled brown slightly sandy, slightly gravelly, CLAY
BH3/47	AA48893	3.0	A16/1632	B	10.4	24	13	11	75	WS	4.4	C L	Light brown/grey slightly sandy, slightly gravelly, CLAY
BH3/52	AA48884	0.5	A16/1633	B	5.6	19	11	8	36	WS	4.4	C L	Light brown/grey slightly sandy, gravelly, CLAY with some cobbles
BH3/52	AA48885	1.0	A16/1634	B	13.6	24	14	10	58	WS	4.4	C L	Light brown sandy gravelly CLAY
BH3/52	AA48886	2.0	A16/1635	B	9.3	21	NP	NP	69	WS	4.4		Light brown/grey slightly sandy, slightly gravelly, SILT
BH3/52	AA48887	3.0	A16/1636	B	10.8	20	11	9	70	WS	4.4	C L	Light brown/grey slightly sandy, slightly gravelly, CLAY
BH3/53	AA48888	0.5	A16/1637	B	5.7	19	NP	NP	22	WS	4.4		Light brown/grey silty, sandy, GRAVEL
BH3/53	AA48889	1.0	A16/1638	B	4.6	20	NP	NP	32	WS	4.4		Light brown/grey silty, sandy, GRAVEL with some cobbles

Notes: Preparation: WS - Wet sieved; AR - As received; NP - Non plastic
Liquid Limit Clause: 4.3 Cone Penetrometer definitive method; 4.4 Cone Penetrometer one point method
Sample Type: B - bulk disturbed; U - Undisturbed

Remarks:

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

Date: 14-06-16

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TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	90	GRAVEL
37.5	80	
28	72	
20	67	
14	63	
10	58	
6.3	54	
5	52	
3.35	48	
2	44	
1.18	41	SAND
0.6	37	
0.425	36	
0.3	34	
0.15	29	
0.063	23	SILT/CLAY
0.036	20	
0.026	19	
0.017	16	
0.010	14	
0.007	12	
0.005	11	
0.002	7	

Contract No: 18963 Report No. R72191

Contract: GCTP Phase 3 - Contact 1

TP: TP3/30

Sample No. AA49484 Lab. Sample No. A16/1314

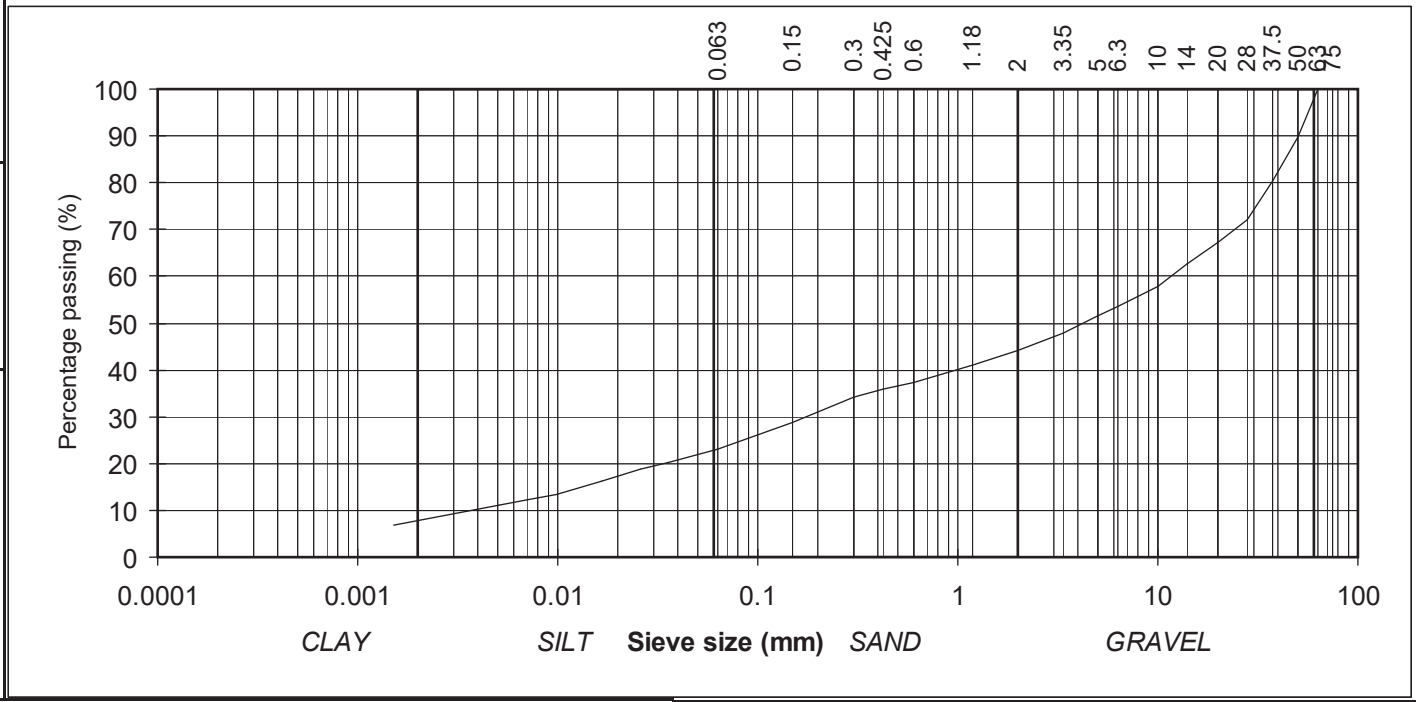
Sample Type: B

Depth (m) 0.10 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 03-05-16

Description: Brown slightly sandy, gravelly, SILT

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	23-05-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	79	COBBLES
63	79	
50	66	GRAVEL
37.5	39	
28	30	
20	21	
14	15	
10	13	
6.3	10	
5	9	
3.35	7	
2	6	
1.18	5	SAND
0.6	4	
0.425	3	
0.3	3	
0.15	2	
0.063	2	SILT/CLAY

Contract No: 18963 Report No. R72068

Contract: GCTP Phase 3 - Contact 1

BH: BH3/15

Sample No. AA48883 Lab. Sample No. A16/1315

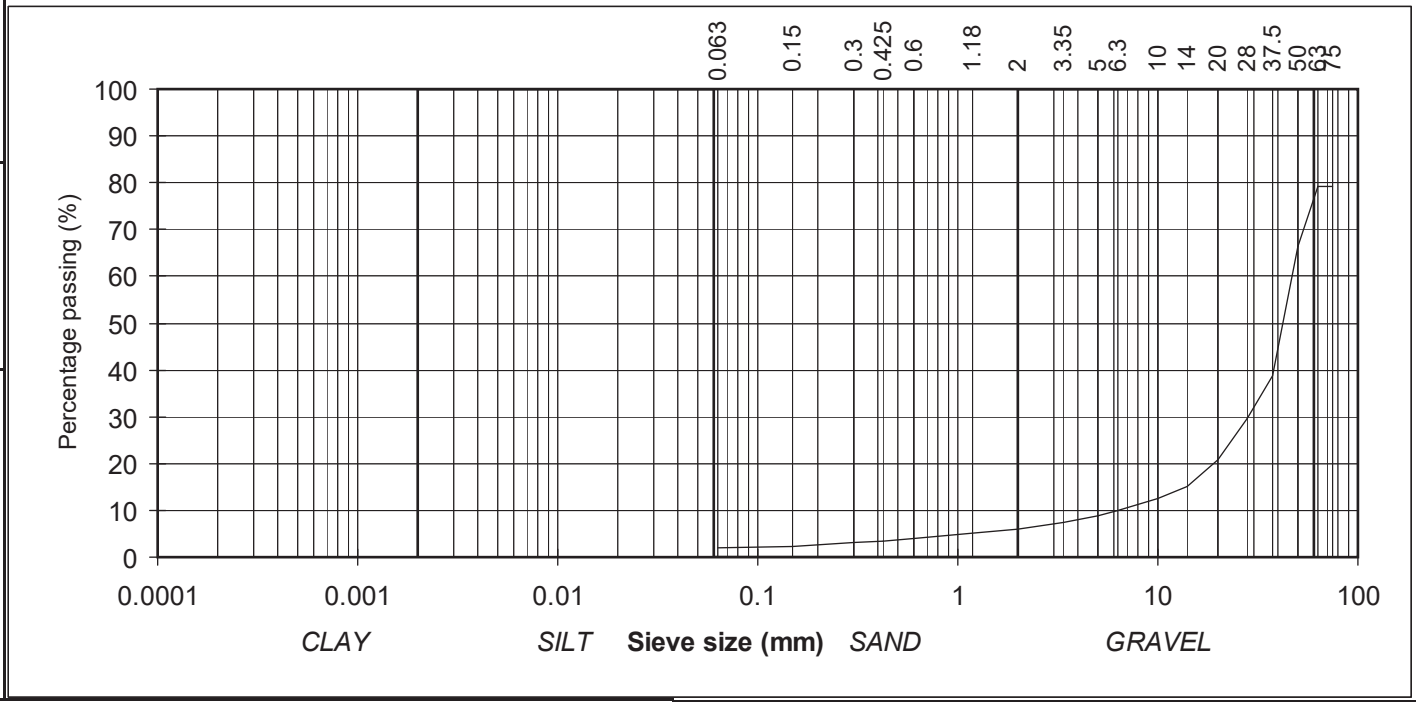
Sample Type: B

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 Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

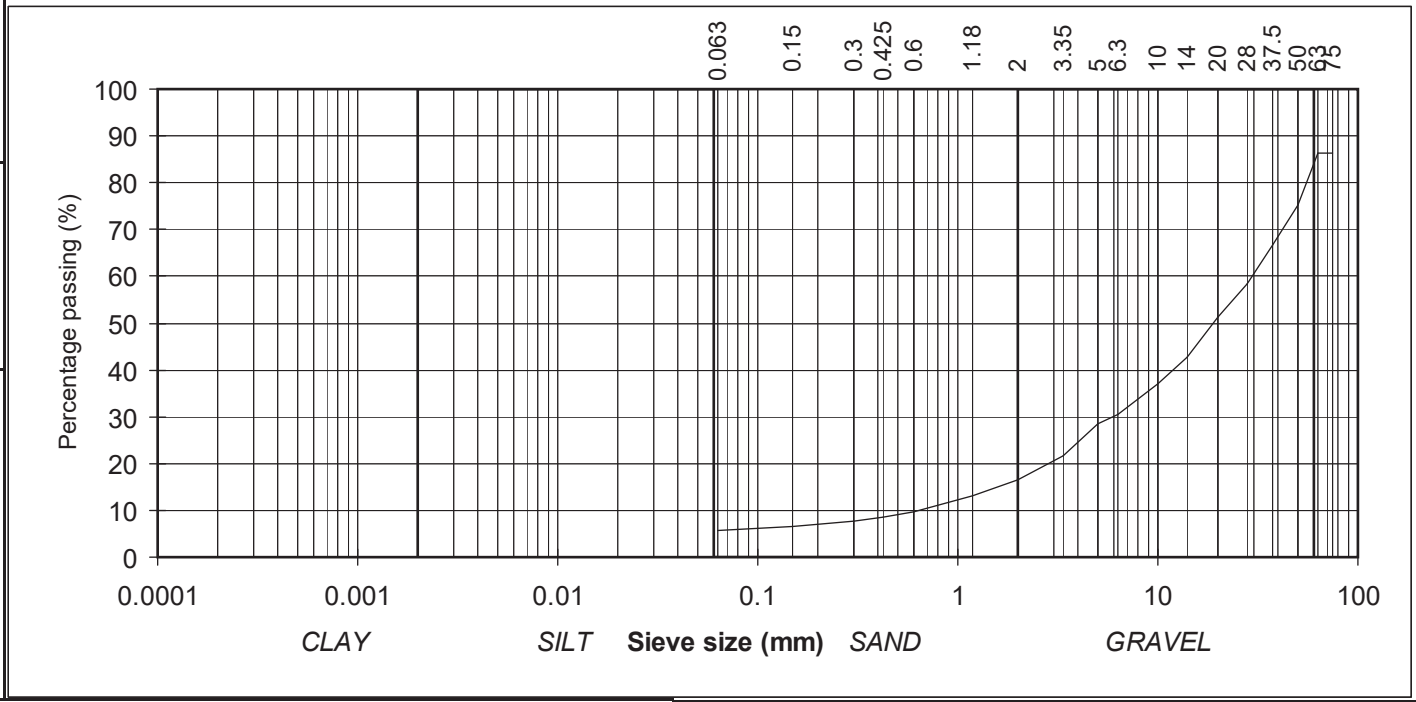
TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

particle size	% passing	
75	86	COBBLES
63	86	
50	75	GRAVEL
37.5	67	
28	58	
20	51	
14	43	
10	37	
6.3	31	
5	28	
3.35	22	
2	17	
1.18	13	SAND
0.6	10	
0.425	9	
0.3	8	
0.15	6	
0.063	6	SILT/CLAY

Contract No: 18963 Report No. R71993
Contract: GCTP Phase 3 - Contact 1
BH: BH3/17
Sample No. AA48880 Lab. Sample No. A16/1316
Sample Type: B
Depth (m) 0.50 Customer: Galway Co.Co.
Date Received 05-04-16 Date Testing started 27-04-16
Description: Dark brown silty, sandy, GRAVEL with some cobbles

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

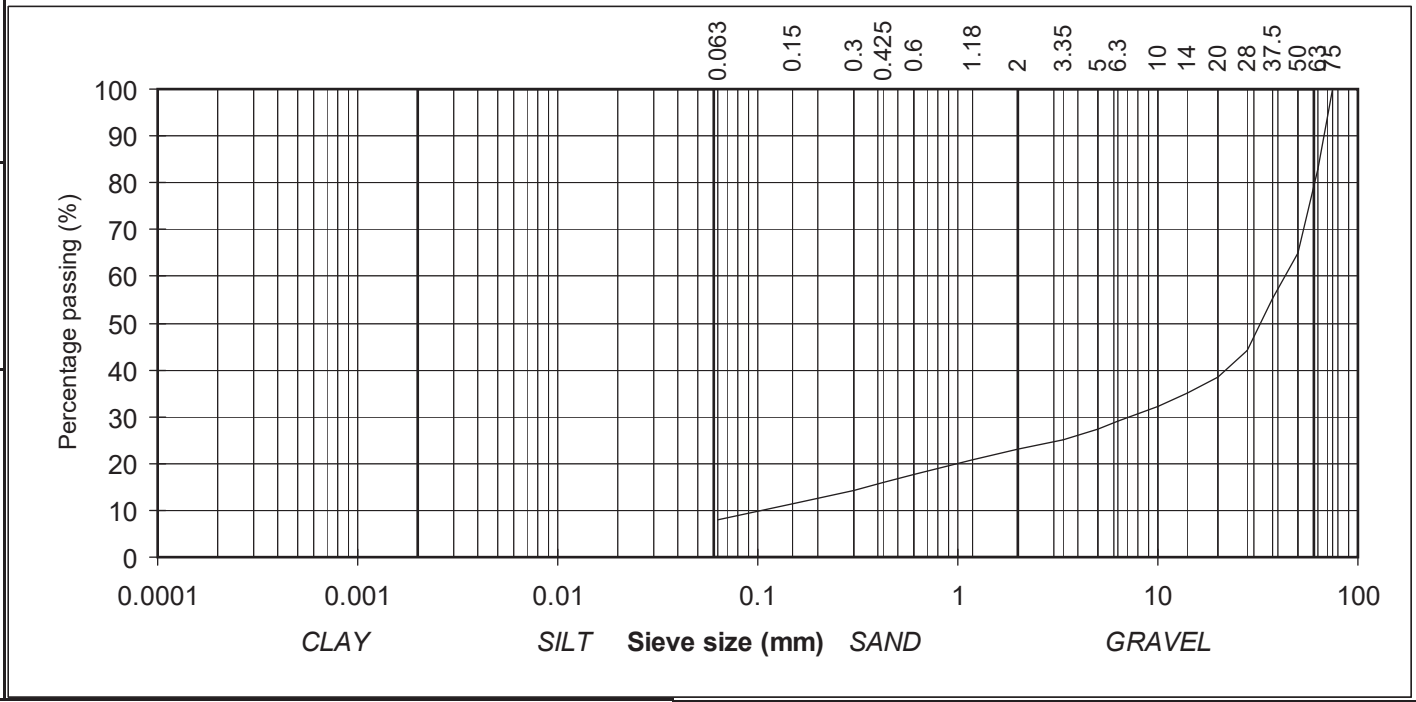
TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	83	
50	65	GRAVEL
37.5	55	
28	44	
20	38	
14	35	
10	32	
6.3	29	
5	27	
3.35	25	
2	23	
1.18	21	SAND
0.6	18	
0.425	16	
0.3	14	
0.15	11	
0.063	8	SILT/CLAY

Contract No: 18963 Report No. R72192
Contract: GCTP Phase 3 - Contact 1
BH: BH3/17
Sample No. AA48881 Lab. Sample No. A16/1317
Sample Type: B
Depth (m) 1.00 Customer: Galway Co.Co.
Date Received 05-04-16 Date Testing started 26-04-16
Description: Brown silty, sandy, GRAVEL with some cobbles

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	60	COBBLES
63	60	
50	50	GRAVEL
37.5	39	
28	35	
20	32	
14	29	
10	26	
6.3	23	
5	21	
3.35	18	
2	15	
1.18	13	SAND
0.6	11	
0.425	9	
0.3	9	
0.15	7	
0.063	6	SILT/CLAY

Contract No: 18963 Report No. R71923

Contract: GCTP Phase 3 - Contact 1

BH: BH03/17

Sample No. AA48882 Lab. Sample No. A16/1318

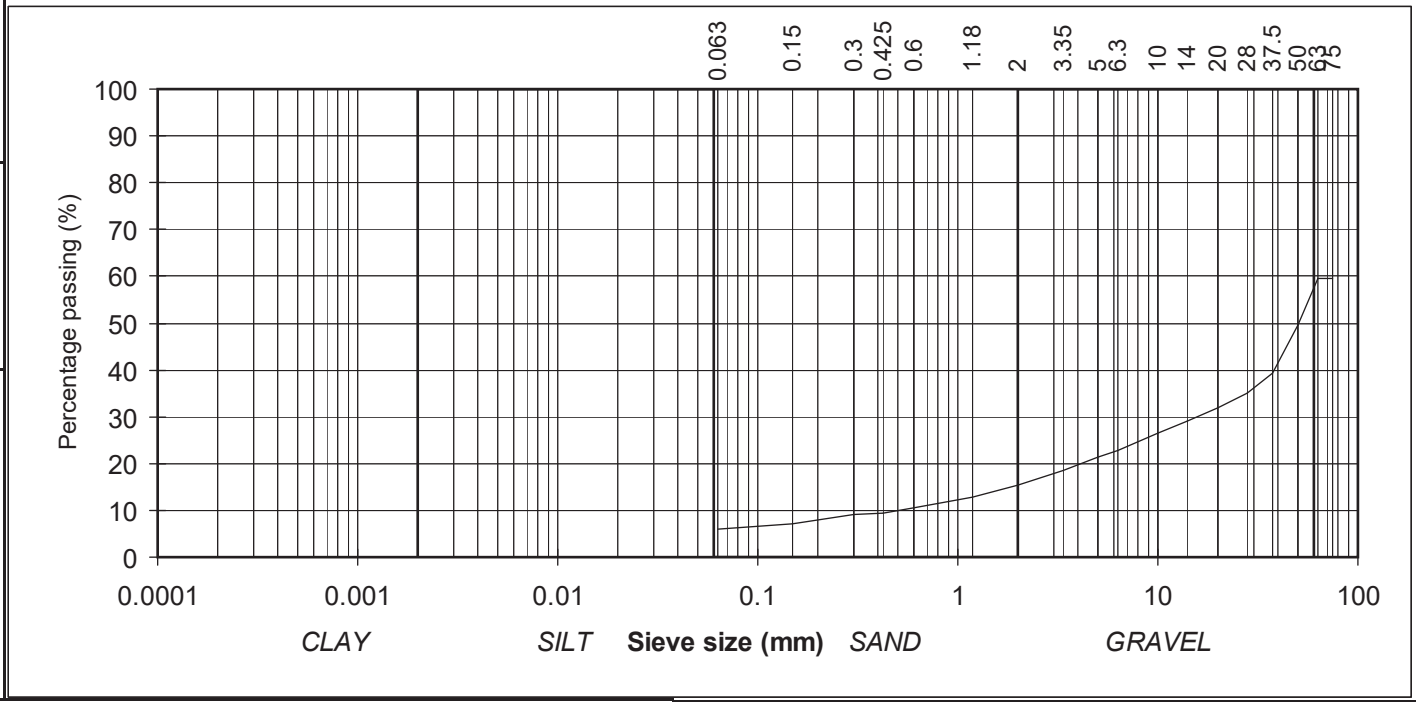
Sample Type: B

Depth (m) 2.00 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 26-04-16

Description: Brown silty, sandy, GRAVEL with many cobbles

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	67	GRAVEL
37.5	63	
28	56	
20	52	
14	47	
10	44	
6.3	38	
5	36	
3.35	33	
2	28	
1.18	24	SAND
0.6	18	
0.425	16	
0.3	13	
0.15	8	
0.063	6	SILT/CLAY

Contract No: 18963 Report No. R71994

Contract: GCTP Phase 3 - Contact 1

BH: BH3/19

Sample No. AA39978 Lab. Sample No. A16/1319

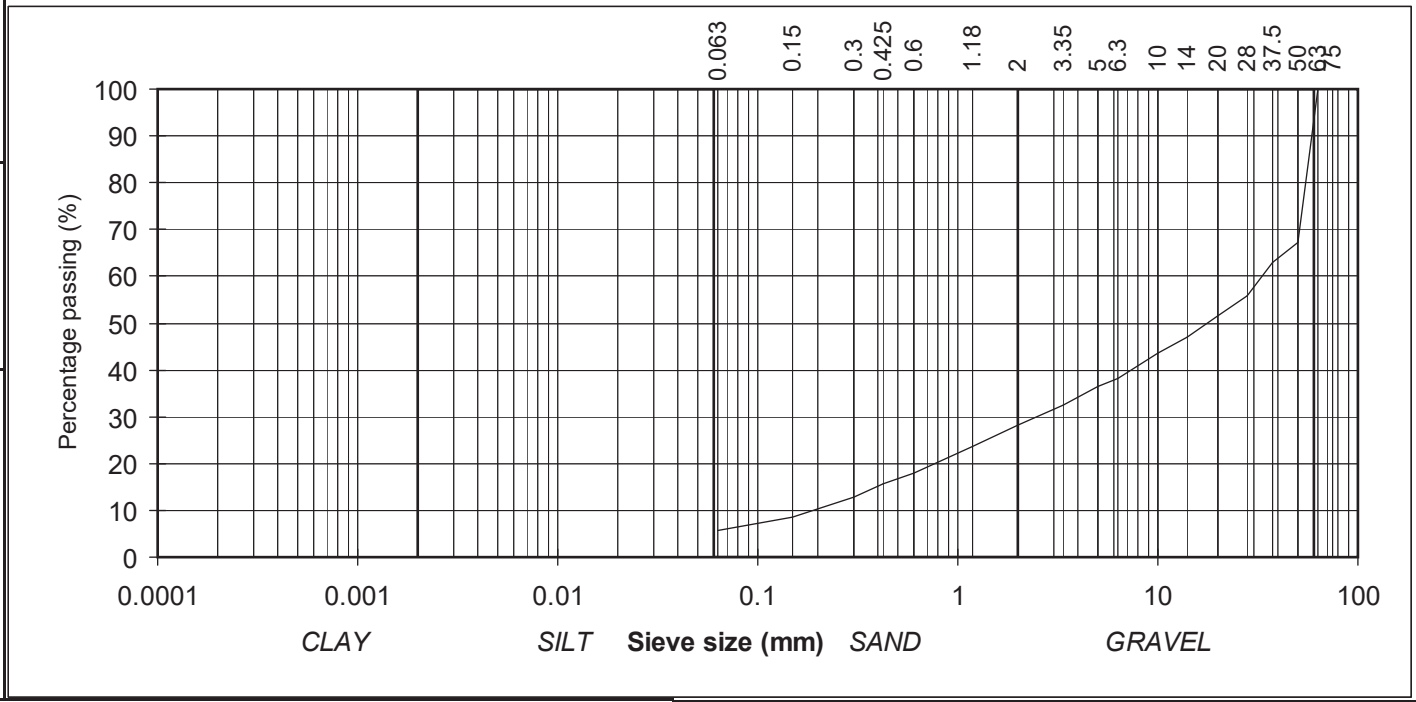
Sample Type: B

Depth (m) 0.30 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 27-04-16

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

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

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H Byrne	13-05-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	90	COBBLES
63	90	
50	77	GRAVEL
37.5	60	
28	54	
20	48	
14	43	
10	38	
6.3	32	
5	31	
3.35	28	
2	24	
1.18	21	SAND
0.6	16	
0.425	14	
0.3	12	
0.15	8	
0.063	6	SILT/CLAY

Contract No: 18963 Report No. R71995

Contract: GCTP Phase 3 - Contact 1

BH: BH3/19

Sample No. AA39979 Lab. Sample No. A16/1320

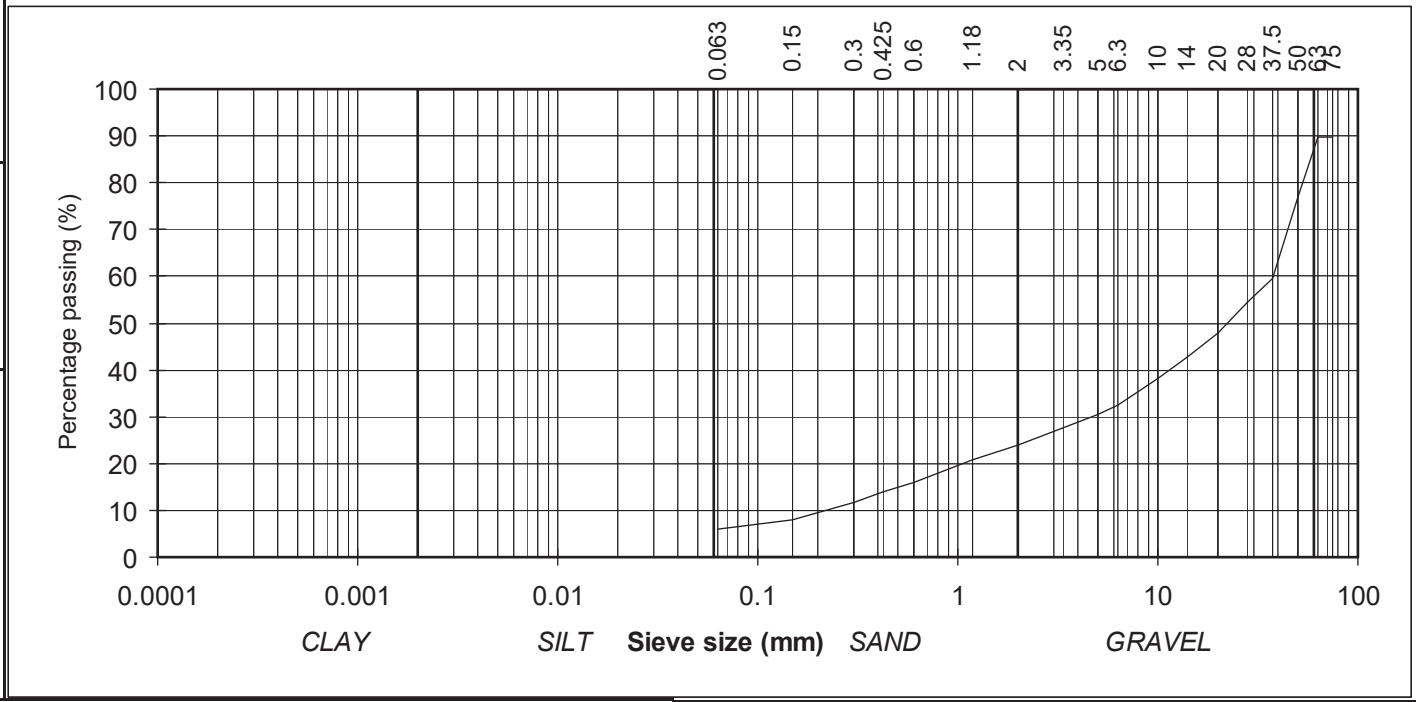
Sample Type: B

Depth (m) 0.50 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 27-04-16

Description: Dark brown silty, sandy, GRAVEL with some cobbles

Remarks



IGSL Ltd Materials Laboratory

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	98	
28	80	
20	73	
14	68	
10	63	
6.3	59	
5	56	
3.35	50	
2	44	
1.18	37	SAND
0.6	30	
0.425	27	
0.3	24	
0.15	18	
0.063	11	SILT/CLAY

Contract No: 18963 Report No. R72069

Contract: GCTP Phase 3 - Contact 1

BH: BH3/20

Sample No. AA49485 Lab. Sample No. A16/1321

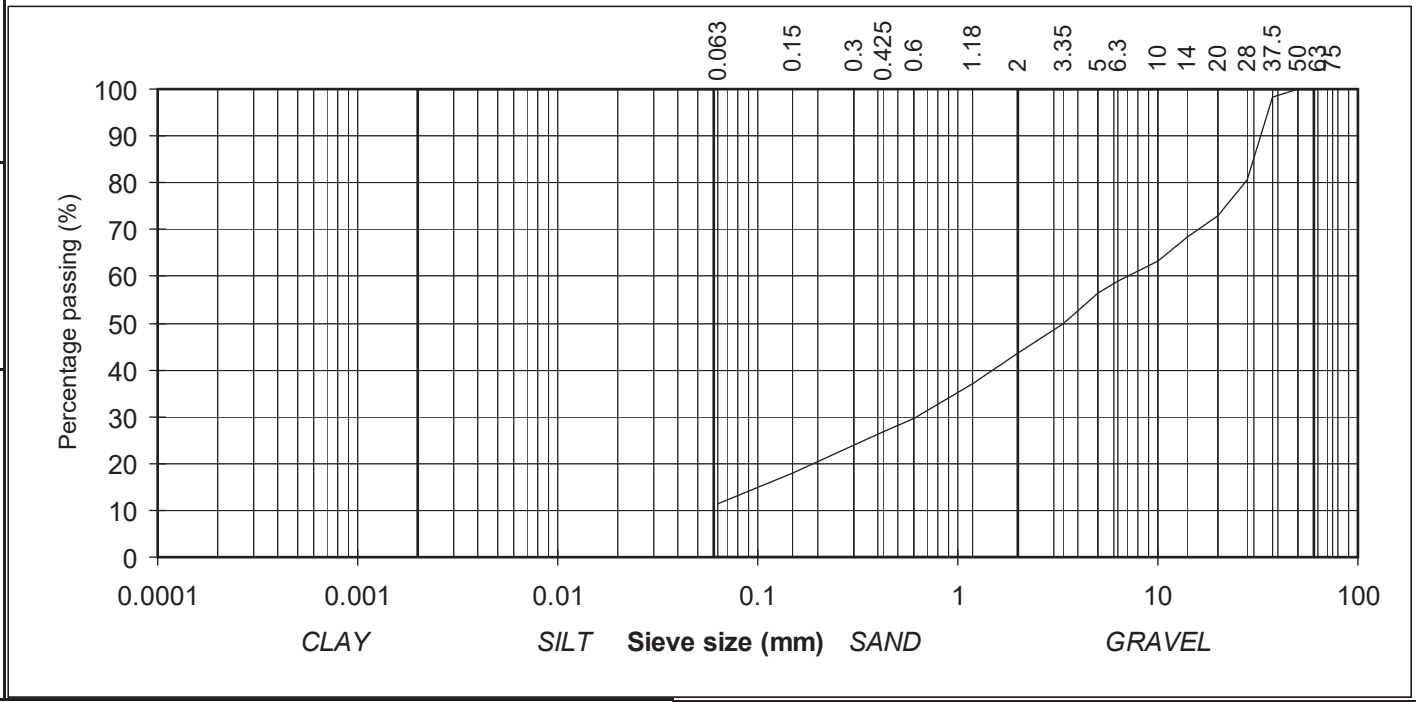
Sample Type: B

Depth (m) 0.10 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 29-04-16

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

Remarks



IGSL Ltd Materials Laboratory

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	87	COBBLES
63	75	
50	64	GRAVEL
37.5	57	
28	51	
20	47	
14	42	
10	38	
6.3	34	
5	32	
3.35	27	
2	22	
1.18	18	SAND
0.6	12	
0.425	11	
0.3	9	
0.15	6	
0.063	5	SILT/CLAY

Contract No: 18963 Report No. R71996

Contract: GCTP Phase 3 - Contact 1

BH: BH3/20

Sample No. AA49486 Lab. Sample No. A16/1322

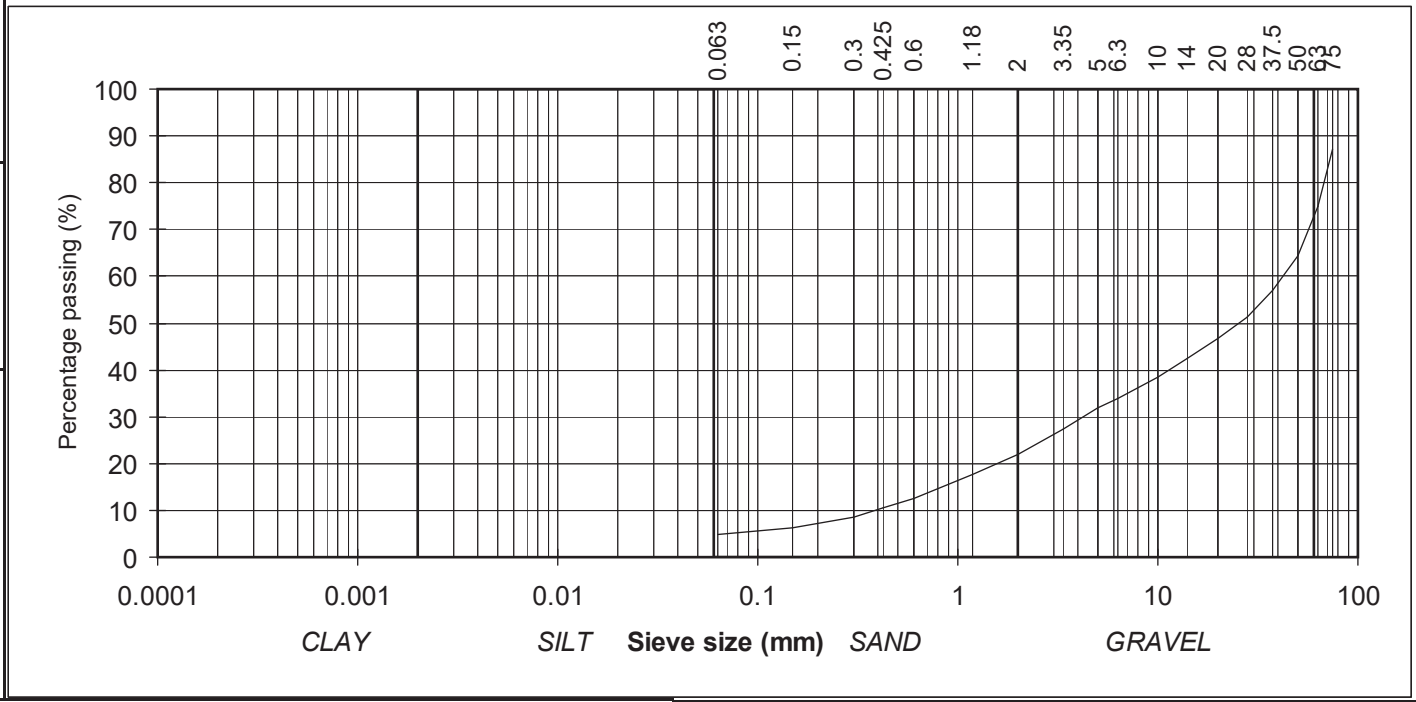
Sample Type: B

Depth (m) 0.50 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 27-04-16

Description: Orange/Brown slightly clayey/silty, sandy, GRAVEL with many cobbles

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

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H Byrne	13-05-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	92	COBBLES
63	92	
50	86	GRAVEL
37.5	76	
28	65	
20	57	
14	51	
10	46	
6.3	40	
5	37	
3.35	32	
2	24	
1.18	17	SAND
0.6	11	
0.425	9	
0.3	7	
0.15	5	
0.063	4	SILT/CLAY

Contract No: 18963 Report No. R71997

Contract: GCTP Phase 3 - Contact 1

BH: BH3/20

Sample No. AA49487 Lab. Sample No. A16/1323

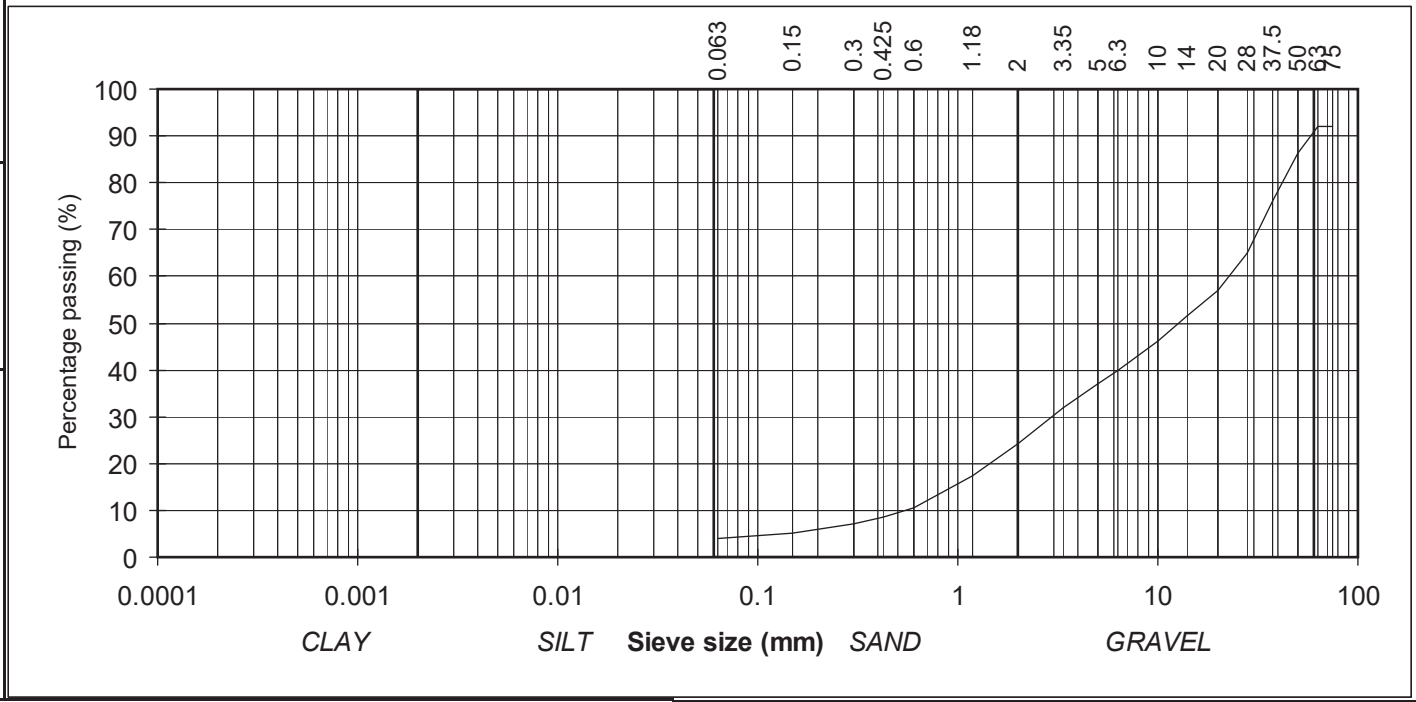
Sample Type: B

Depth (m) 0.80 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 26-04-16

Description: Brown slightly clayey/silty, very sandy, GRAVEL with some cobbles

Remarks



IGSL Ltd Materials Laboratory

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	96	
20	93	
14	93	
10	92	
6.3	89	
5	88	
3.35	85	
2	83	
1.18	79	SAND
0.6	77	
0.425	73	
0.3	69	
0.15	58	
0.063	45	SILT/CLAY
0.037	38	
0.026	36	
0.017	32	
0.010	29	
0.007	27	
0.005	26	
0.002	16	

Contract No: 18963 Report No. R72734

Contract: GCTP Phase 3 - Contact 1

BH: BH3/31CF

Sample No. AA48875 Lab. Sample No. A16/1324

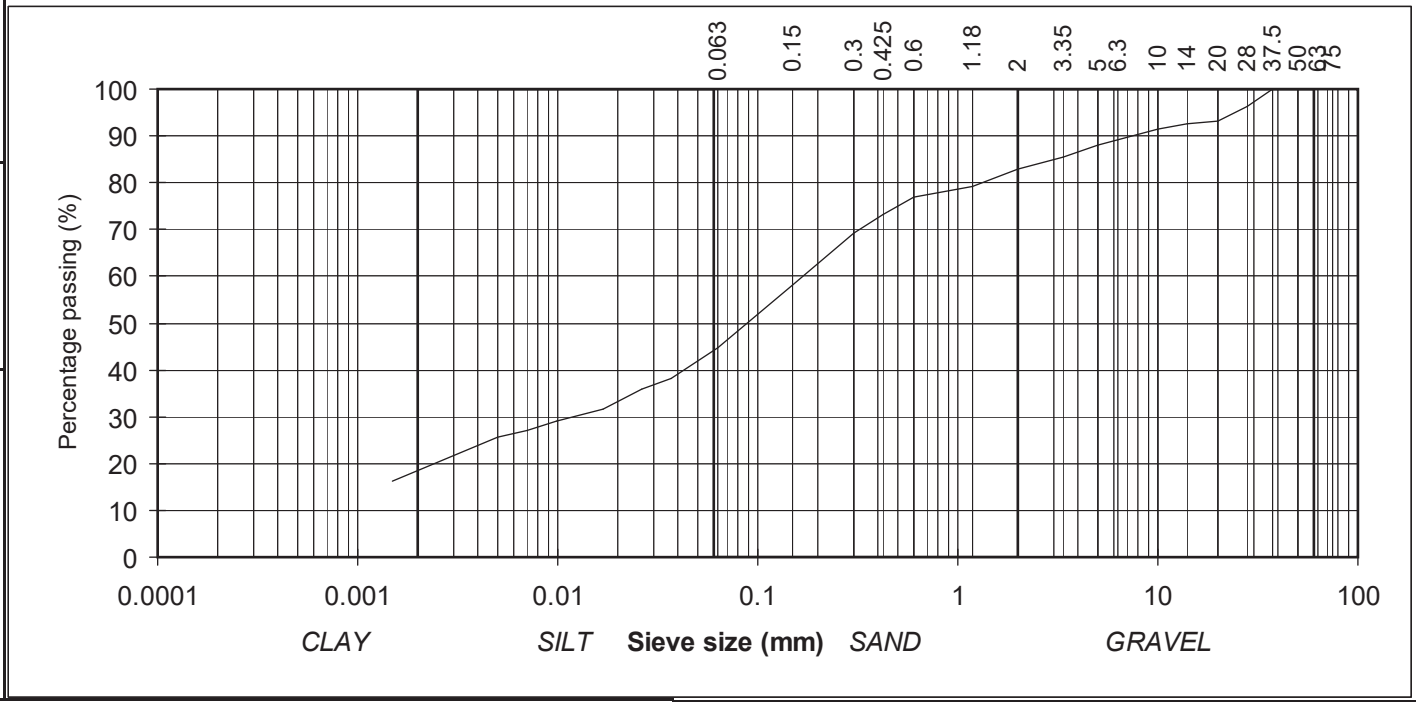
Sample Type: B

Depth (m) 0.50 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 09-06-16

Description: Light brown/grey sandy, slightly gravelly, SILT

Remarks



IGSL Ltd Materials Laboratory

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	91	
50	78	GRAVEL
37.5	71	
28	70	
20	65	
14	57	
10	52	
6.3	46	
5	44	
3.35	40	
2	37	
1.18	34	SAND
0.6	31	
0.425	30	
0.3	28	
0.15	25	
0.063	20	SILT/CLAY
0.040	17	
0.028	17	
0.018	15	
0.010	14	
0.007	13	
0.005	11	
0.002	7	

Contract No: 18963 Report No. R72735

Contract: GCTP Phase 3 - Contact 1

BH: BH3/31CF

Sample No. AA48876 Lab. Sample No. A16/1325

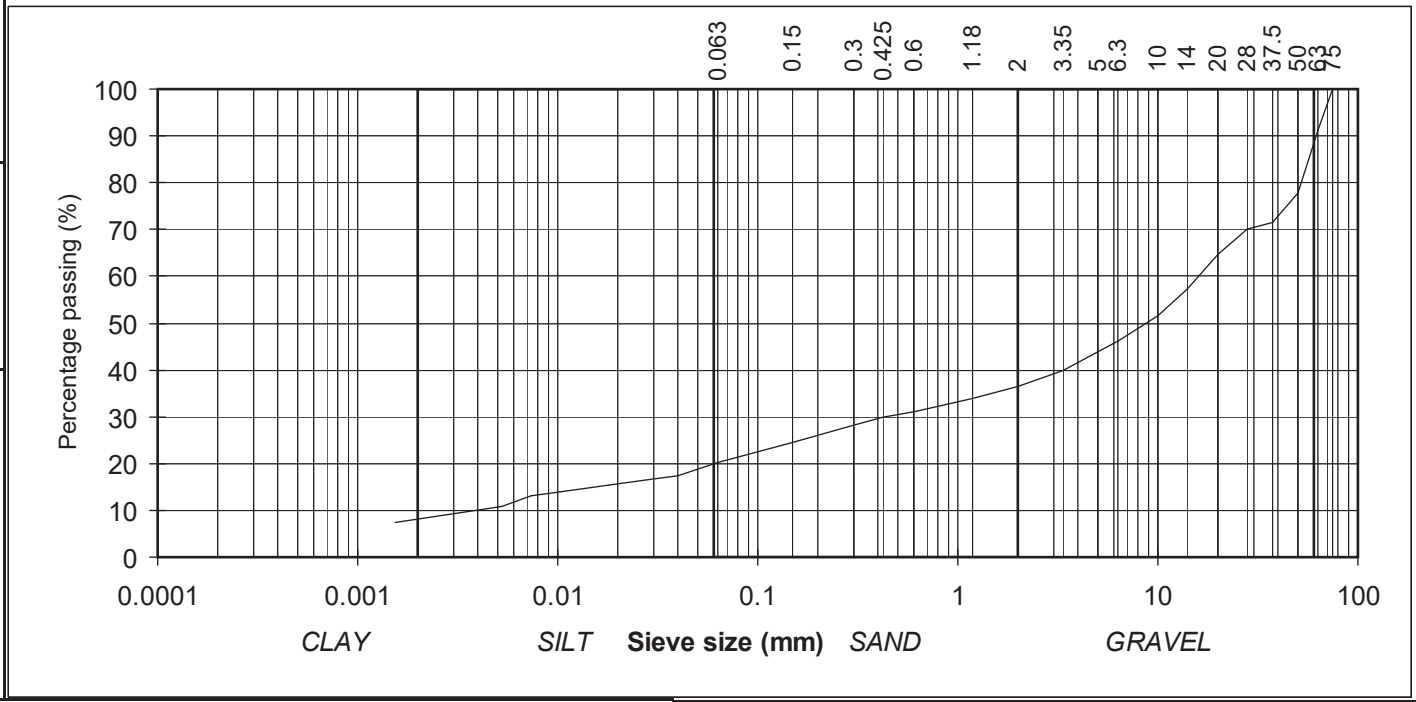
Sample Type: B

Depth (m) 1.00 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 09-06-16

Description: Light brown/grey slightly sandy, gravelly, CLAY with some cobbles

Remarks



IGSL Ltd Materials Laboratory

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	90	
50	90	GRAVEL
37.5	88	
28	82	
20	77	
14	71	
10	68	
6.3	64	
5	62	
3.35	59	
2	55	
1.18	51	SAND
0.6	46	
0.425	43	
0.3	41	
0.15	36	
0.063	31	SILT/CLAY
0.039	26	
0.028	23	
0.018	21	
0.010	19	
0.007	18	
0.005	16	
0.002	10	

Contract No: 18963 Report No. R72070

Contract: GCTP Phase 3 - Contact 1

BH: BH3/31CR

Sample No. AA48877 Lab. Sample No. A16/1326

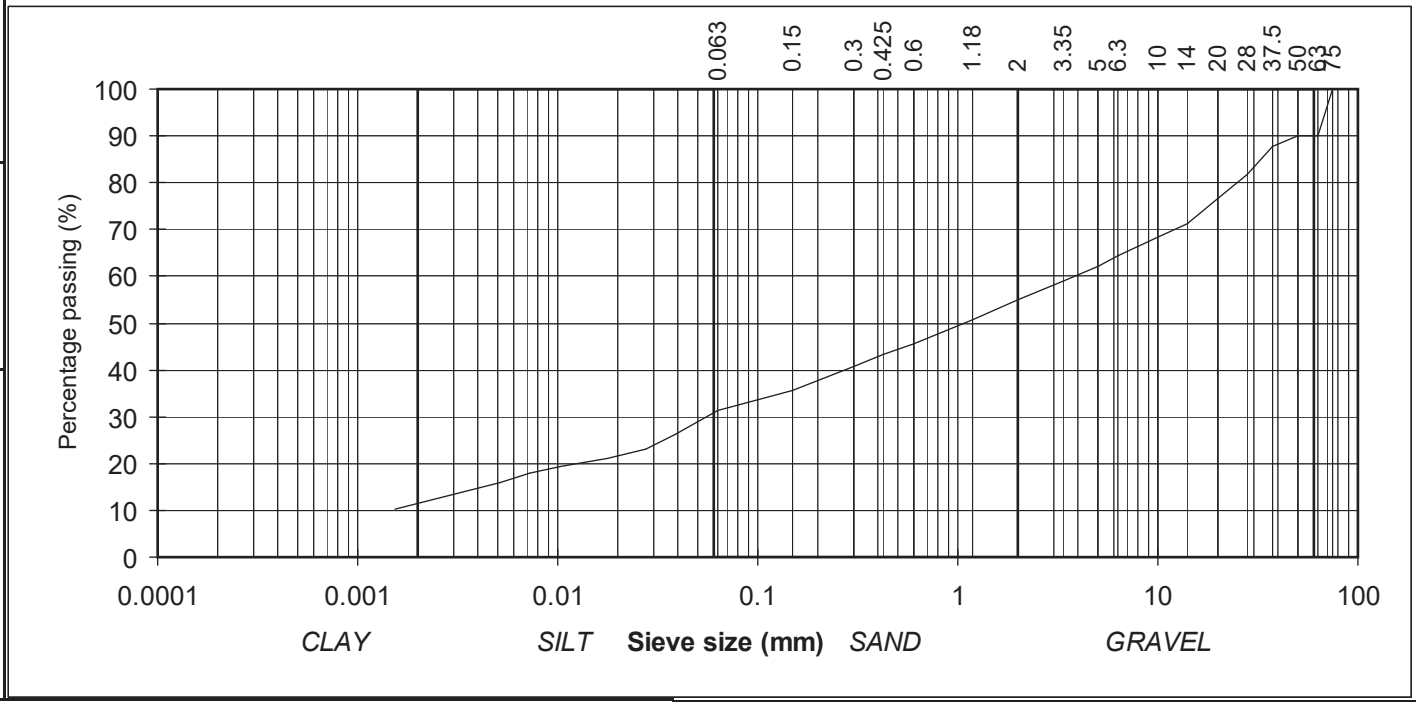
Sample Type: B

Depth (m) 2.00 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 29-04-16

Description: Light brown slightly sandy, gravelly, SILT with some cobbles

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	98	
14	95	
10	91	
6.3	86	
5	83	
3.35	77	
2	70	
1.18	63	SAND
0.6	56	
0.425	54	
0.3	50	
0.15	44	
0.063	38	SILT/CLAY
0.036	32	
0.026	29	
0.017	24	
0.010	20	
0.007	17	
0.005	15	
0.002	8	

Contract No: 18963 Report No. R71922

Contract: GCTP Phase 3 - Contact 1

BH: BH03/31CR

Sample No. AA48875 Lab. Sample No. A16/1327

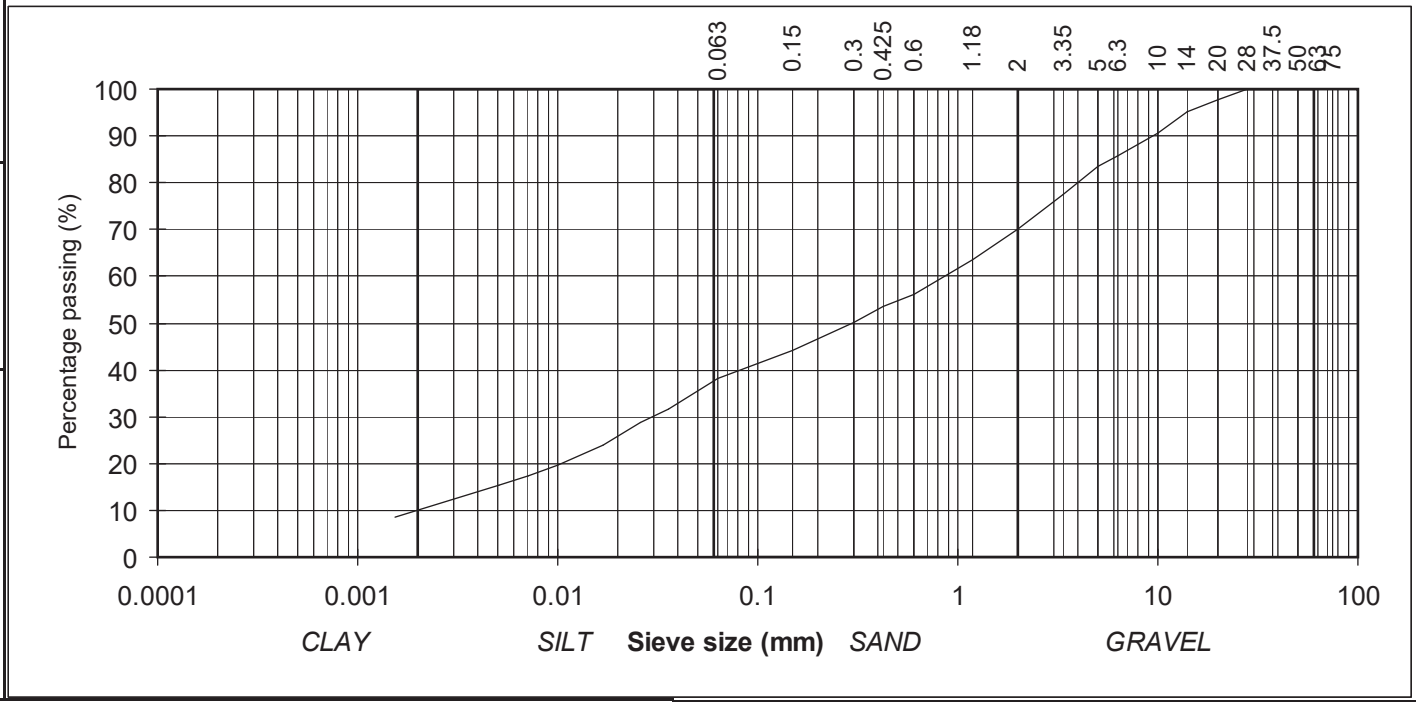
Sample Type: B

Depth (m) 3.00 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 27-04-16

Description: Mottled light brown slightly sandy, slightly gravelly, SILT

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	97	
28	92	
20	87	
14	85	
10	82	
6.3	78	
5	76	
3.35	73	
2	69	
1.18	65	SAND
0.6	61	
0.425	58	
0.3	55	
0.15	47	
0.063	38	SILT/CLAY
0.037	34	
0.027	31	
0.017	28	
0.010	24	
0.007	22	
0.005	19	
0.002	11	

Contract No: 18963 Report No. R72686

Contract: GCTP Phase 3 - Contact 1

BH: BH3/31CF

Sample No. AA48879 Lab. Sample No. A16/1328

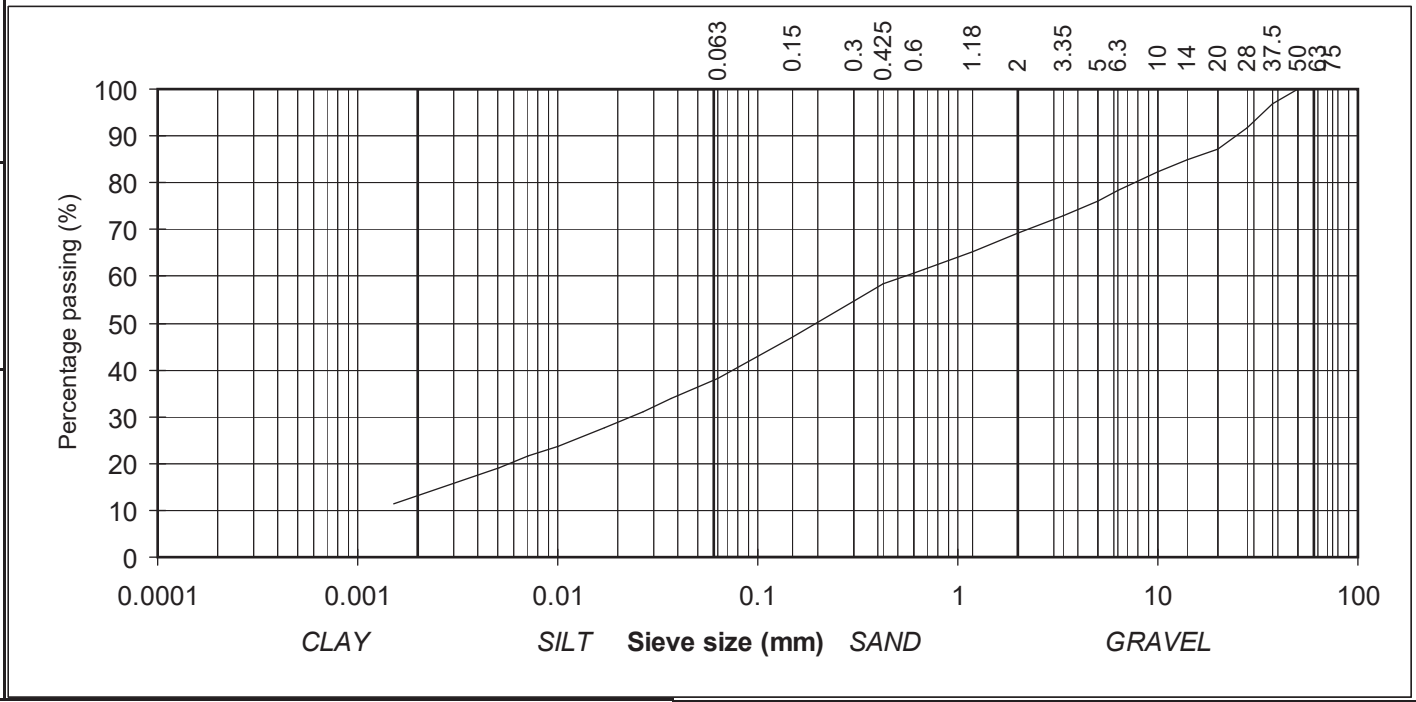
Sample Type: B

Depth (m) 4.00 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 09-06-16

Description: Light brown/grey slightly sandy, slightly gravelly, CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	17-06-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	92	
50	92	GRAVEL
37.5	92	
28	90	
20	87	
14	83	
10	81	
6.3	77	
5	76	
3.35	72	
2	68	
1.18	65	SAND
0.6	61	
0.425	58	
0.3	56	
0.15	48	
0.063	40	SILT/CLAY
0.037	35	
0.027	32	
0.017	29	
0.010	25	
0.007	22	
0.005	19	
0.002	12	

Contract No: 18963 Report No. R71928

Contract: GCTP Phase 3 - Contact 1

BH: BH03/47

Sample No. AA48890 Lab. Sample No. A16/1629

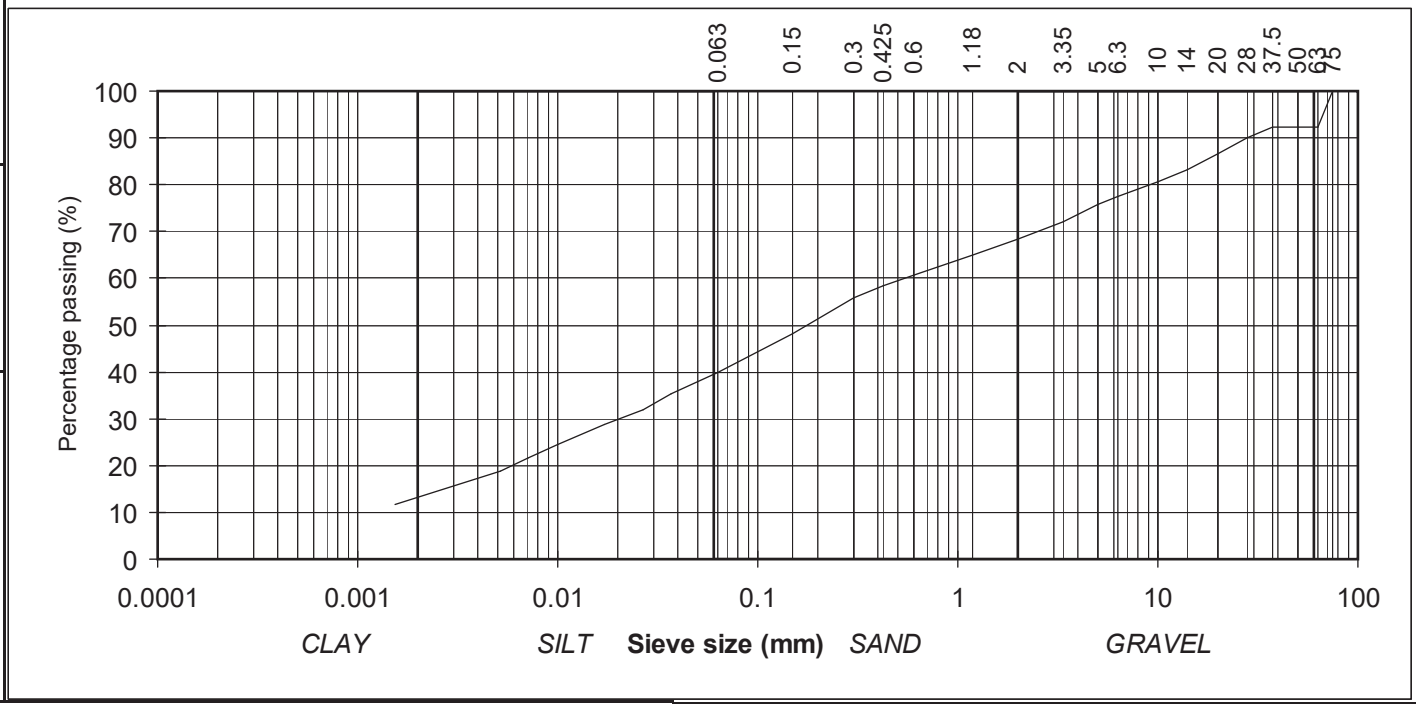
Sample Type: B

Depth (m) 0.50 Customer: Galway Co.Co.

Date Received 29-03-16 Date Testing started 27-04-16

Description: Mottled brown slightly sandy, slightly gravelly, SILT with some cobbles

Remarks



IGSL Ltd Materials Laboratory

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H Byrne	18-05-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	91	GRAVEL
37.5	91	
28	90	
20	88	
14	85	
10	83	
6.3	80	
5	78	
3.35	75	
2	72	
1.18	69	SAND
0.6	64	
0.425	62	
0.3	59	
0.15	51	
0.063	45	SILT/CLAY
0.037	38	
0.026	36	
0.017	33	
0.010	29	
0.007	27	
0.005	24	
0.002	15	

Contract No: 18963 Report No. R71929

Contract: GCTP Phase 3 - Contact 1

BH: BH03/47

Sample No. AA48891 Lab. Sample No. A16/1630

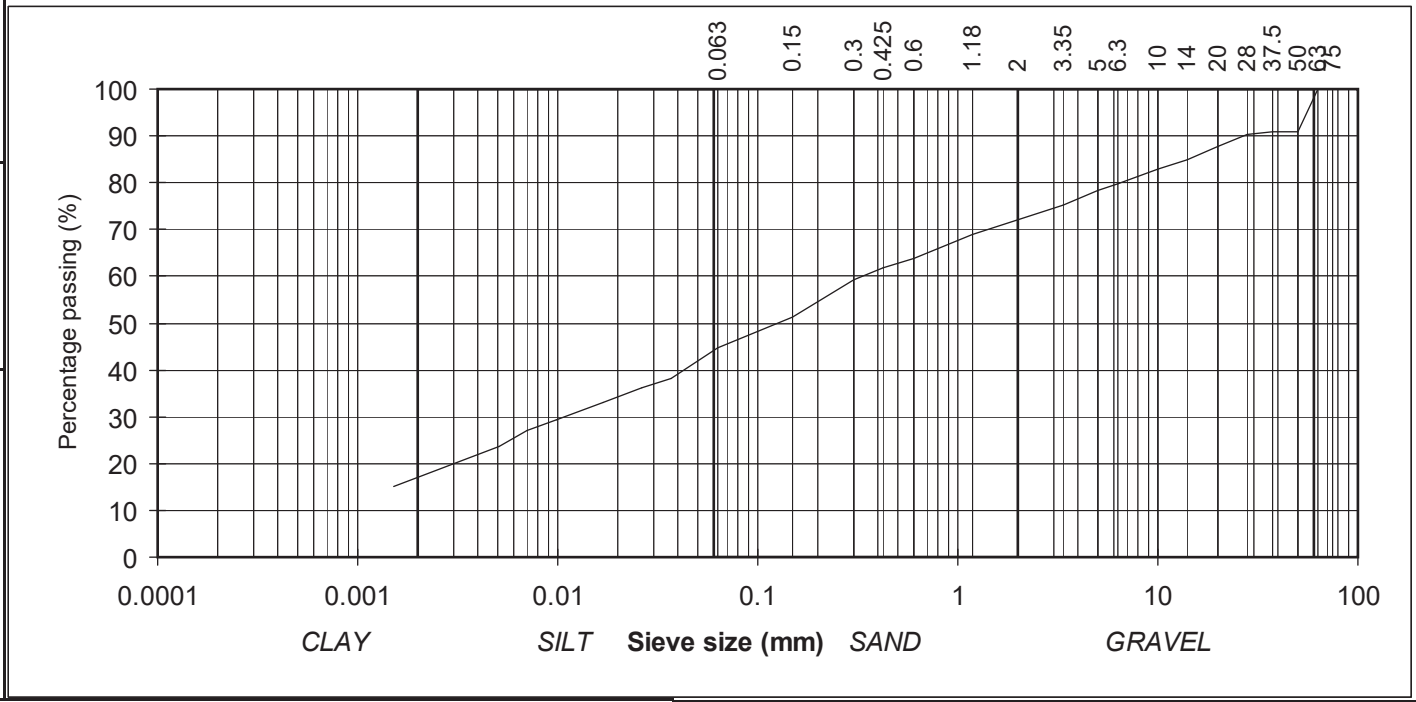
Sample Type: B

Depth (m) 1.00 Customer: Galway Co.Co.

Date Received 29-03-16 Date Testing started 27-04-16

Description: Light brown slightly sandy, slightly gravelly, SILT

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	94	GRAVEL
37.5	92	
28	92	
20	91	
14	89	
10	87	
6.3	83	
5	81	
3.35	77	
2	74	
1.18	71	SAND
0.6	66	
0.425	65	
0.3	62	
0.15	55	
0.063	45	SILT/CLAY
0.037	40	
0.026	37	
0.017	35	
0.010	32	
0.007	29	
0.005	26	
0.002	18	

Contract No: 18963 Report No. R72127

Contract: GCTP Phase 3 - Contact 1

BH: BH3/47

Sample No. AA48892 Lab. Sample No. A16/1631

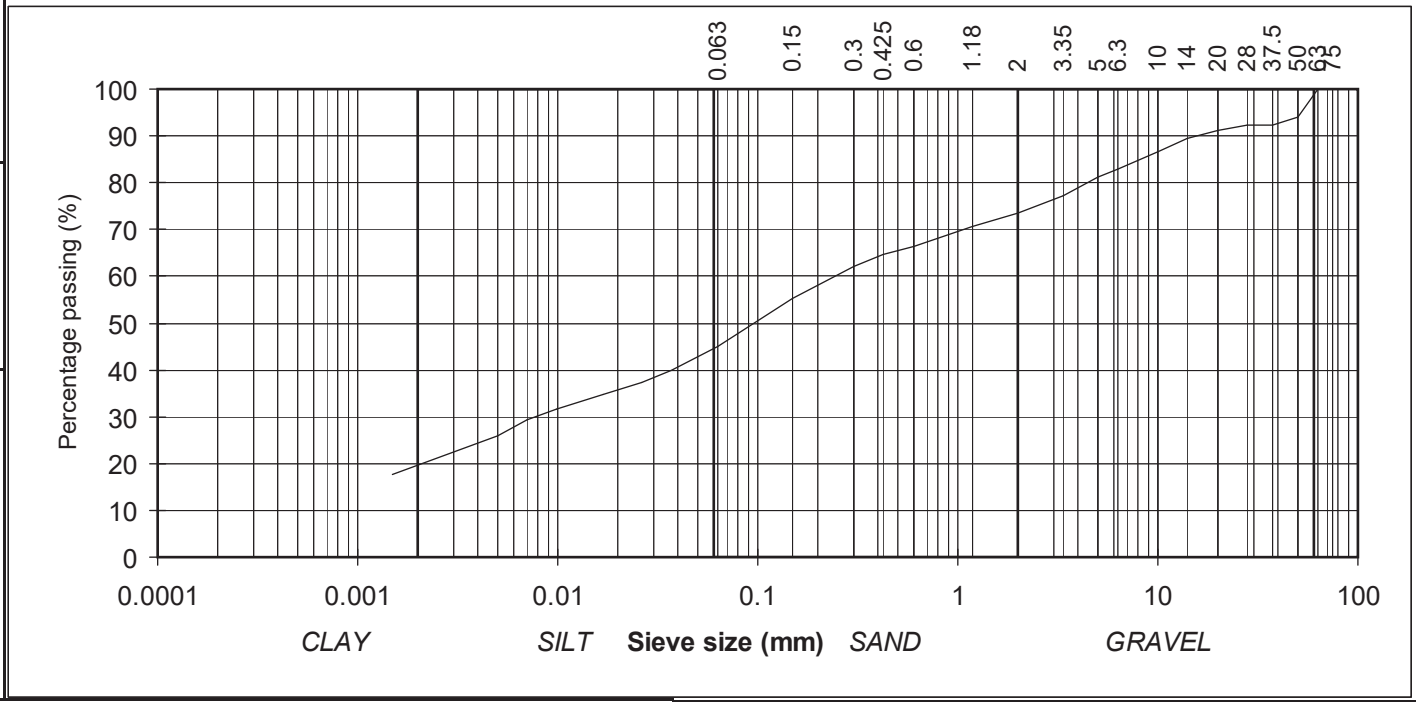
Sample Type: B

Depth (m) 2.00 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 27-04-16

Description: Mottled brown slightly sandy, slightly gravelly, CLAY

Remarks



IGSL Ltd Materials Laboratory

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	91	GRAVEL
37.5	89	
28	87	
20	85	
14	84	
10	80	
6.3	77	
5	76	
3.35	72	
2	68	
1.18	64	SAND
0.6	59	
0.425	57	
0.3	55	
0.15	50	
0.063	45	SILT/CLAY
0.036	41	
0.026	39	
0.016	36	
0.010	33	
0.007	31	
0.005	28	
0.001	20	

Contract No: 18963 Report No. R71998

Contract: GCTP Phase 3 - Contact 1

BH: BH3/47

Sample No. AA48893 Lab. Sample No. A16/1632

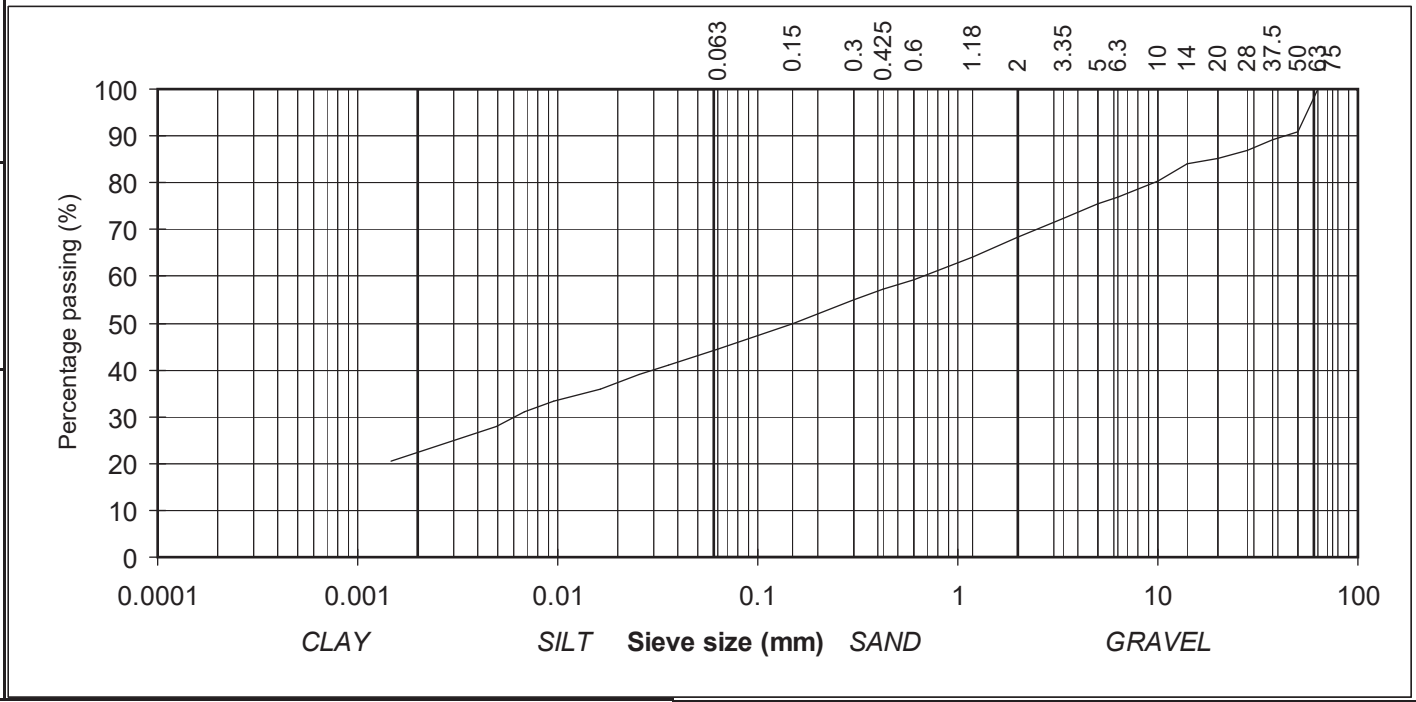
Sample Type: B

Depth (m) 3.00 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 27-04-16

Description: Light brown/grey slightly sandy, slightly gravelly, CLAY

Remarks



IGSL Ltd Materials Laboratory

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	87	COBBLES
63	87	
50	79	GRAVEL
37.5	74	
28	71	
20	69	
14	65	
10	62	
6.3	59	
5	57	
3.35	53	
2	48	
1.18	43	SAND
0.6	38	
0.425	36	
0.3	34	
0.15	30	
0.063	27	SILT/CLAY
0.036	24	
0.026	23	
0.016	22	
0.010	20	
0.007	18	
0.005	17	
0.001	11	

Contract No: 18963 Report No. R72071

Contract: GCTP Phase 3 - Contact 1

BH: BH3/52

Sample No. AA48884 Lab. Sample No. A16/1633

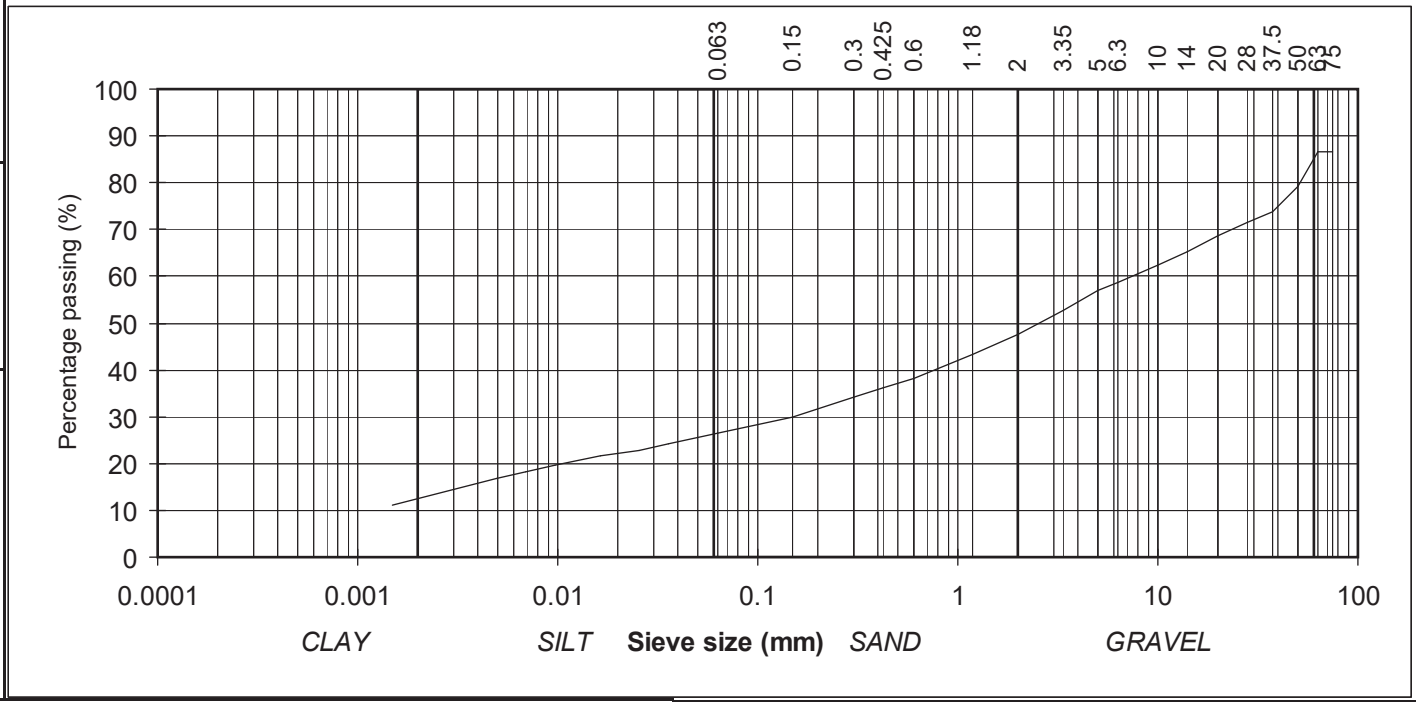
Sample Type: B

Depth (m) 0.50 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 29-04-16

Description: Light brown/grey slightly sandy, gravelly, CLAY with some cobbles

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	96	
28	95	
20	91	
14	88	
10	85	
6.3	82	
5	80	
3.35	78	
2	75	
1.18	72	SAND
0.6	68	
0.425	65	
0.3	62	
0.15	52	
0.063	40	SILT/CLAY
0.036	32	
0.026	30	
0.017	28	
0.010	25	
0.007	22	
0.005	19	
0.001	14	

Contract No: 18963 Report No. R72737

Contract: GCTP Phase 3 - Contact 1

BH: BH3/52

Sample No. AA48886 Lab. Sample No. A16/1634

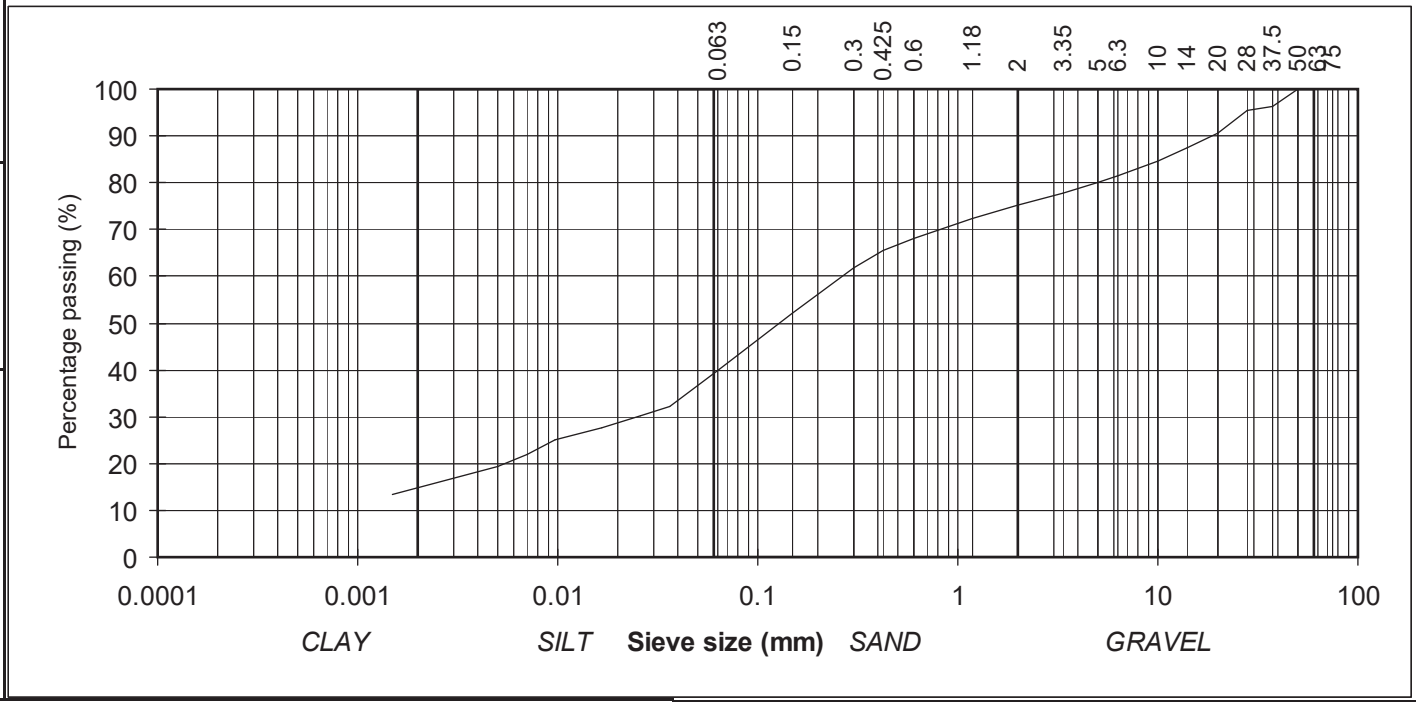
Sample Type: B

Depth (m) 1.00 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 09-06-16

Description: Brown sandy, slightly gravelly, CLAY

Remarks



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

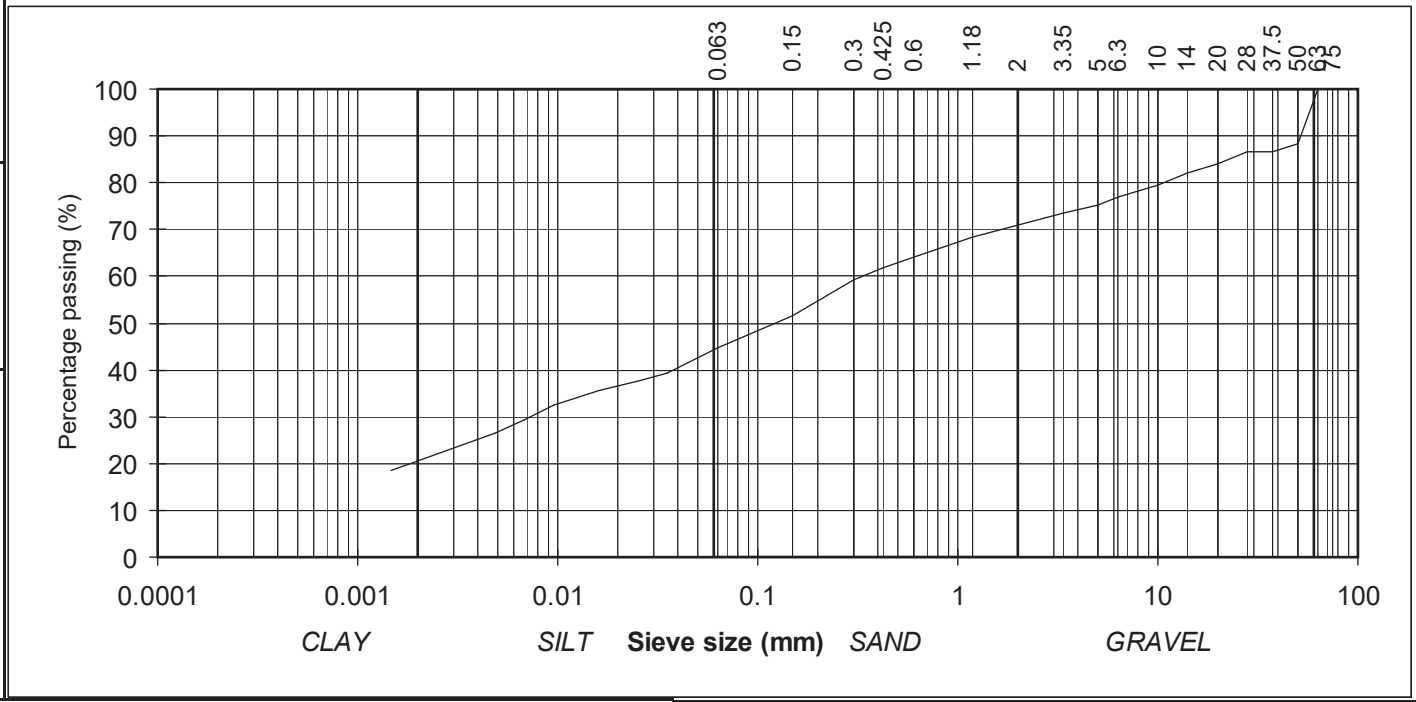
TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	88	GRAVEL
37.5	87	
28	87	
20	84	
14	82	
10	79	
6.3	77	
5	75	
3.35	73	
2	71	
1.18	68	SAND
0.6	64	
0.425	62	
0.3	59	
0.15	52	
0.063	45	SILT/CLAY
0.035	39	
0.025	38	
0.016	36	
0.009	32	
0.007	29	
0.005	27	
0.001	19	

Contract No: 18963 Report No. R72072
Contract: GCTP Phase 3 - Contact 1
BH: BH3/52
Sample No. AA48886 Lab. Sample No. A16/1635
Sample Type: B
Depth (m) 2.00 Customer: Galway Co.Co.
Date Received 05-04-16 Date Testing started 29-04-16
Description: Light brown/grey slightly sandy, slightly gravelly, SILT

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	98	
28	96	
20	96	
14	95	
10	93	
6.3	89	
5	88	
3.35	84	
2	78	
1.18	75	SAND
0.6	70	
0.425	68	
0.3	65	
0.15	58	
0.063	52	SILT/CLAY
0.035	46	
0.025	44	
0.016	41	
0.009	38	
0.007	35	
0.005	32	
0.001	23	

Contract No: 18963 Report No. R71999

Contract: GCTP Phase 3 - Contact 1

BH: BH3/52

Sample No. AA48887 Lab. Sample No. A16/1636

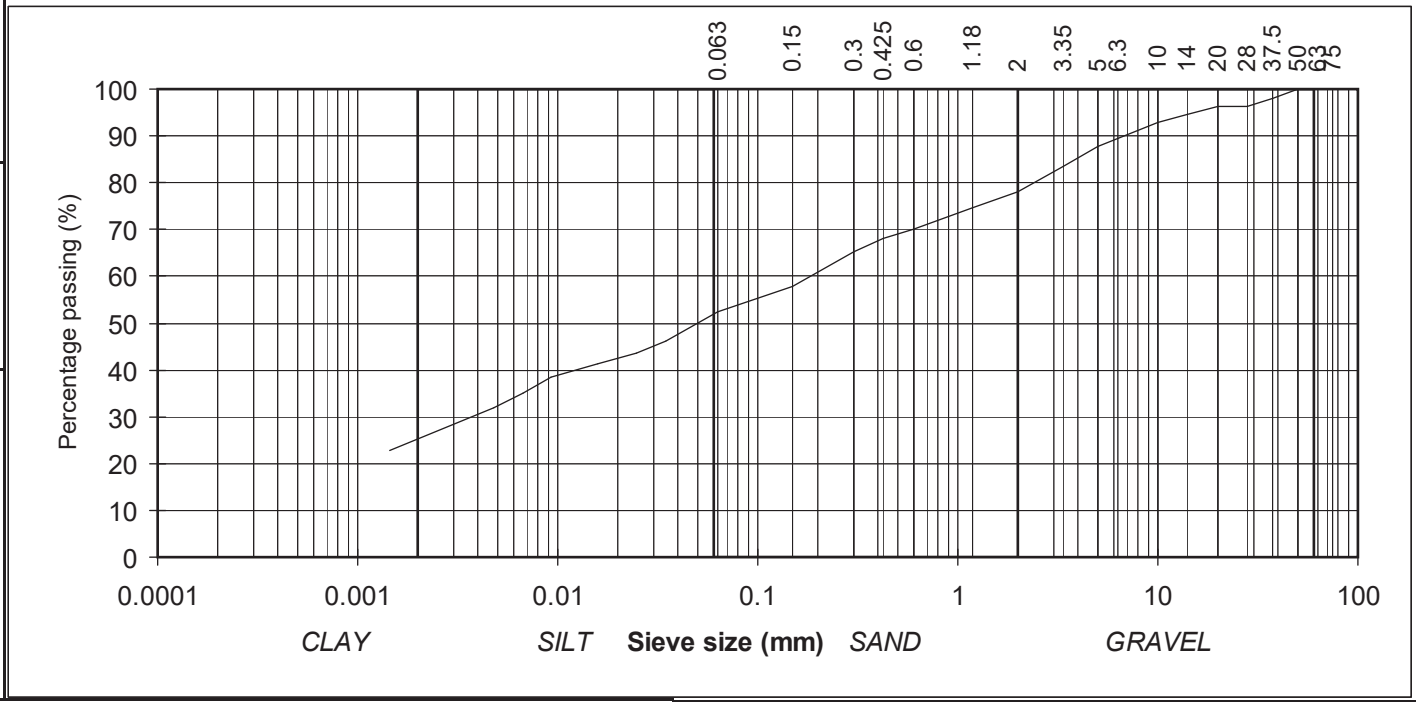
Sample Type: B

Depth (m) 3.00 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 27-04-16

Description: Light brown/grey slightly sandy, slightly gravelly, CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	88	COBBLES
63	82	
50	67	GRAVEL
37.5	57	
28	50	
20	44	
14	40	
10	37	
6.3	34	
5	32	
3.35	28	
2	23	
1.18	20	SAND
0.6	17	
0.425	15	
0.3	14	
0.15	12	
0.063	10	SILT/CLAY

Contract No: 18963 Report No. R71930

Contract: GCTP Phase 3 - Contact 1

BH: BH03/53

Sample No. AA48889 Lab. Sample No. A16/1638

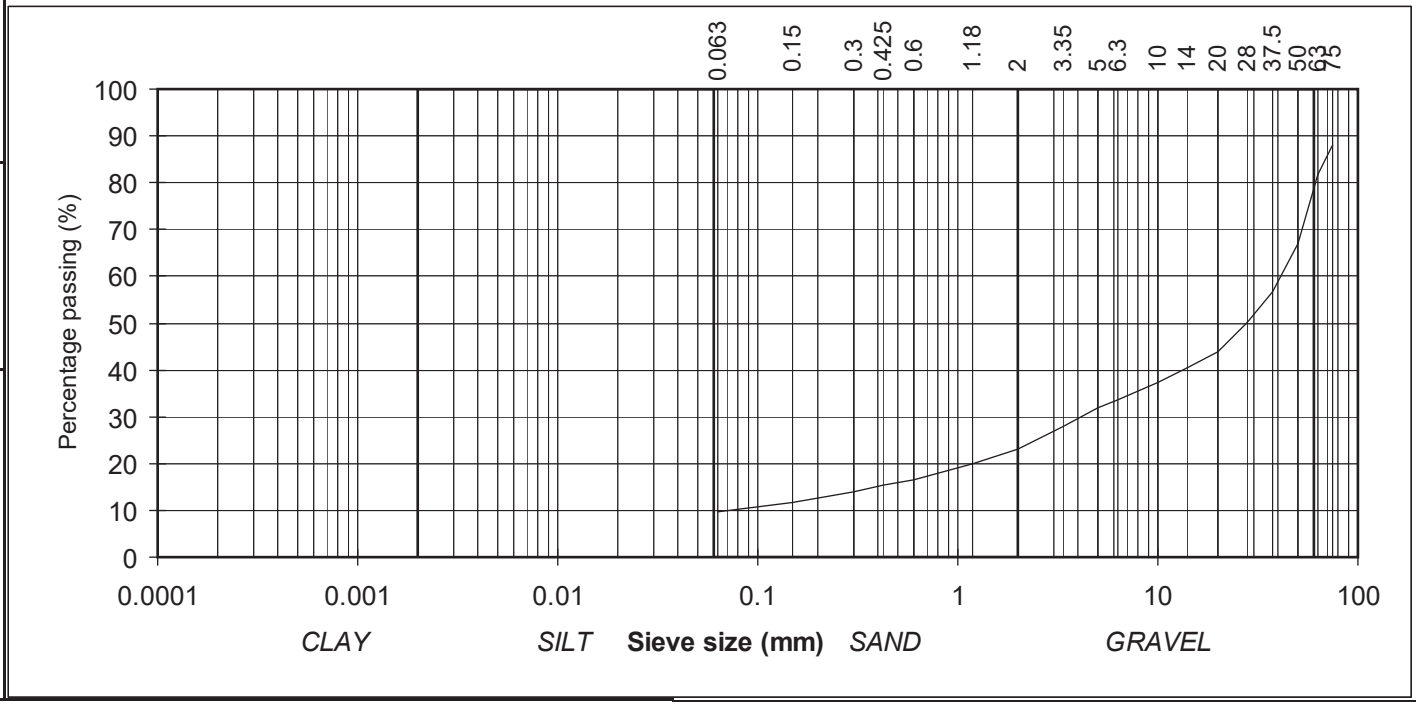
Sample Type: B

Depth (m) 1.00 Customer: Galway Co.Co.

Date Received 29-03-16 Date Testing started 27-04-16

Description: Light brown/grey silty, sandy, GRAVEL with some cobbles

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	84	
28	66	
20	58	
14	50	
10	46	
6.3	40	
5	38	
3.35	33	
2	29	
1.18	25	SAND
0.6	20	
0.425	18	
0.3	16	
0.15	13	
0.063	11	SILT/CLAY

Contract No: 18963 Report No. R72073

Contract: GCTP Phase 3 - Contact 1

BH: BH3/53

Sample No. AA48888 Lab. Sample No. A16/1637

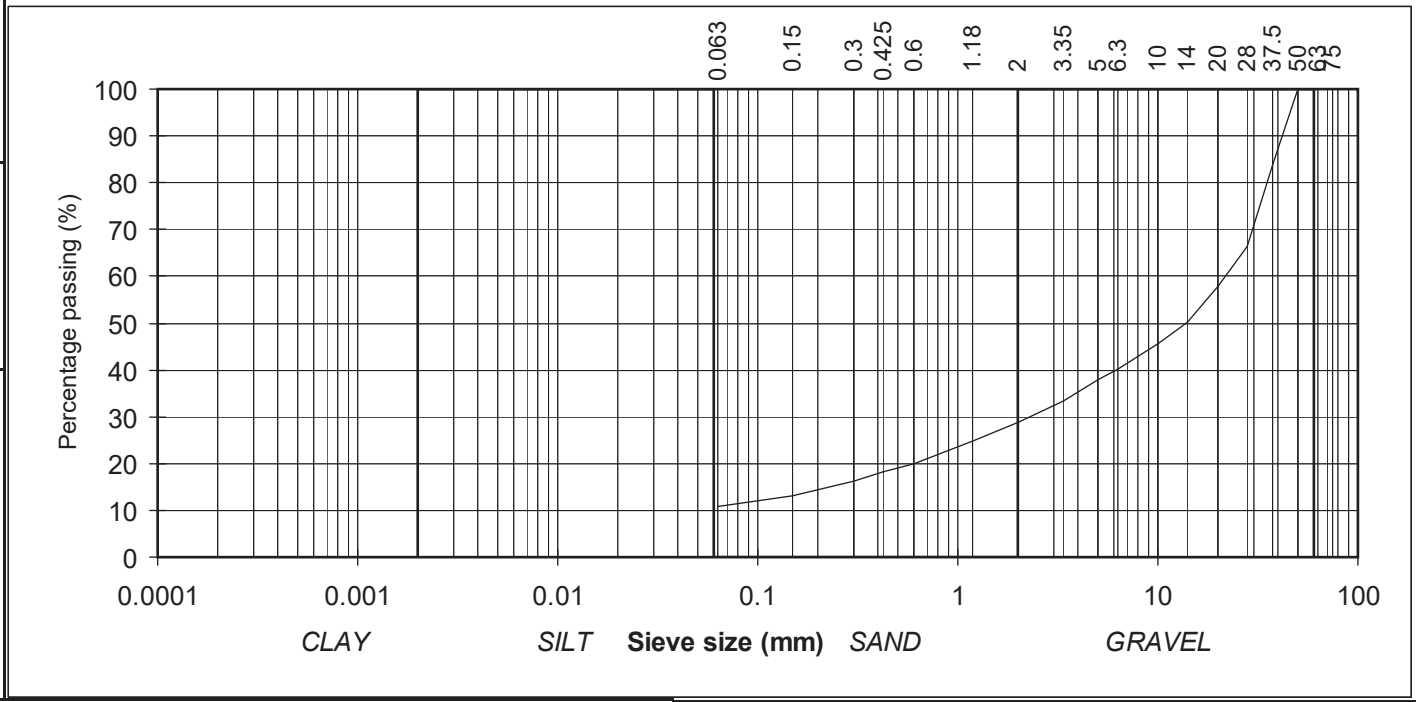
Sample Type: B

Depth (m) 0.50 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 29-04-16

Description: Light brown/grey silty, sandy, GRAVEL

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

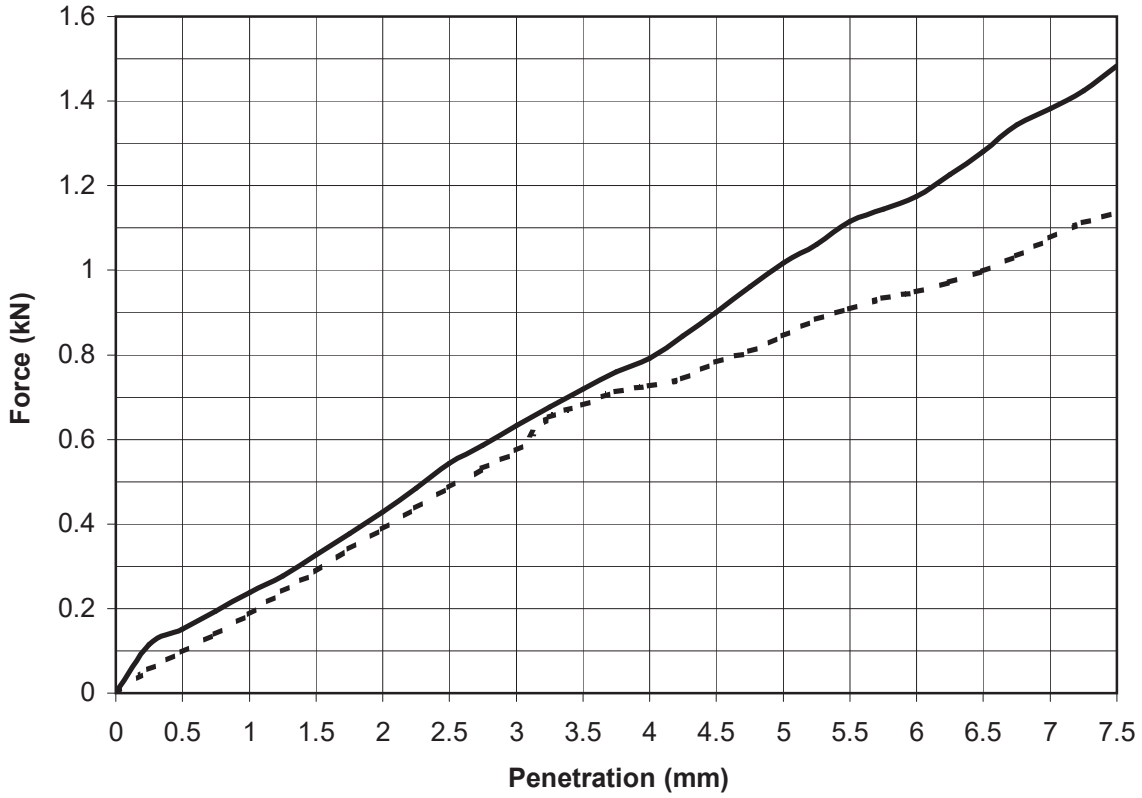
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)

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

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1337

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: ———— Top ---------- Base

Description:	Dark brown silty, sandy, GRAVEL with some cobbles		
Initial Condition:	Soaked 4 Days		
Moisture Content (%):	18	Bulk Density (Mg/m^3):	2.07
Surcharge (kg):	4	Dry Density (Mg/m^3):	1.75
% Material >20mm:	24		
Method of compaction:	Static Compaction Method 2		

Test Result	Top	Base
CBR %	**5**	**4**
Moisture Content %	17	19

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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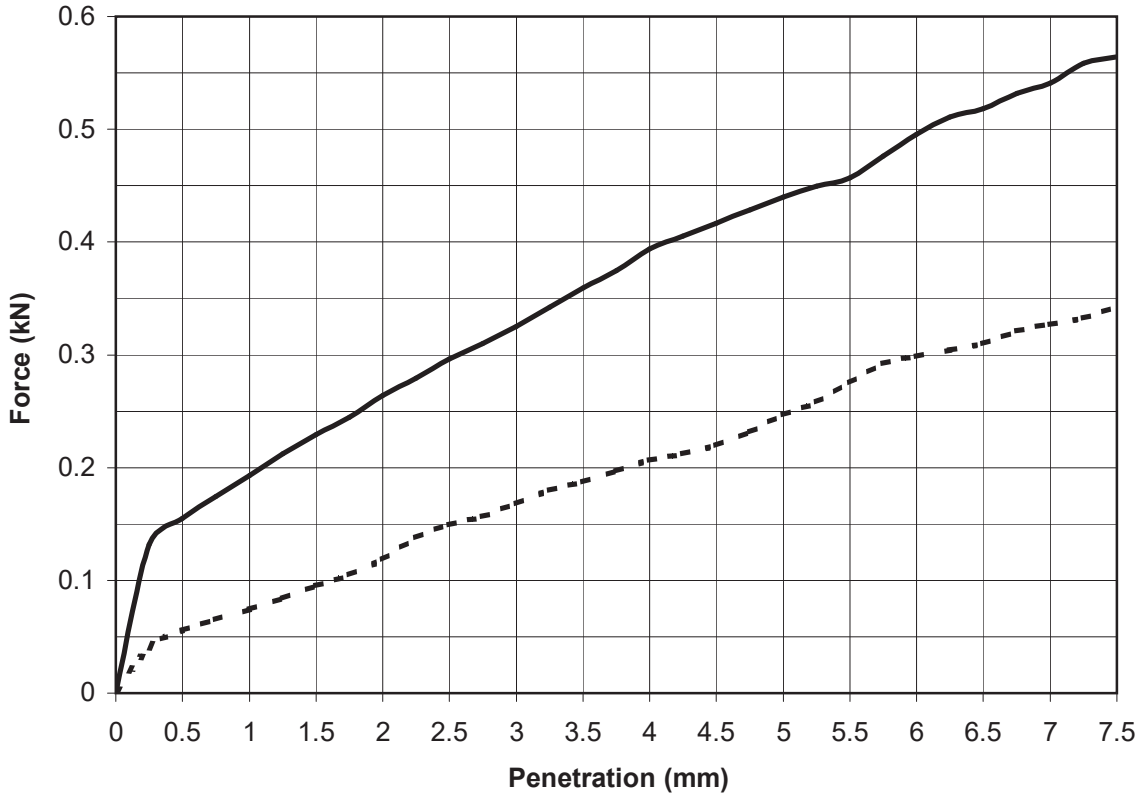
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)

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

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

Report No.	R72513	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.	BH3/31CR	Sample No.	AA48878	Type:	B
Depth (m)	3.00	Lab sample No.	A16/1327		



Key: ———— Top ---------- Base

Description:	Mottled light brown slightly sandy, slightly gravelly, 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 Compaction Method 2		

Test Result	Top	Base
CBR %	**2.2**	**1.2**
Moisture Content %	11	11

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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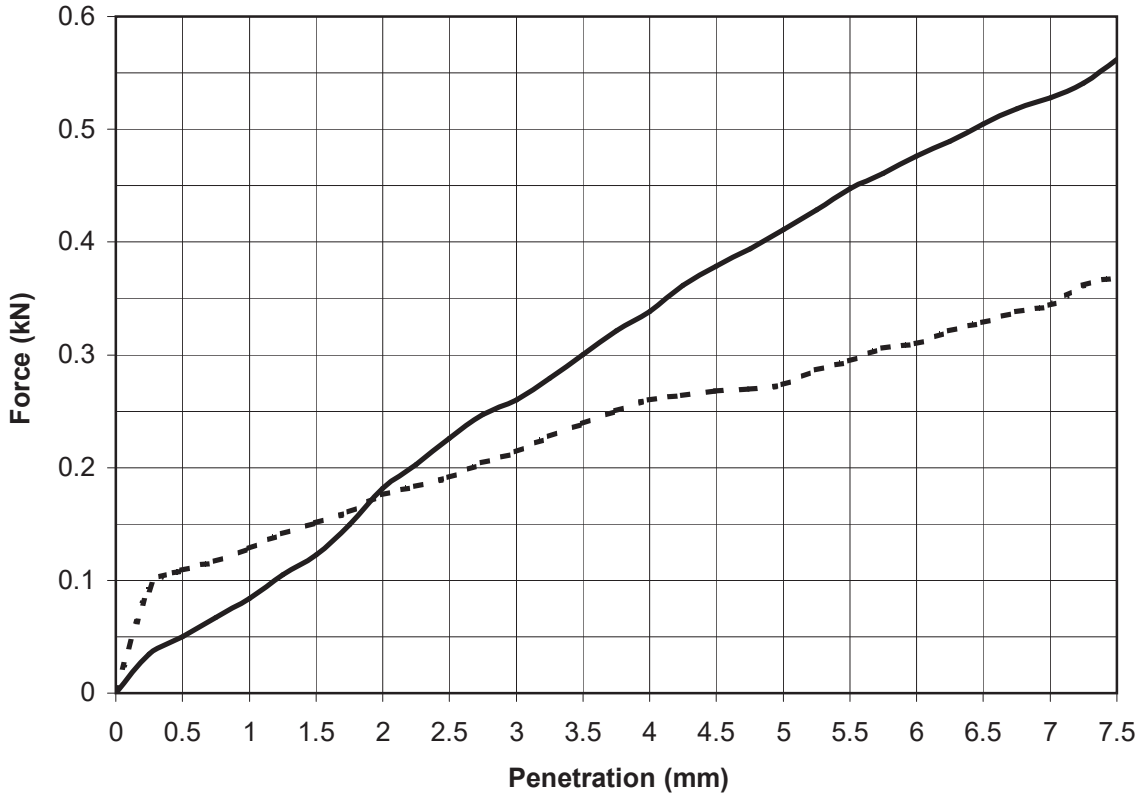
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)

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

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

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: ———— Top ---------- Base

Description:	Light brown slightly sandy, 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 Compaction Method 2		

Test Result	Top	Base
CBR %	**2.1**	**1.4**
Moisture 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.
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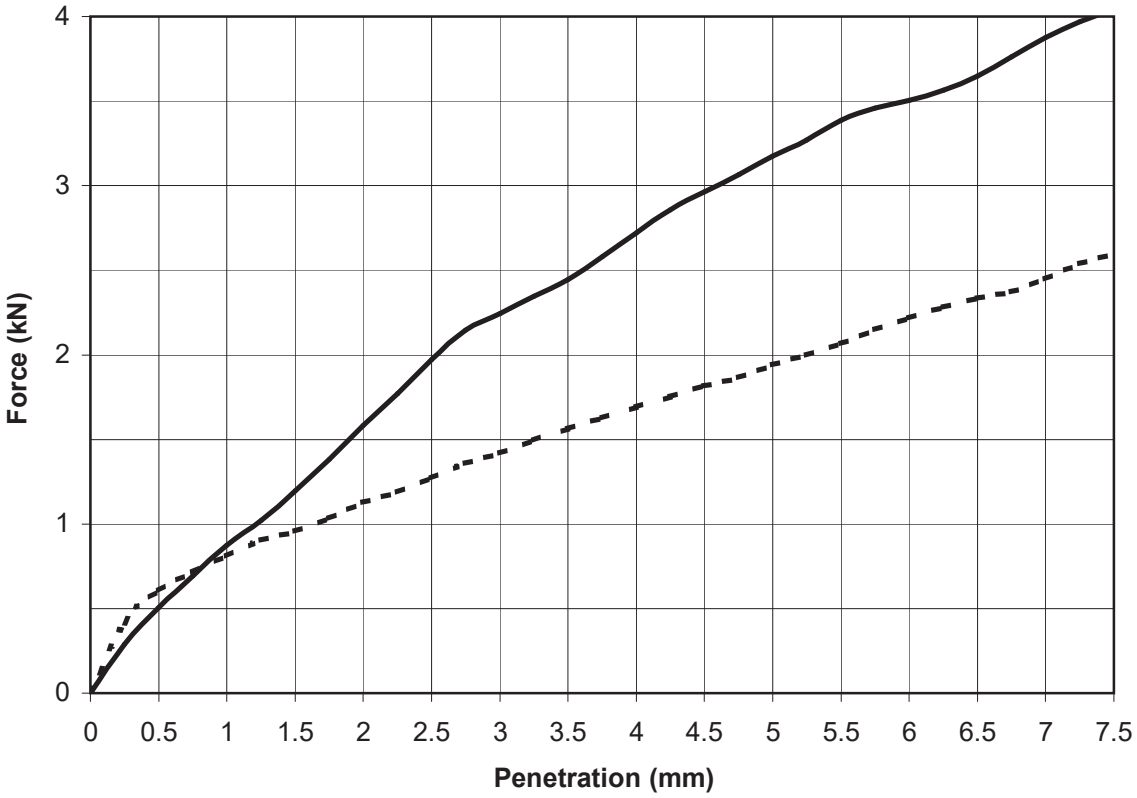
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)

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

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

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: ———— Top ---------- Base

Description:	Brown sandy very gravelly CLAY		
Initial Condition:	Unsoaked 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	Top	Base
CBR %	**16**	**10**
Moisture Content %	17	17

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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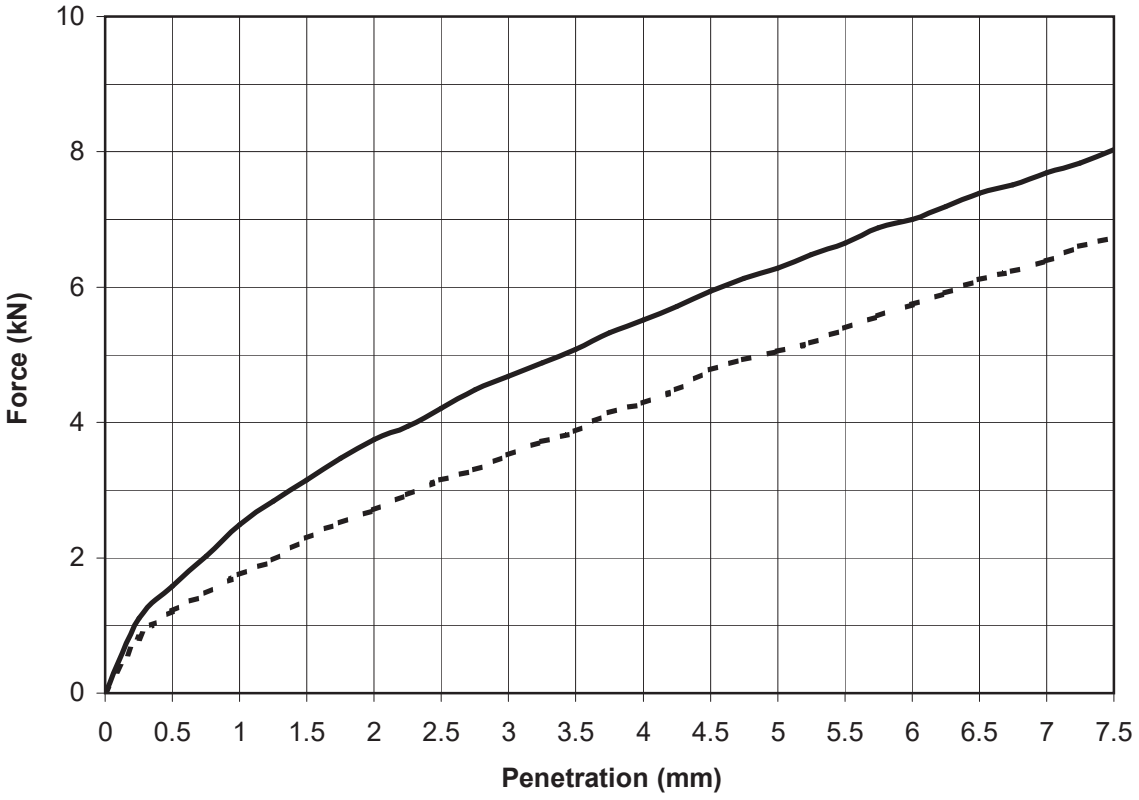
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)

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

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1337

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: ———— Top ---------- Base

Description:	Orange/Brown slightly clayey/silty, sandy, GRAVEL with many cobbles		
Initial Condition:	Unsoaked Point 2 of 5		
Moisture Content (%):	5	Bulk Density (Mg/m^3):	1.96
Surcharge (kg):	4	Dry Density (Mg/m^3):	1.87
% Material >20mm:	34		
Method of compaction:	Static Compaction Method 2		

Test Result	Top	Base
CBR %	**32**	**25**
Moisture Content %	5	5

Persons authorized to approve reports

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

IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
H Byrne	02-06-16	2 of 5

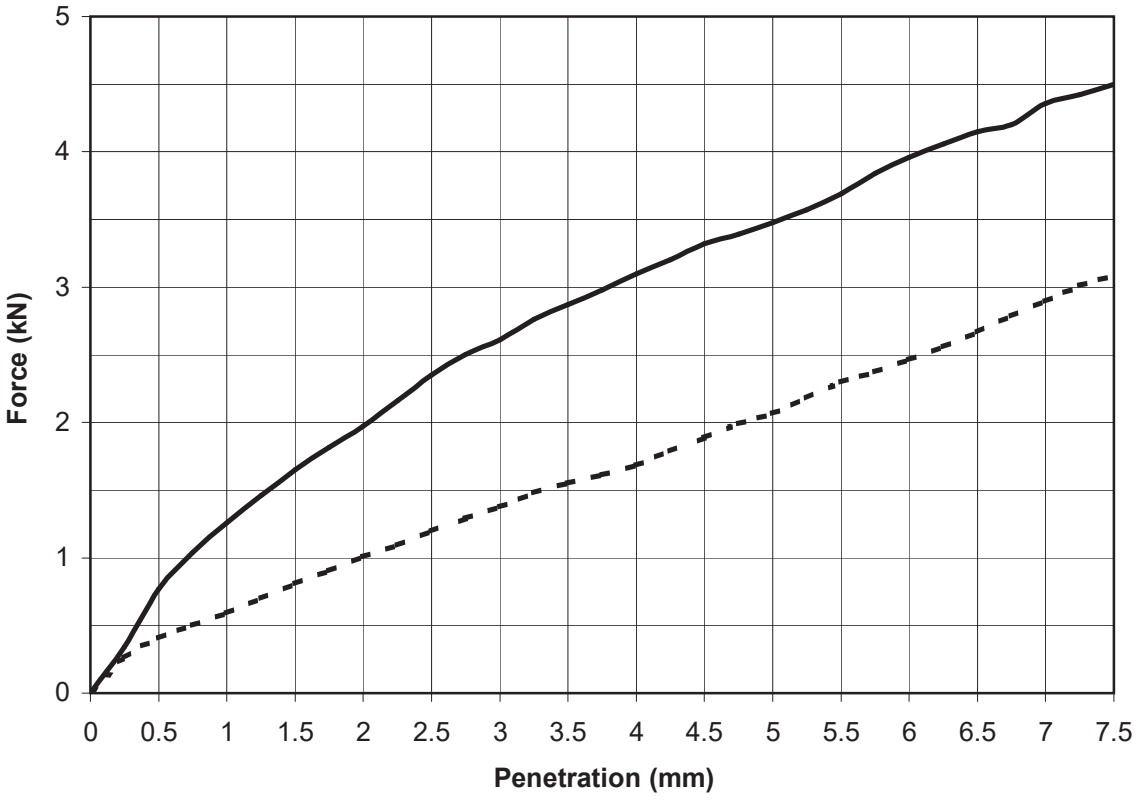
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)

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

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

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: ———— Top ---------- Base

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

Test Result	Top	Base
CBR %	**18**	**10**
Moisture Content %	9	10

Persons authorized to approve reports

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

IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
H Byrne	02-06-16	3 of 5

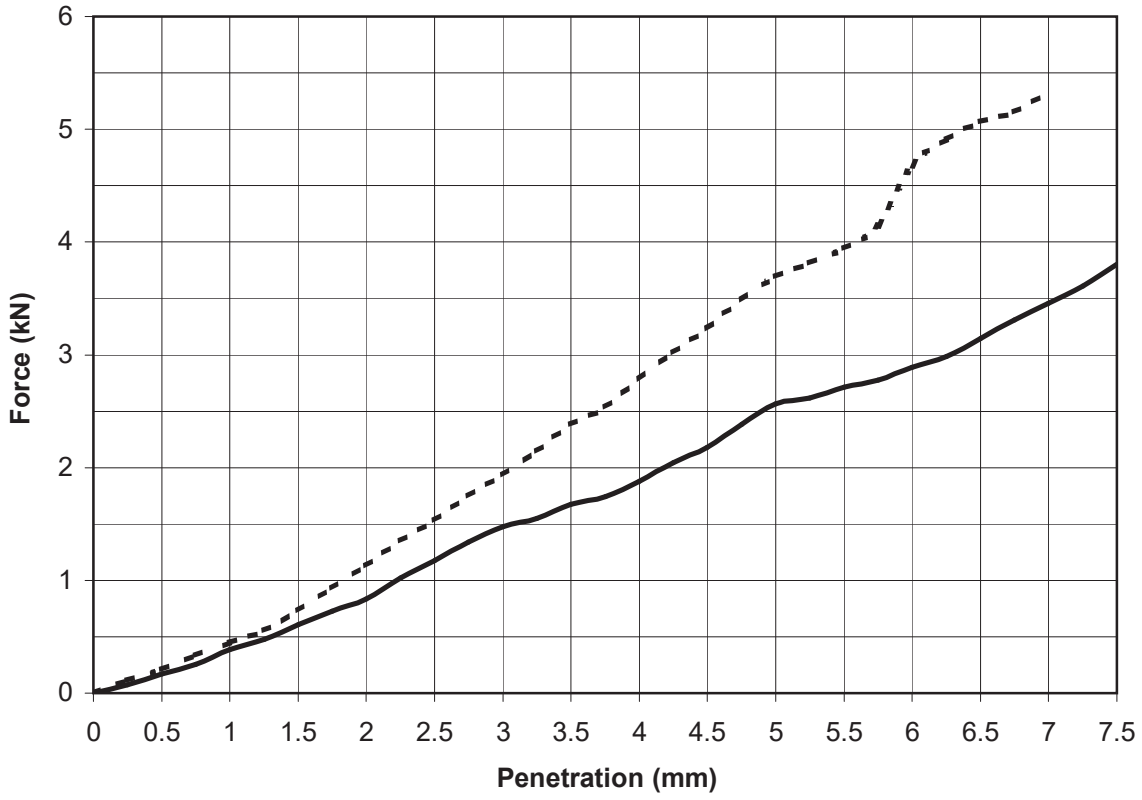
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)

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

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

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: ———— Top ---------- Base

Description:	Orange/Brown slightly clayey/silty, sandy, GRAVEL with many cobbles		
Initial Condition:	Unsoaked Point 4 of 5		
Moisture Content (%):	13	Bulk Density (Mg/m^3):	2.02
Surcharge (kg):	4	Dry Density (Mg/m^3):	1.79
% Material >20mm:	34		
Method of compaction:	Static Compaction Method 2		

Test Result	Top	Base
CBR %	**13**	**19**
Moisture Content %	13	13

Persons authorized to approve reports

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

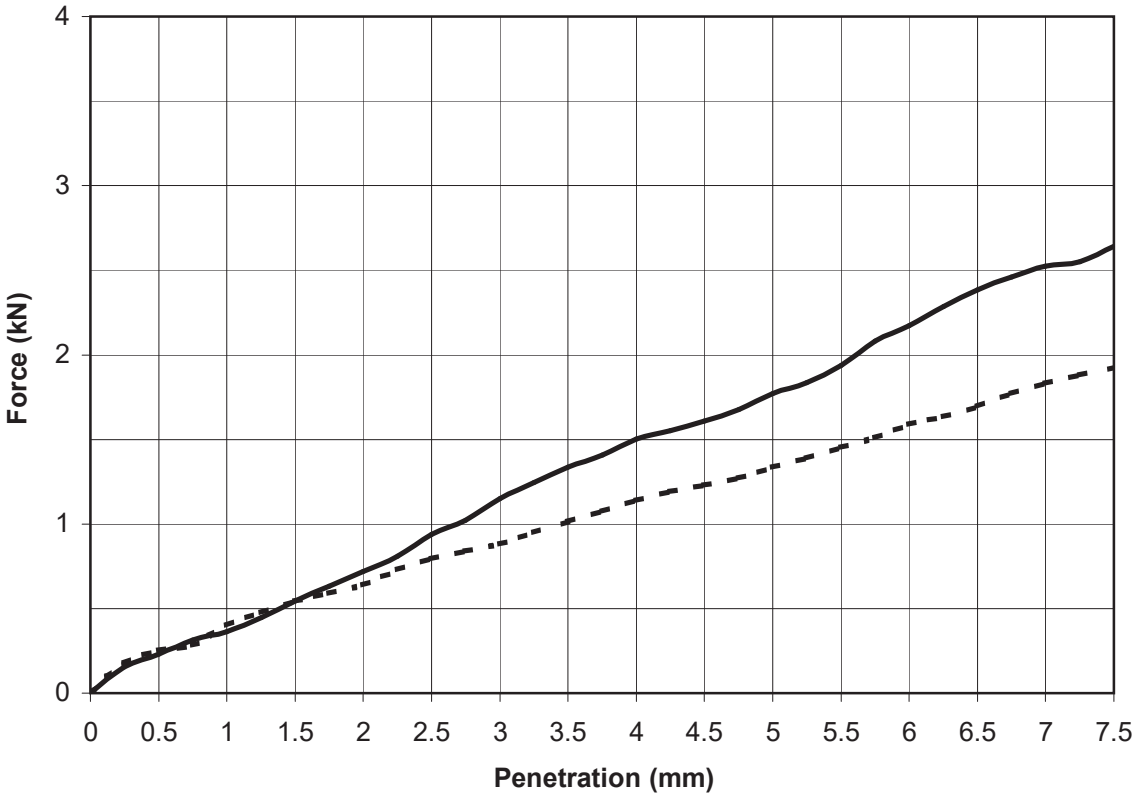
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)

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

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

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: ———— Top ---------- Base

Description:	Orange/Brown slightly clayey/silty, sandy, GRAVEL with many cobbles		
Initial Condition:	Unsoaked 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 Compaction Method 2		

Test Result	Top	Base
CBR %	**9**	**7**
Moisture Content %	15	15

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

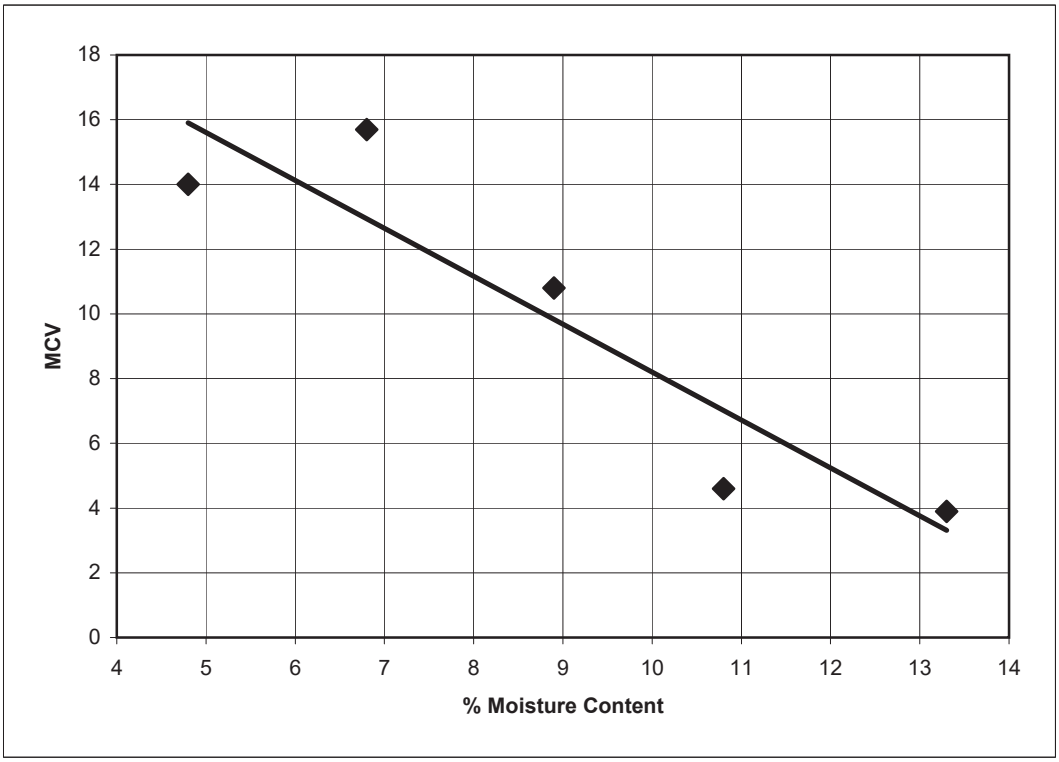
IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
H Byrne	02-06-16	5 of 5

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	Approved by	Date	Page No.
	H Byrne	14-06-16	1 of 1

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

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1331

Report No. R72384 Contract No. 18963

Contract Name: GCTP Phase 3 - Contract 1 GI

Lab Contract No. 18963 Location: BH3/20

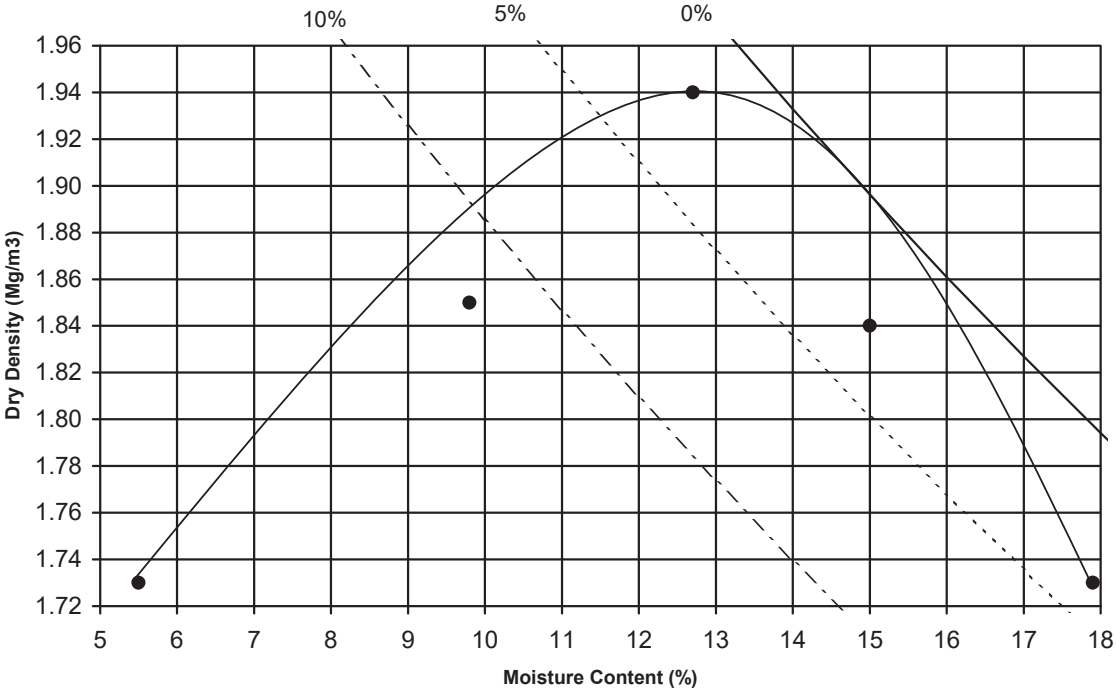
Sample No. AA49486 Depth (m) 0.5 Material Type B

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/m^3): 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/m^3): 2.65 Particle Density: Assumed

% retained on 20/37.5mm sieve: 34

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

The result relates to the specimen tested.
Opinions and interpretations are outside the scope of accreditation

IGSL Materials Laboratory	Approved by	Date	Page
	H Byrne	02-06-16	1 of 1

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

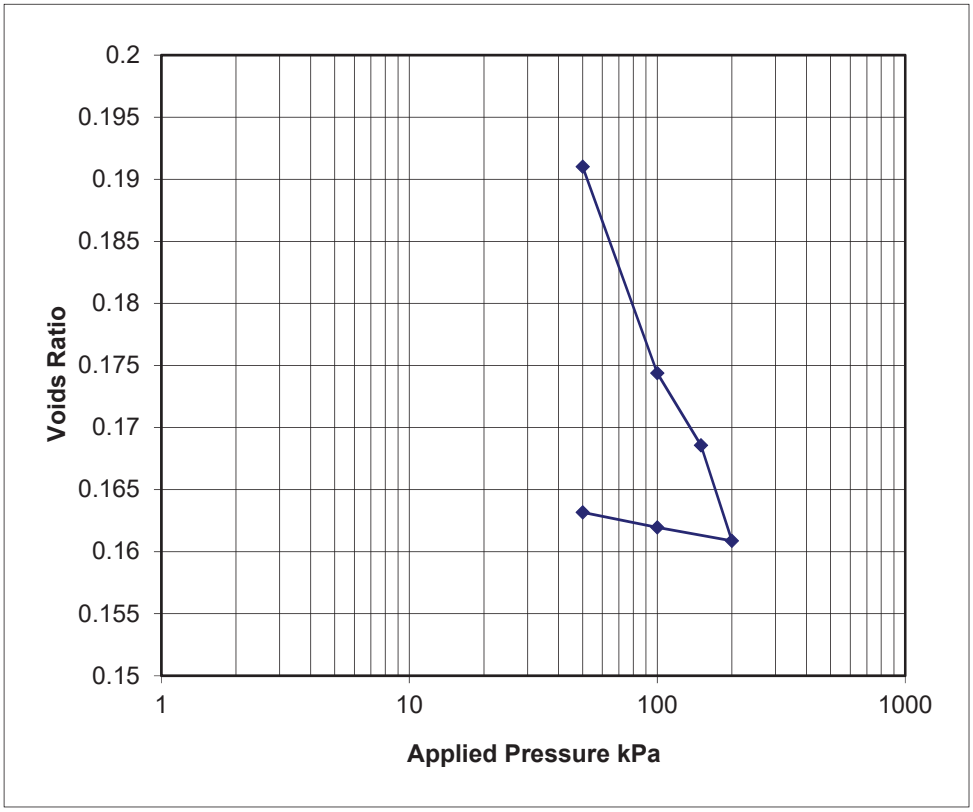
Description Greyish brown sandy gravelly SILT/CLAY (remoulded includes some fine gravel)

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

	Initial	Final
Moisture content %	11	11
Bulk density Mg/m^3	2.33	2.47
Dry density Mg/m^3	2.10	2.21
Void ratio	0.264	0.163

Assumed Particle density Mg/m^3 2.65

Applied Pressure (kPa)	m_v (m^2/MN)	c_v (m^2/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

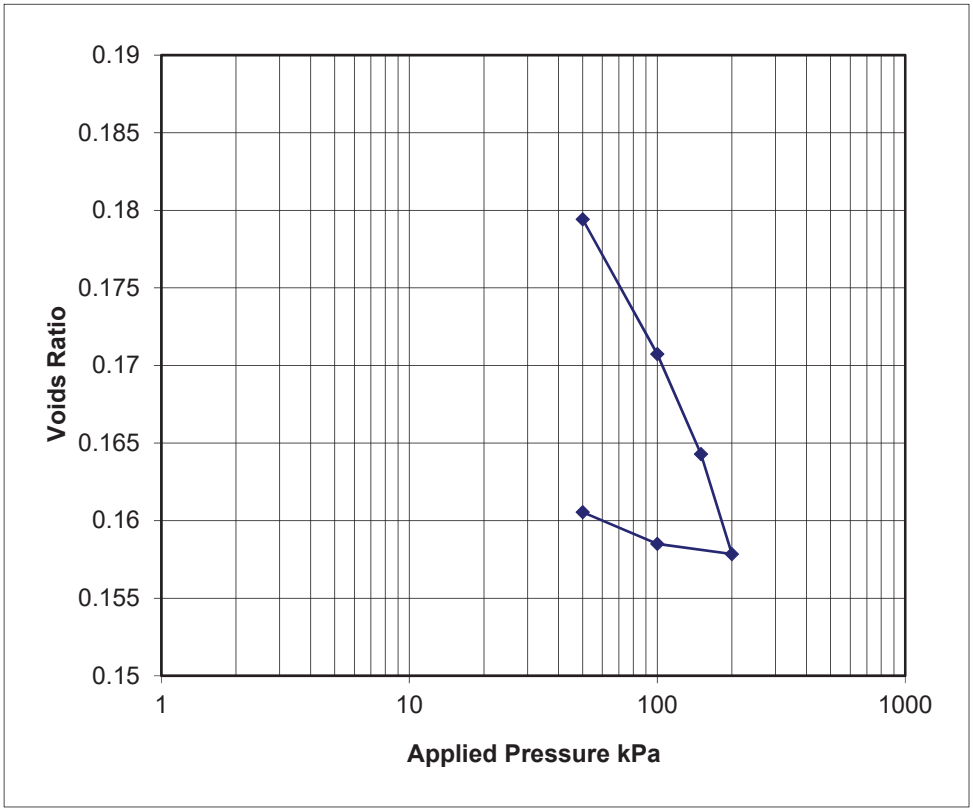
Description Greyish brown sandy gravelly SILT/CLAY (remoulded includes some fine gravel)

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

	Initial	Final
Moisture content %	10	9
Bulk density Mg/m^3	2.40	2.49
Dry density Mg/m^3	2.18	2.28
Void ratio	0.217	0.161

Assumed Particle density Mg/m^3 2.65

Applied Pressure (kPa)	m_v (m^2/MN)	c_v (m^2/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



IGSL Ltd.

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

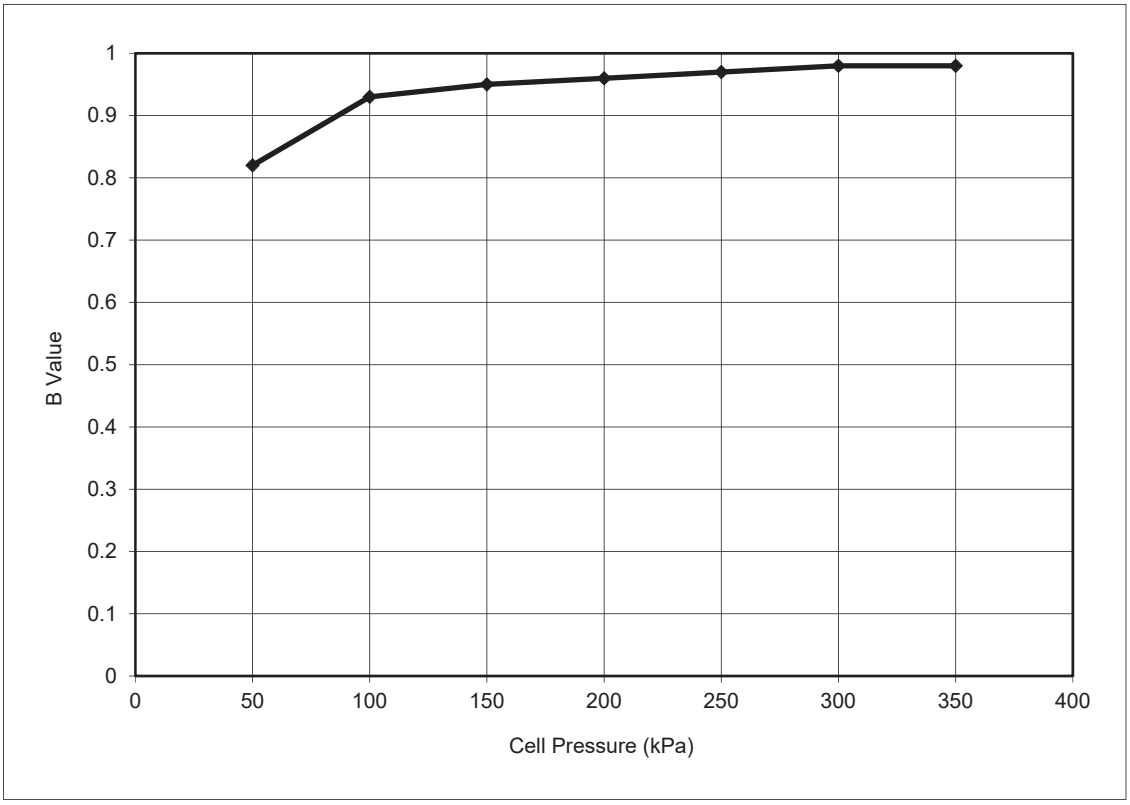
Height (mm)	202.0	Diameter (mm)	102.0	Side drains fitted	Yes

	Initial	Final
Moisture Content (%)	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



Number of days saturating 5

IGSL Ltd.

Consolidated undrained Triaxial Compression with pore pressure measurement

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

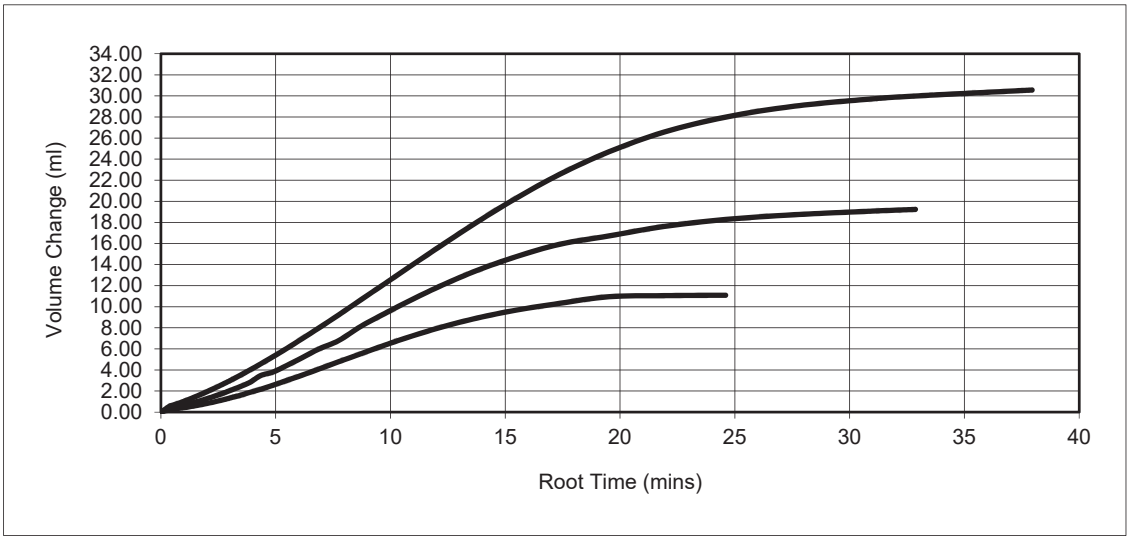
Report No. **R72733** Lab Sample no. **A16/1534**

Contract No. **18963** Contract Name **GCTP Phase 3**

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

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)	297	290	301
Volume Change (ml)	30.56	19.23	11.09
% Pore Pressure Dissipation	100	100	99



Number of days consolidating 3

Compression Stage

Failure criteria	Maximum Effective Principal Stress 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

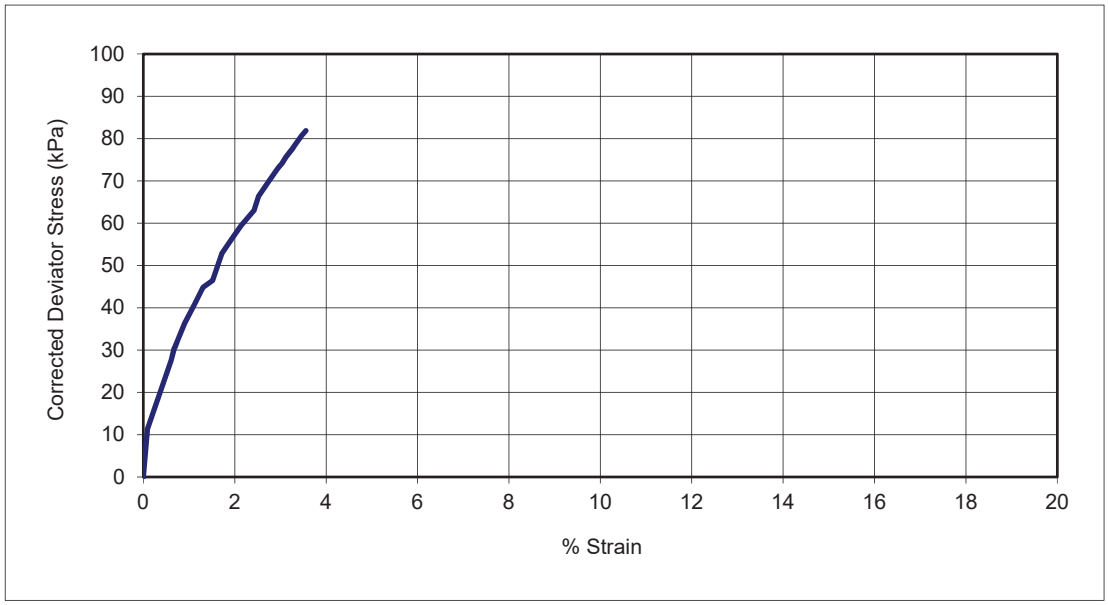
Number of days in compression 3

Total Number of days on test 11

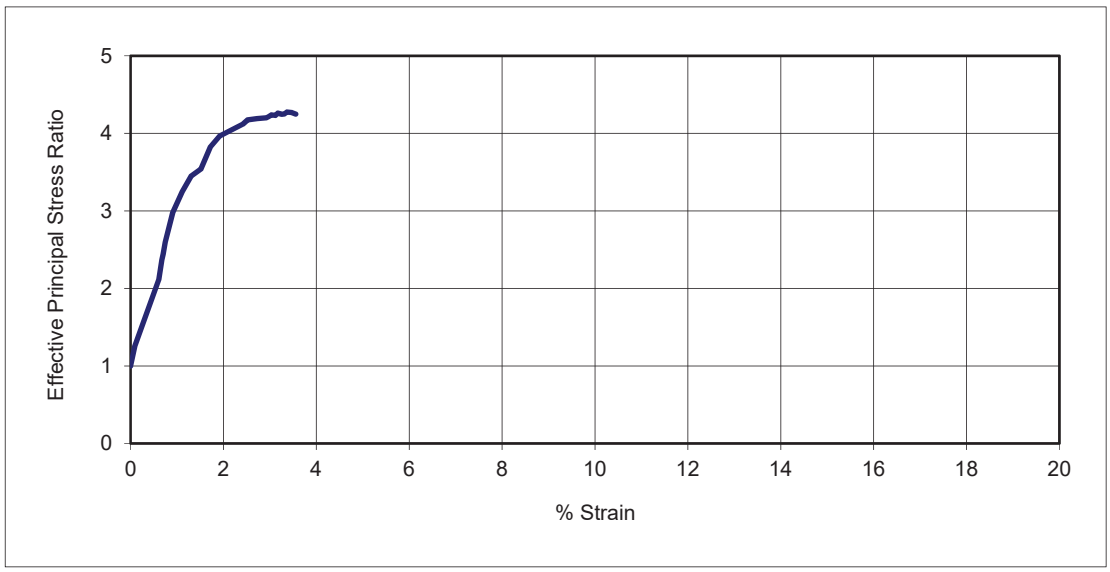
IGSL Ltd.

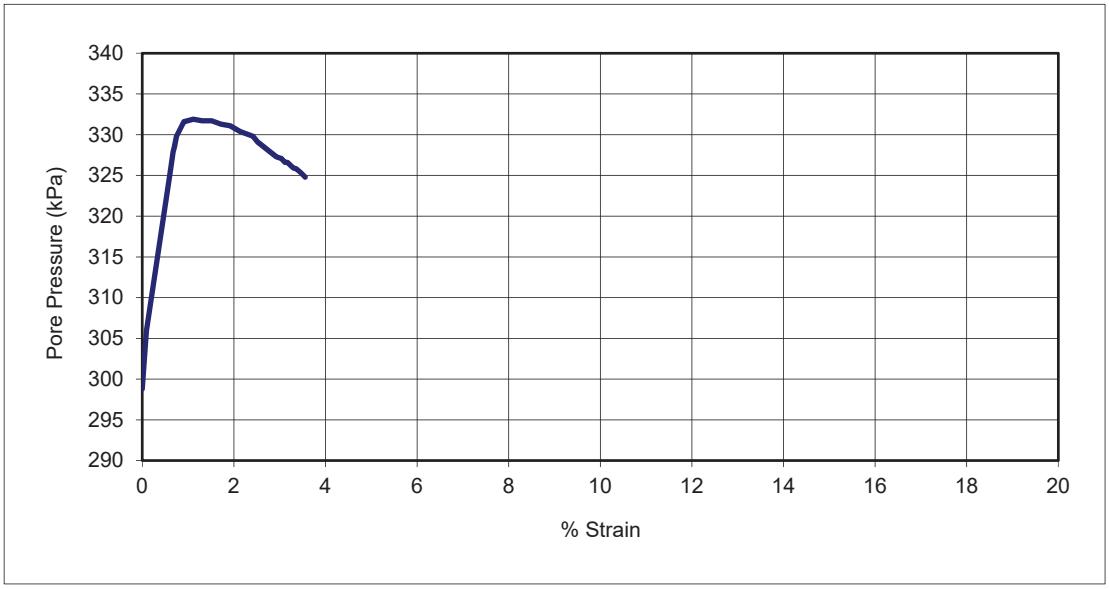
Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

Contract No. 18963 Location BH3/52 Sample No. AA48885 Depth 1.00



Stage 1

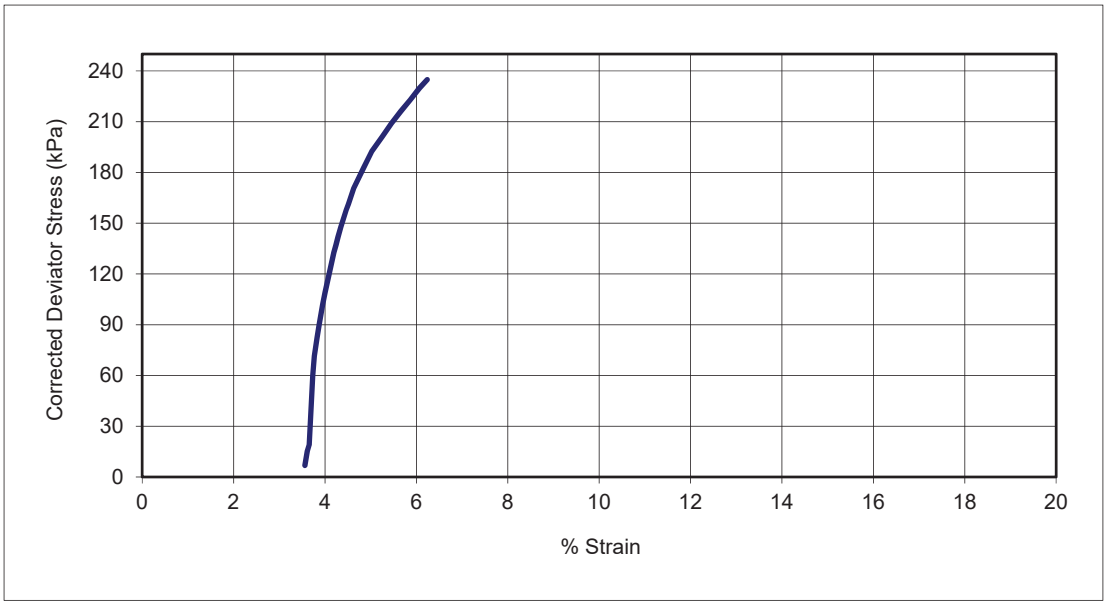




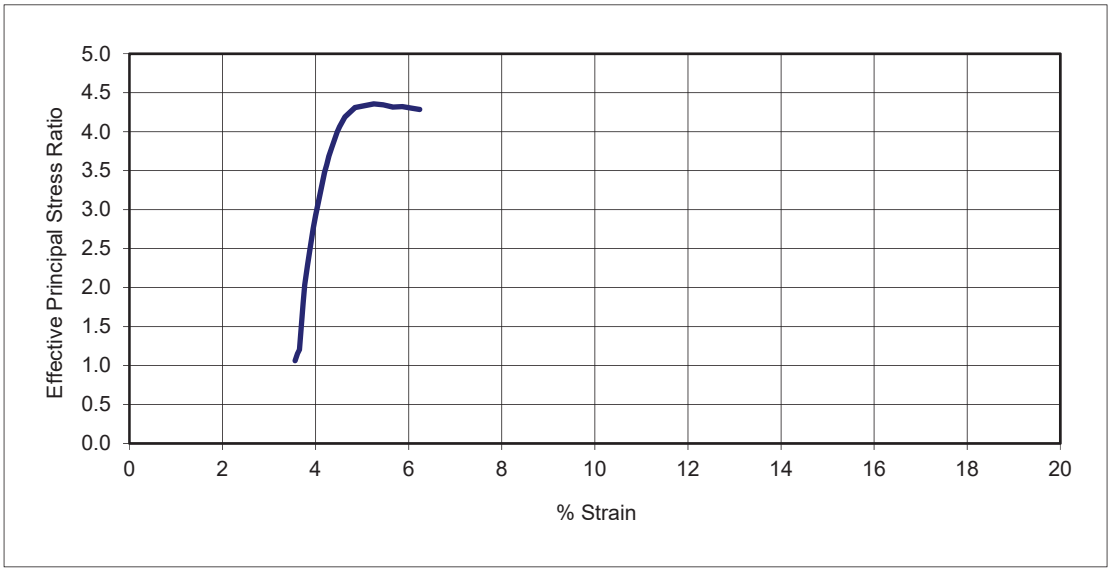
IGSL Ltd.

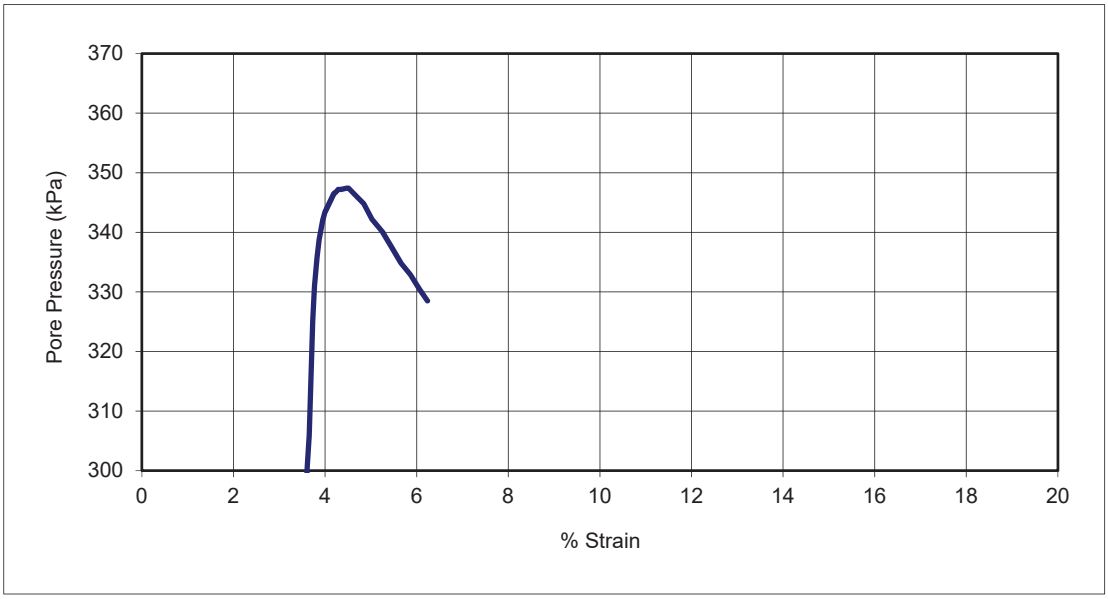
Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

Contract No. 18963 Location BH3/52 Sample No. AA48885 Depth 1.00



Stage 2



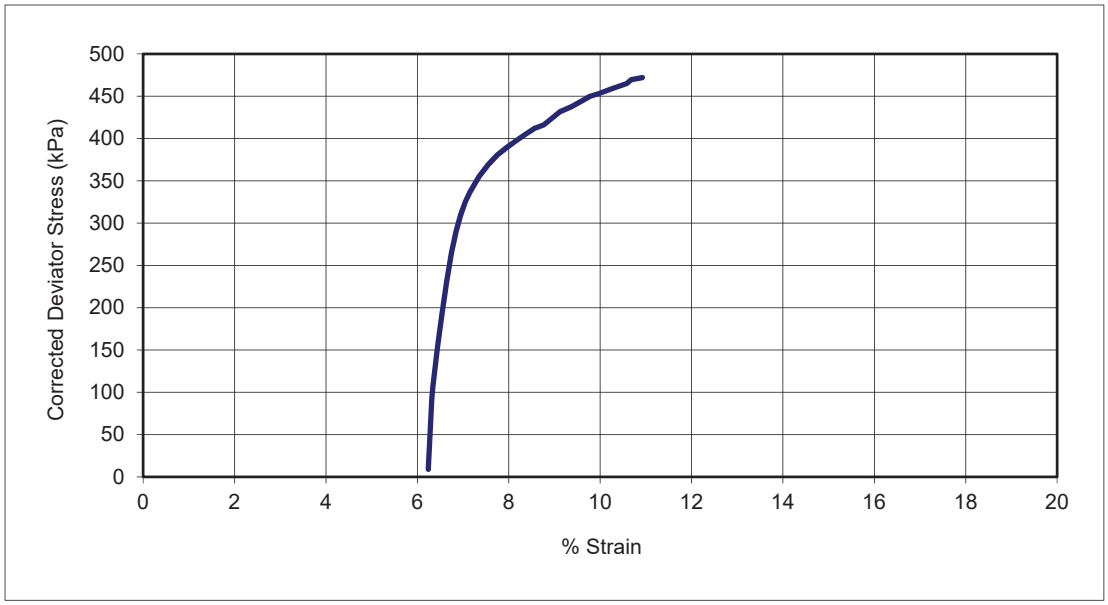


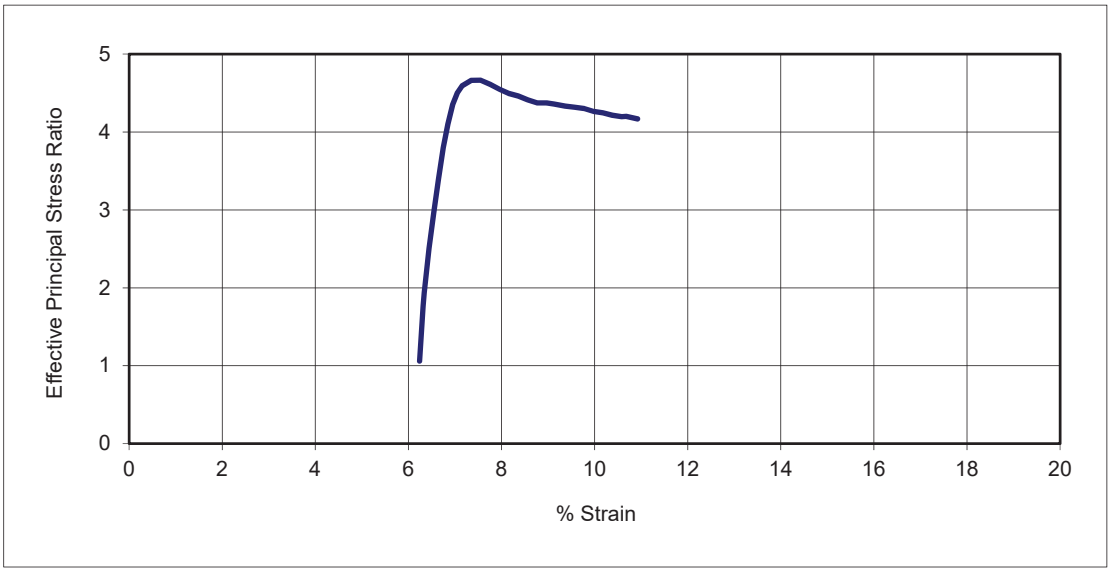
IGSL Ltd.

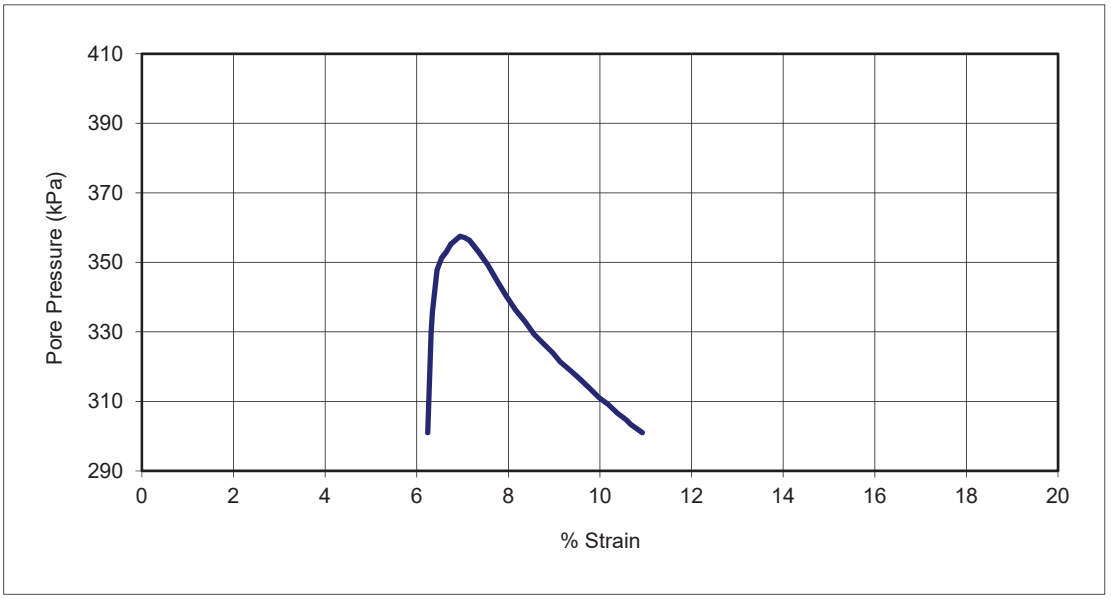
Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

Contract No. 18963 Location BH3/52 Sample No. AA48885 Depth 1.00

Stage 3



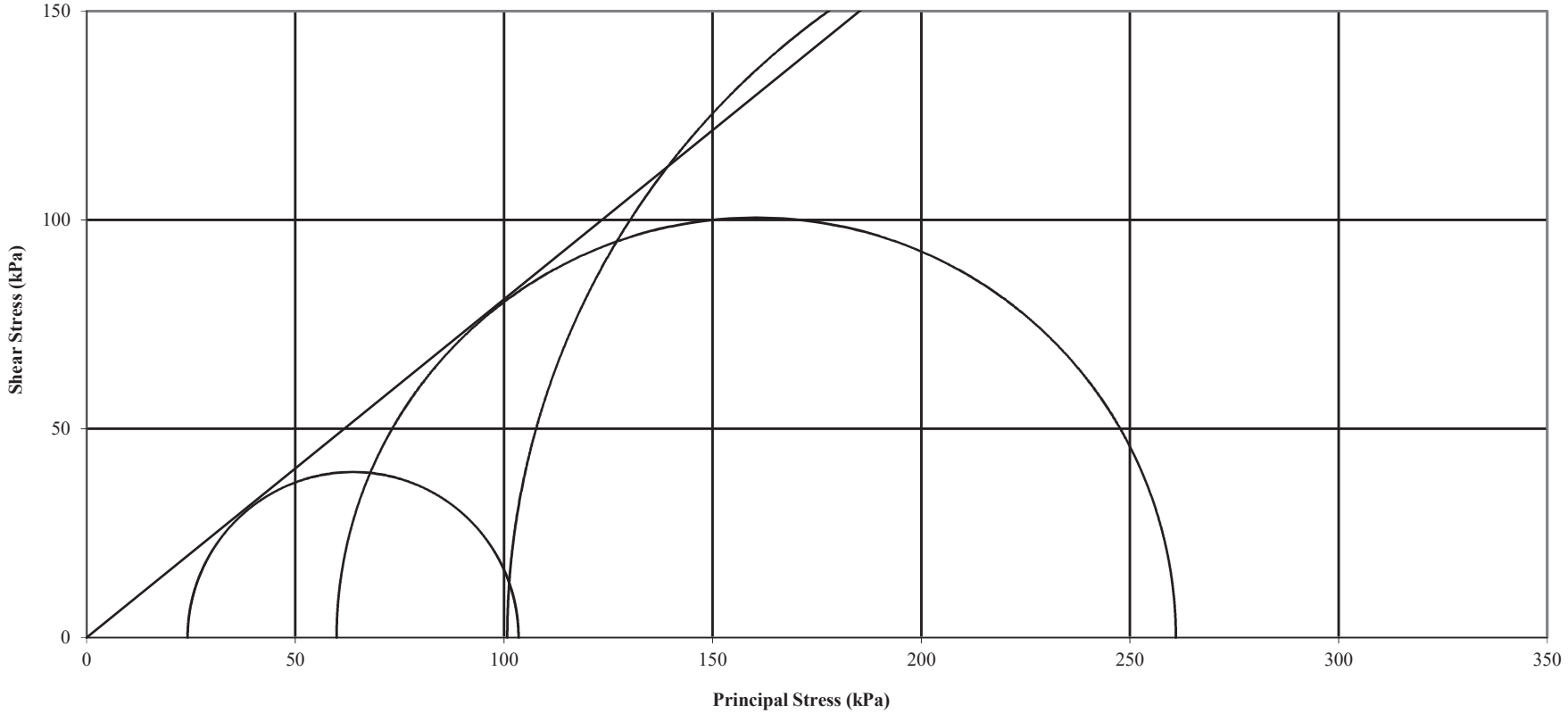




CONSOLIDATED UNDRAINED TRIAXIAL TEST - MOHR CIRCLES

In accordance with BS1377:Part 8:1990 and K H Head *Manual of Soils Laboratory Testing* Vol 3

Borehole 3/52 Sample Number: AA48885 Depth (m): 1.00



IGSL Ltd M7 Business Park Naas Co. Kildare	C'	0	ϕ'	39	Job No 18963
	Failure Criteria: Maximum effective principal stress ratio				
	Contract GCTP Phase 3				Page

IGSL Ltd.

Consolidated undrained Triaxial Compression with pore pressure measurement

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

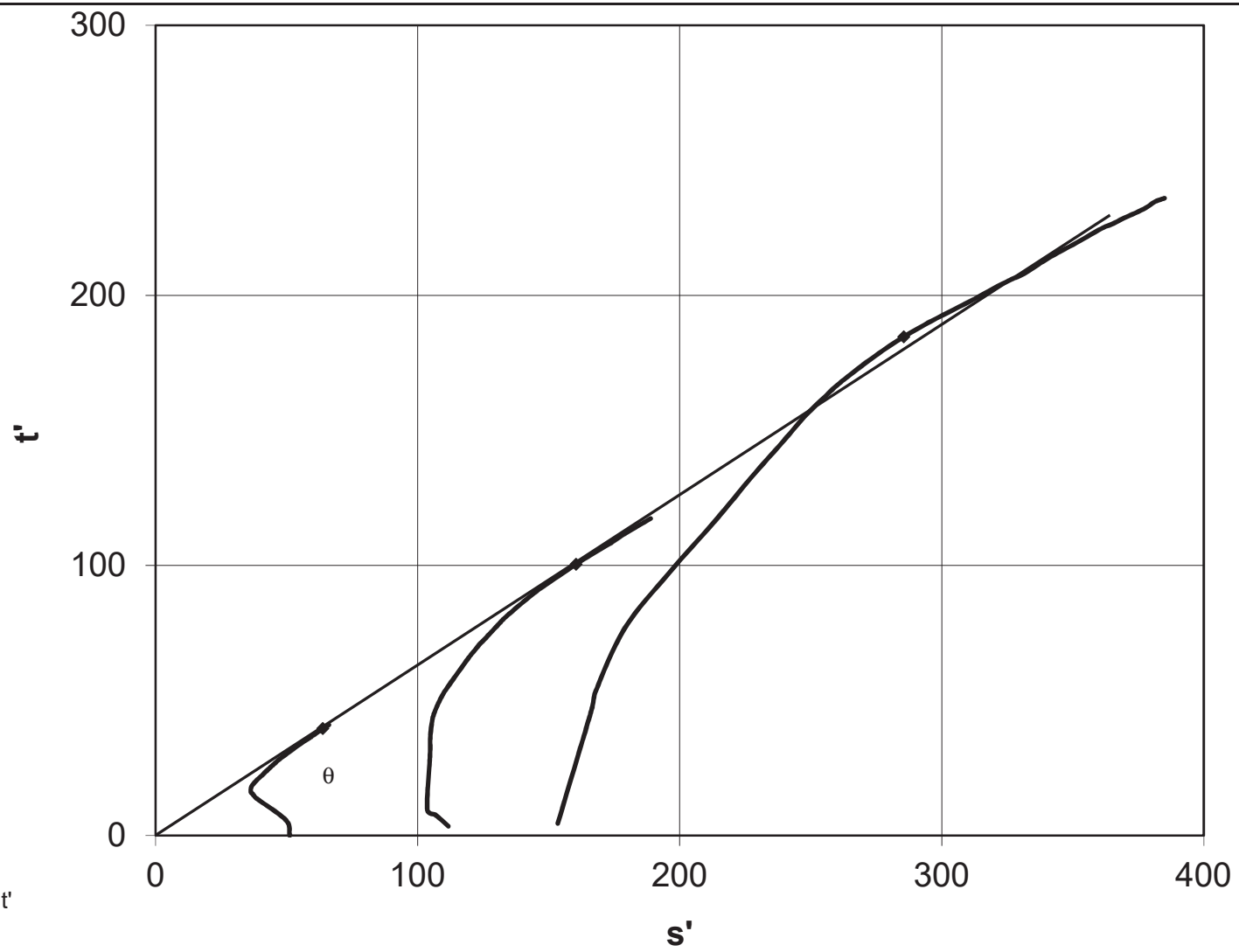
Contract No.	18963
Location	BH3/52
Sample No.	AA48885
Depth (m)	1.0

Shear strength parameters

c'	0
ϕ'	40
θ	33

$\sin \phi' = \tan \theta$

$c' = t'_o / \cos \phi'$



Plot of Stress Path Parameters s' v t'

Laboratory Report

2788

GEO Site & Testing Services Ltd

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) Non Accredited Test - @ Non Accredited Test	1
Disposal of Samples on Project	1

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

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.

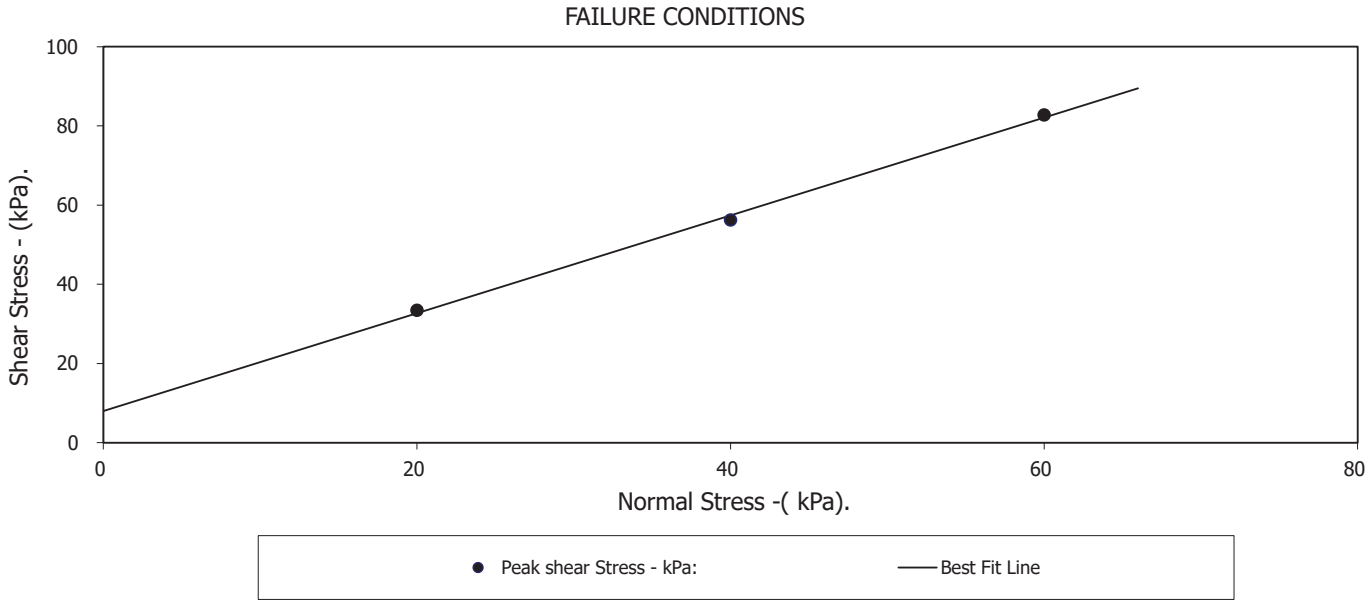
Borehole:	BH3/17	Depth (m) from:	2.00
Sample Number :	A16/1318	Depth (m) to:	0.00

Sample Type:	D
Particle Density - Mg/m3:	2.65 (Assumed)
Specimen Tested:	Submerged, Remoulded material above 2.00mm removed

Sample Description:
light brown slightly clayey slightly silty sandy (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:(~~θ~~)	**51.0**
Effective Cohesion - kPa:	**8**



DP Evans 19/05/16
Checked Page 1 by: Date

DP Evans 19/05/16
Approved Page 1 by: Date

Contract No.:
30805

Client Ref Number:
8741

GSTL
GEO SITE & TESTING SERVICES LTD

G.C.T.P

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

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 1331

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 CR	AA001	0.5	A16/1329	B	5.9	21	12	9	67	WS	4.4	C L	Brown slightly sandy, gravelly, CLAY
BH3/35 CR	AA002	1.0	A16/1330	B	8.3	18	NP	NP	60	WS	4.4		Light brown/grey slightly sandy, slightly gravelly, SILT
BH3/35 CR	AA003	2.0	A16/1331	B	6	21	NP	NP	61	WS	4.4		Light brown/grey slightly sandy gravelly SILT
BH3/35 CR	AA004	3.0	A16/1332	B	9.7	22	NP	NP	71	WS	4.4		Light brown/grey slightly sandy, gravelly, SILT with some cobbles
BH3/35 CR	AA005	4.0	A16/1333	B	11	22	NP	NP	69	WS	4.4		Mottled brown slightly sandy, gravelly, SILT
BH3/35 CR	AA006	5.0	A16/1334	B	8.9	23	NP	NP	53	WS	4.4		Mottled light brown slightly sandy, slightly gravelly, SILT with many cobbles
BH3/35 CR	AA007	6.5	A16/1323	B	5.3		NP	NP					Mottled grey/brown slightly sandy, slightly gravelly, SILT
BH3/35 CR	AA008	8.0	A16/1336	B	13	24	NP	NP	68	WS	4.4		Mottled grey/brown slightly sandy, slightly gravelly, SILT
BH3/54	AA009	0.5	A16/1337	B	2.3		NP	NP					COBBLES with dark brown/grey slightly silty, slightly sandy, gravel
BH3/54	AA010	1.0	A16/1338	B	5.1	21	NP	NP	39	WS	4.4		Grey brown silty sandy GRAVEL
BH3/54	AA011	2.0	A16/1339	B	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	B	5.2	19	NP	NP	39	WS	4.4		Mottled light brown/grey silty, sandy, GRAVEL with some cobbles

Notes: Preparation: WS - Wet sieved; AR - As received; NP - Non plastic
Liquid Limit Clause: 4.3 Cone Penetrometer definitive method; 4.4 Cone Penetrometer one point method
Sample Type: B - bulk disturbed; U - Undisturbed

Remarks:

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

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H Byrne	28-04-16	1 of 1

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	92	GRAVEL
37.5	87	
28	81	
20	79	
14	77	
10	73	
6.3	70	
5	68	
3.35	66	
2	62	
1.18	58	SAND
0.6	54	
0.425	52	
0.3	49	
0.15	44	
0.063	37	SILT/CLAY
0.034	30	
0.024	27	
0.016	24	
0.010	19	
0.007	17	
0.005	15	
0.002	9	

Contract No: 18963 Report No. R72659

Contract: GCTP Phase 3 - Contact 1

BH: BH03/35CR

Sample No. AA1 Lab. Sample No. A16/1329

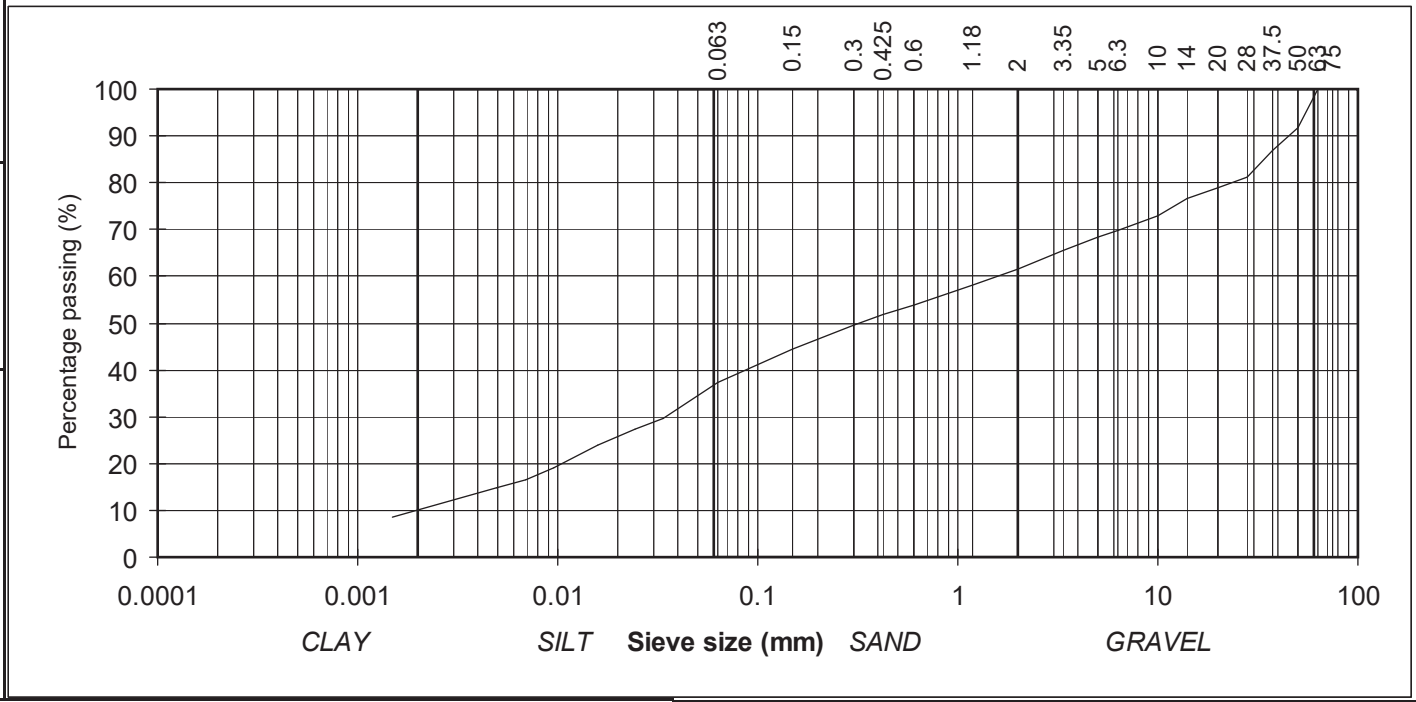
Sample Type: B

Depth (m) 0.50 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 09-06-16

Description: Brown slightly sandy, gravelly, CLAY

Remarks



IGSL Ltd Materials Laboratory

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

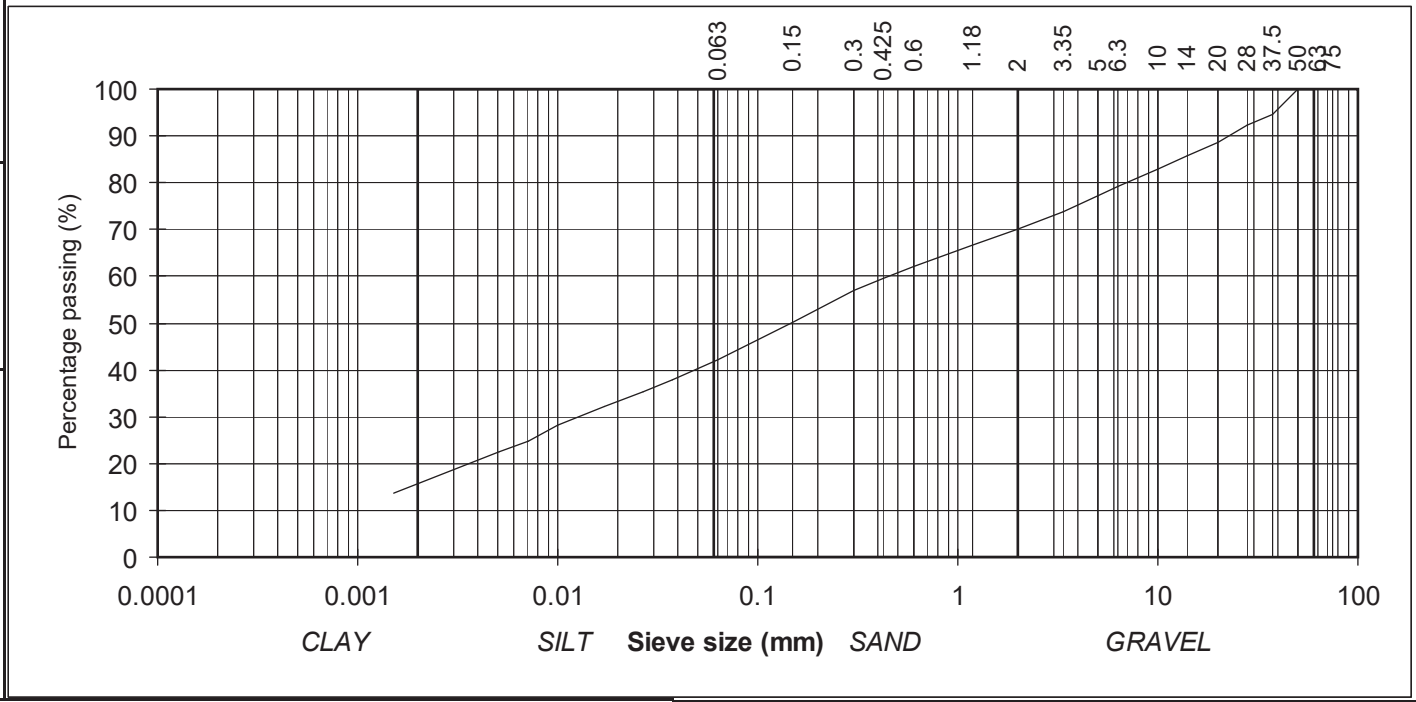
TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	95	
28	92	
20	89	
14	86	
10	83	
6.3	79	
5	77	
3.35	74	
2	70	
1.18	67	SAND
0.6	62	
0.425	60	
0.3	57	
0.15	50	
0.063	42	SILT/CLAY
0.037	38	
0.027	35	
0.017	32	
0.010	28	
0.007	25	
0.005	22	
0.002	14	

Contract No: 18963 Report No. R71924
Contract: GCTP Phase 3 - Contact 1
BH: BH03/35CR
Sample No. AA2 Lab. Sample No. A16/1330
Sample Type: B
Depth (m) 1.00 Customer: Galway Co.Co.
Date Received 05-04-16 Date Testing started 27-04-16
Description: Light brown/grey slightly sandy, slightly gravelly, SILT

Remarks



IGSL Ltd Materials Laboratory

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	83	COBBLES
63	83	
50	74	GRAVEL
37.5	71	
28	63	
20	60	
14	58	
10	55	
6.3	52	
5	51	
3.35	48	
2	46	
1.18	44	SAND
0.6	42	
0.425	40	
0.3	39	
0.15	34	
0.063	28	SILT/CLAY
0.036	25	
0.026	23	
0.017	22	
0.010	19	
0.007	18	
0.005	16	
0.001	11	

Contract No: 18963 Report No. R72000

Contract: GCTP Phase 3 - Contact 1

BH: BH3/35CR

Sample No. AA3 Lab. Sample No. A16/1331

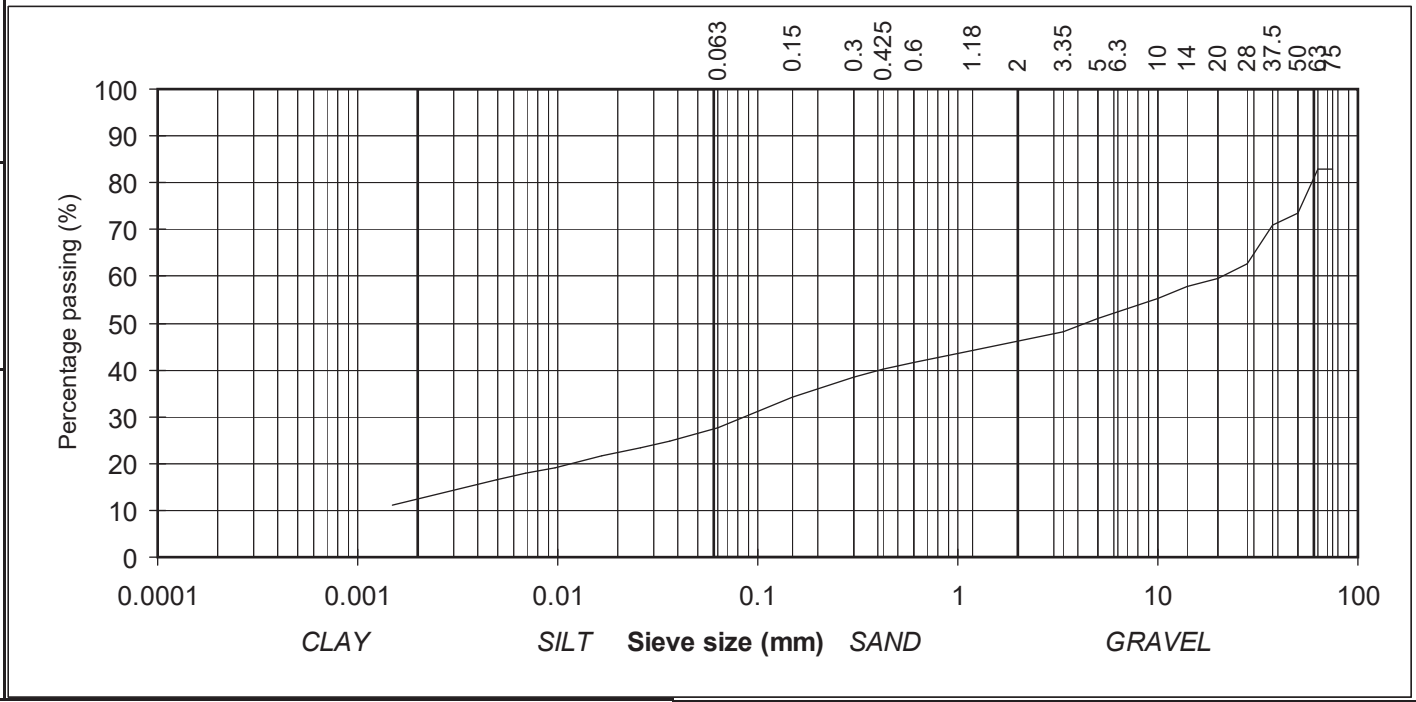
Sample Type: B

Depth (m) 2.00 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 26-04-16

Description: Light brown/grey slightly sandy, gravelly, SILT with some cobbles

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	95	
28	94	
20	90	
14	87	
10	85	
6.3	82	
5	80	
3.35	77	
2	74	
1.18	72	SAND
0.6	70	
0.425	67	
0.3	64	
0.15	54	
0.063	41	SILT/CLAY
0.037	35	
0.027	33	
0.017	27	
0.010	22	
0.007	19	
0.005	16	
0.002	10	

Contract No: 18963 Report No. R71925

Contract: GCTP Phase 3 - Contact 1

BH: BH03/35CR

Sample No. AA4 Lab. Sample No. A16/1332

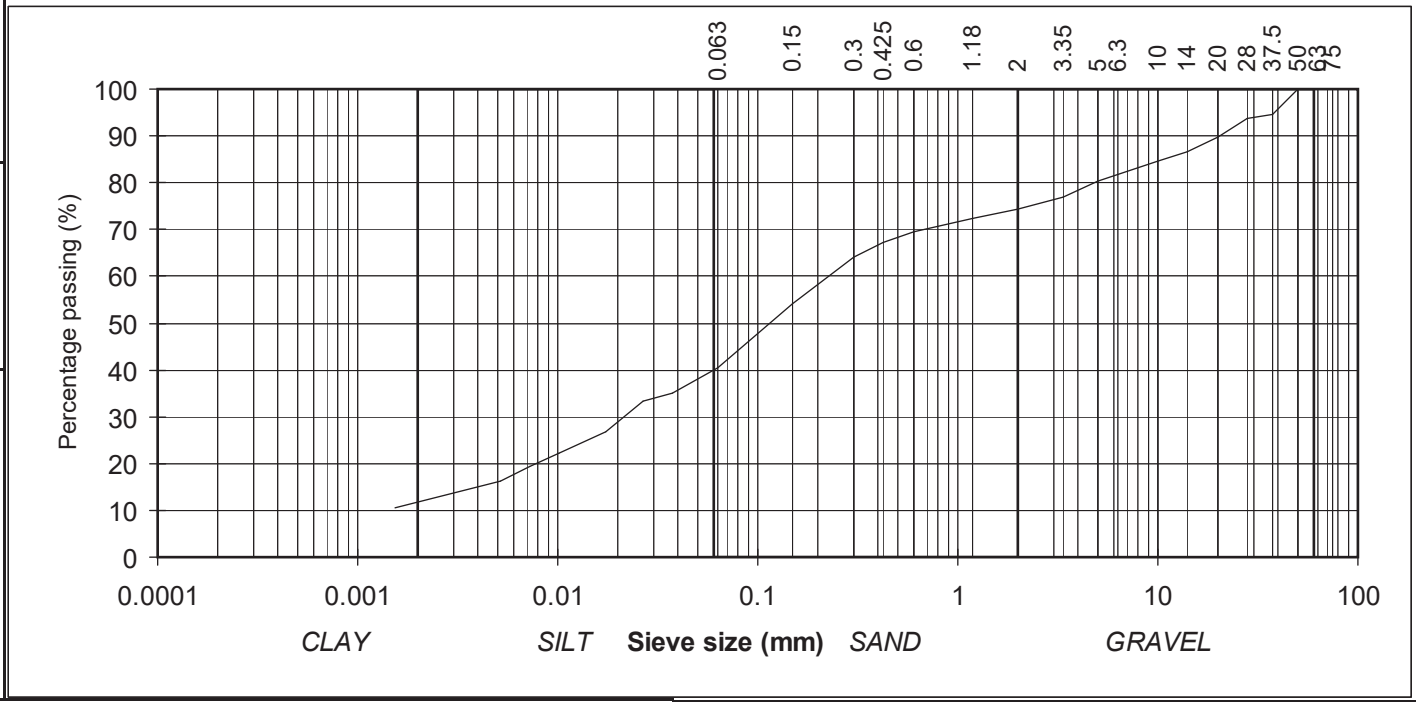
Sample Type: B

Depth (m) 3.00 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 27-04-16

Description: Brown slightly sandy, slightly gravelly, SILT

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	84	GRAVEL
37.5	79	
28	77	
20	74	
14	71	
10	68	
6.3	65	
5	64	
3.35	62	
2	60	
1.18	58	SAND
0.6	56	
0.425	54	
0.3	52	
0.15	46	
0.063	33	SILT/CLAY
0.037	28	
0.026	26	
0.017	21	
0.010	18	
0.007	15	
0.005	13	
0.002	7	

Contract No: 18963 Report No. R72001

Contract: GCTP Phase 3 - Contact 1

BH: BH3/35CR

Sample No. AA5 Lab. Sample No. A16/1333

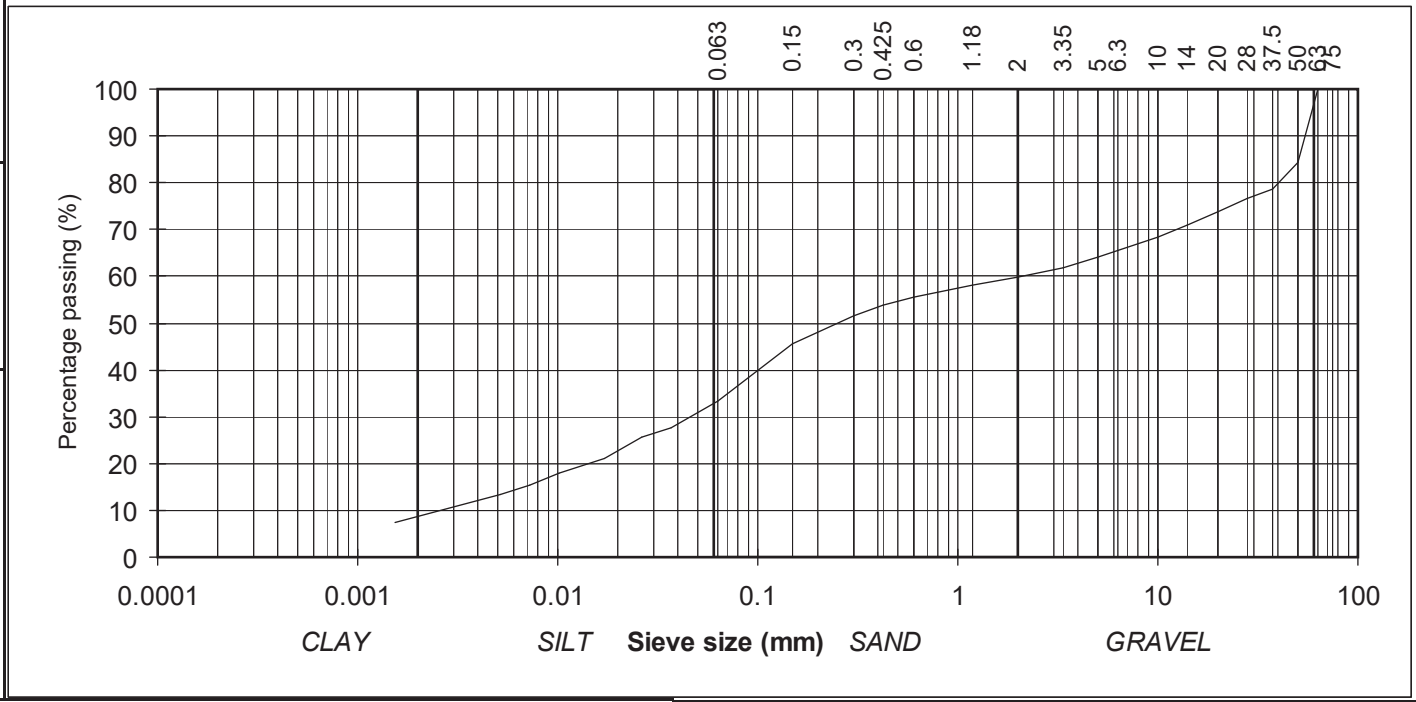
Sample Type: B

Depth (m) 4.00 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 27-04-16

Description: Mottled brown slightly sandy, gravelly, SILT

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	80	COBBLES
63	80	
50	80	GRAVEL
37.5	72	
28	70	
20	64	
14	61	
10	57	
6.3	54	
5	52	
3.35	49	
2	46	
1.18	43	SAND
0.6	40	
0.425	39	
0.3	37	
0.15	32	
0.063	25	SILT/CLAY
0.037	22	
0.026	21	
0.017	18	
0.010	15	
0.007	14	
0.005	13	
0.002	9	

Contract No: 18963 Report No. R71926

Contract: GCTP Phase 3 - Contact 1

BH: BH03/35CR

Sample No. AA6 Lab. Sample No. A16/1334

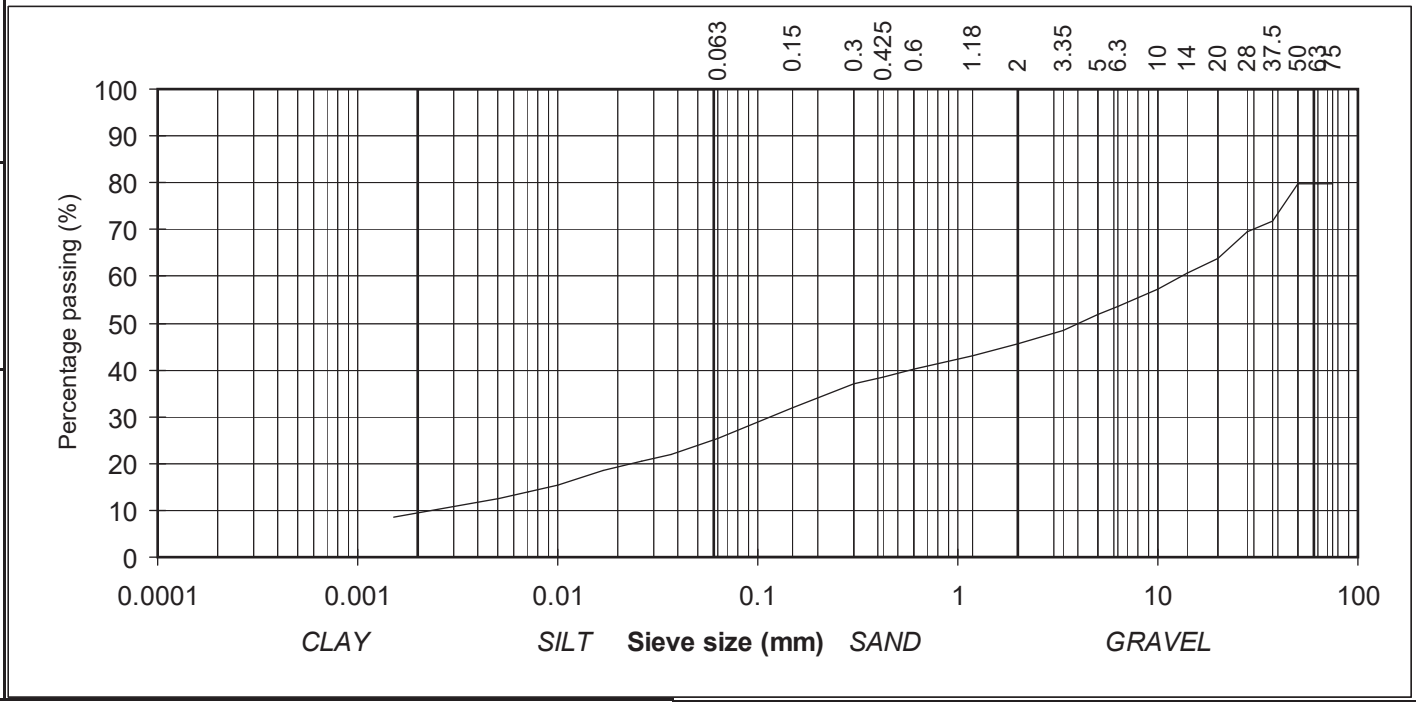
Sample Type: B

Depth (m) 5.00 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 27-04-16

Description: Mottled light brown slightly sandy, slightly gravelly, SILT with many cobbles

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	98	
28	97	
20	93	
14	90	
10	86	
6.3	81	
5	79	
3.35	76	
2	71	
1.18	68	SAND
0.6	64	
0.425	62	
0.3	58	
0.15	50	
0.063	37	SILT/CLAY
0.038	32	
0.027	30	
0.017	27	
0.010	23	
0.007	21	
0.005	19	
0.002	13	

Contract No: 18963 Report No. R71927

Contract: GCTP Phase 3 - Contact 1

BH: BH03/35CR

Sample No. AA7 Lab. Sample No. A16/1335

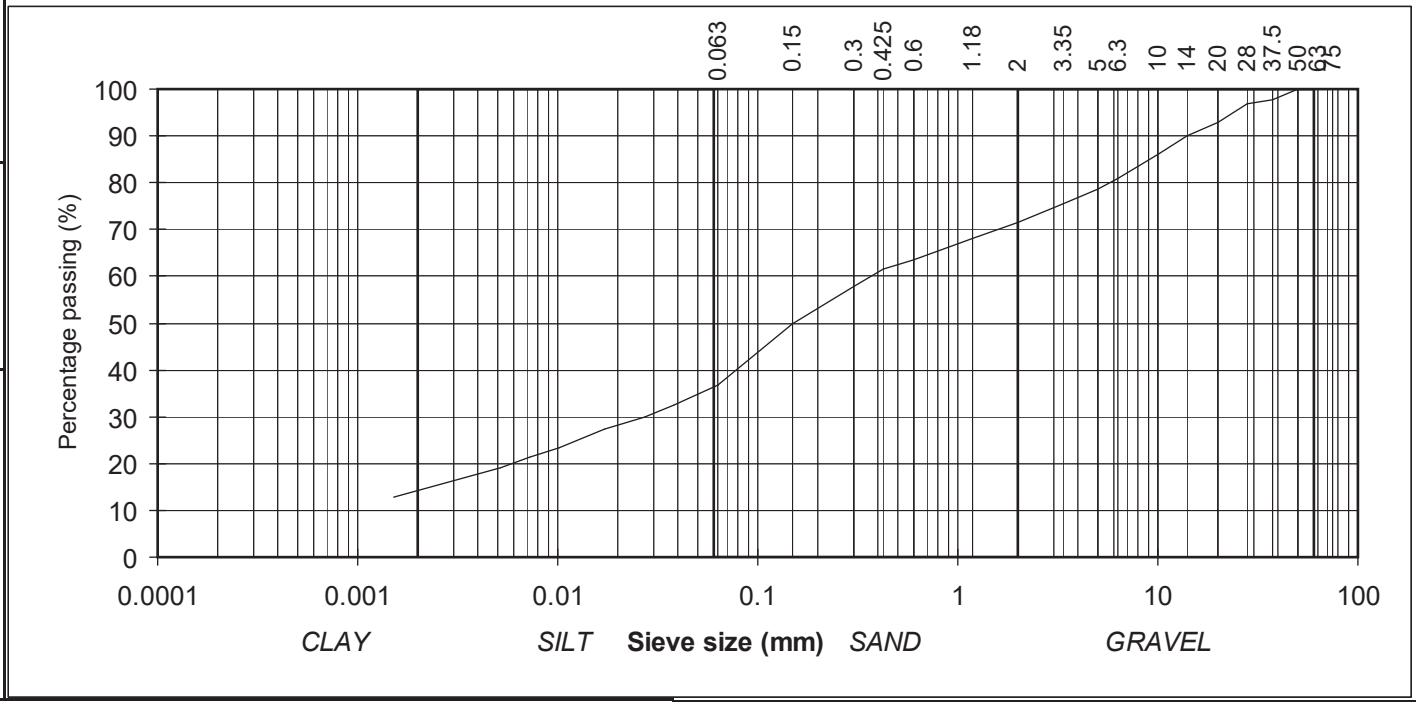
Sample Type: B

Depth (m) 6.50 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 26-04-16

Description: Mottled grey/brown slightly sandy, slightly gravelly, SILT

Remarks



IGSL Ltd Materials Laboratory

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	93	
28	89	
20	82	
14	79	
10	76	
6.3	73	
5	71	
3.35	69	
2	67	
1.18	65	SAND
0.6	62	
0.425	61	
0.3	59	
0.15	49	
0.063	37	SILT/CLAY
0.037	31	
0.027	29	
0.017	26	
0.010	23	
0.007	21	
0.005	19	
0.002	12	

Contract No: 18963 Report No. R71928

Contract: GCTP Phase 3 - Contact 1

BH: BH03/35CR

Sample No. AA8 Lab. Sample No. A16/1338

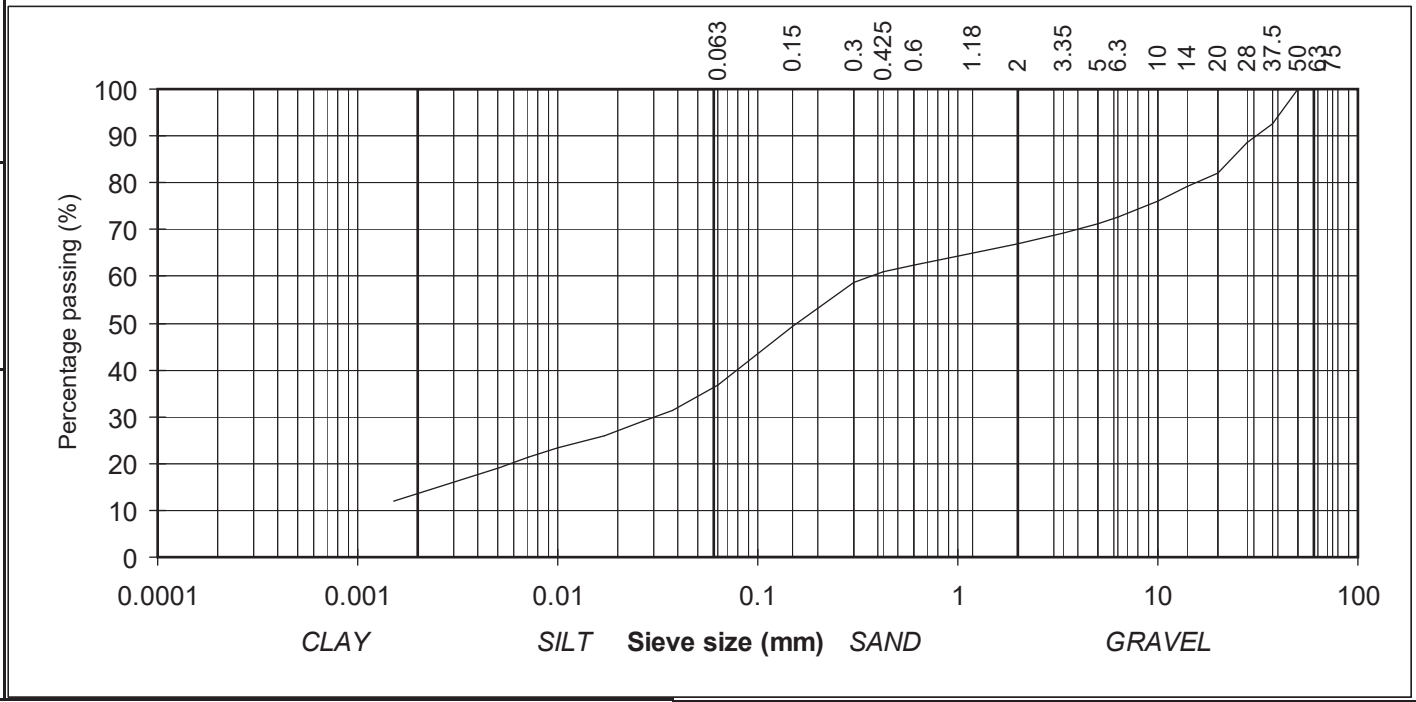
Sample Type: B

Depth (m) 8.00 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 26-04-16

Description: Mottled grey/brown slightly sandy, slightly gravelly, SILT

Remarks



IGSL Ltd Materials Laboratory

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	46	COBBLES
63	27	
50	20	GRAVEL
37.5	14	
28	10	
20	9	
14	8	
10	8	
6.3	7	
5	7	
3.35	6	
2	5	
1.18	5	SAND
0.6	4	
0.425	4	
0.3	4	
0.15	3	
0.063	3	SILT/CLAY

Contract No: 18963 Report No. R71931

Contract: GCTP Phase 3 - Contact 1

BH: BH3/54

Sample No. AA9 Lab. Sample No. A16/1337

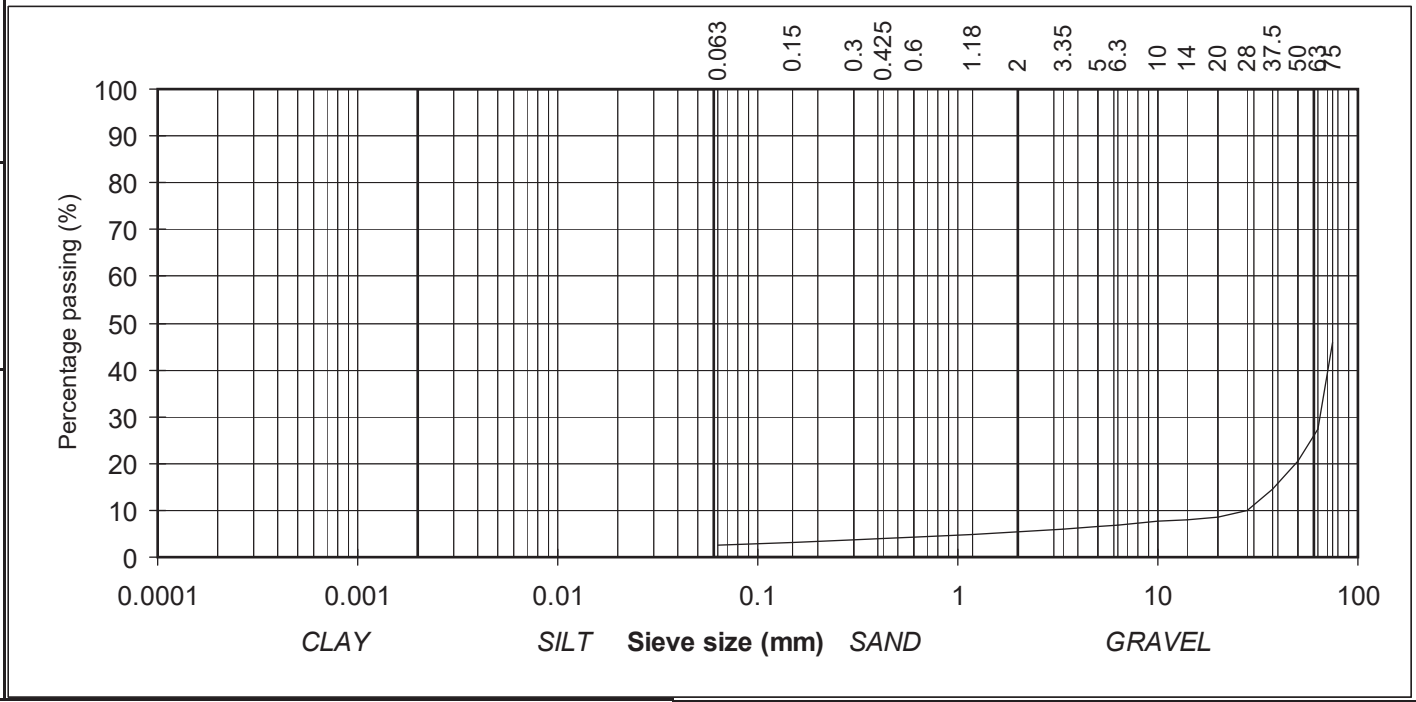
Sample Type: B

Depth (m) 0.50 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 27/4/116

Description: COBBLES with dark brown/grey slightly silty, slightly sandy, gravel

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

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

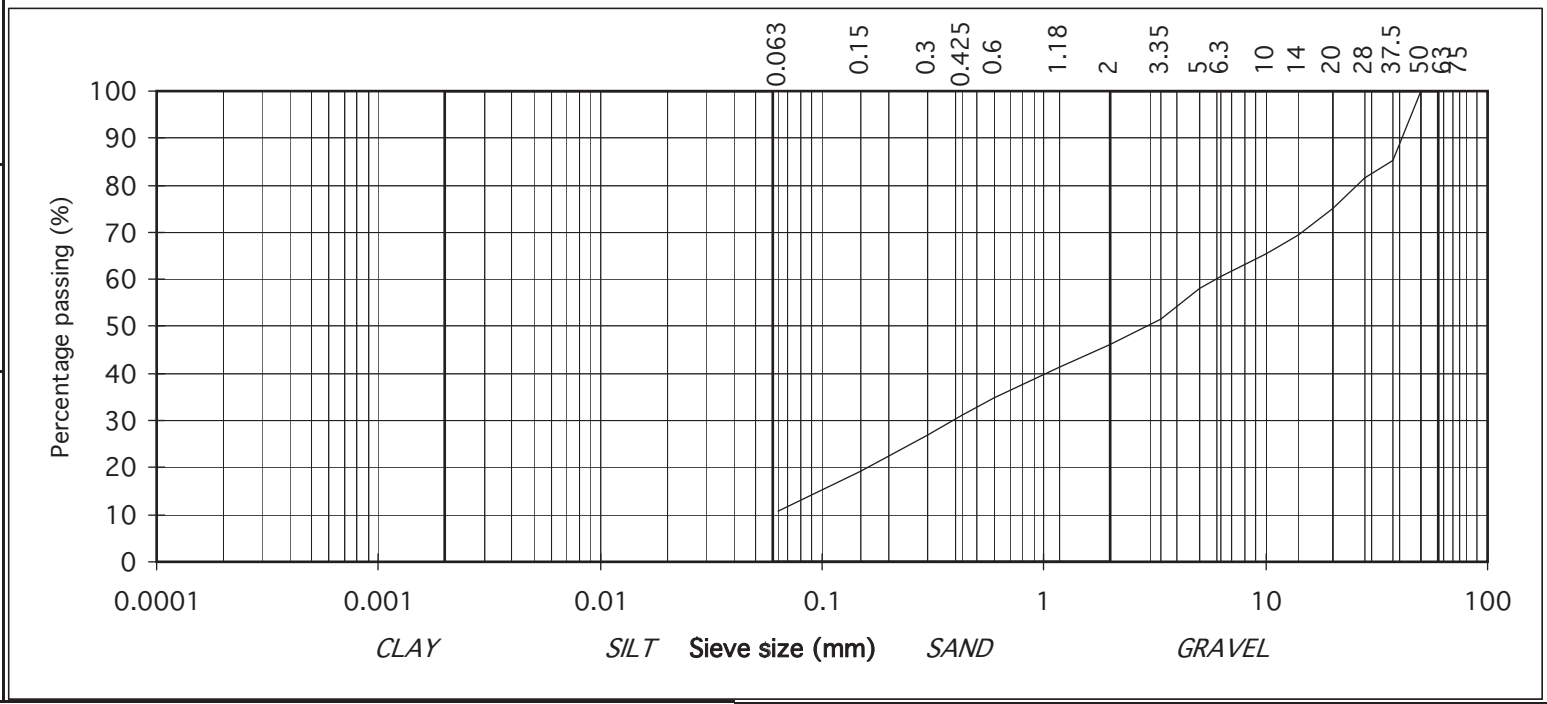
TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 137T

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	85	
28	82	
20	75	
14	70	
10	65	
6.3	61	
5	58	
3.35	51	
2	46	
1.18	41	SAND
0.6	35	
0.425	31	
0.3	27	
0.15	19	
0.063	11	SILT/CLAY

Contract No:	18963	Report No.	R72736
Contract:	GCTP Phase 3 - Contact 1		
BH:	BH3/54		
Sample No.	AA10	Lab. Sample No.	A16/1338
Sample Type:	B		
Depth (m)	1.00	Customer:	Galway Co.Co.
Date Received	05-04-16	Date Testing started	09-06-16
Description:	Mottled light brown/grey silty, very sandy, GRAVEL		
Remarks	Sample size did not meet the requirements of BS1377		



IGSL Ltd Materials Laboratory

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	68	COBBLES
63	50	
50	37	GRAVEL
37.5	25	
28	19	
20	15	
14	14	
10	13	
6.3	12	
5	11	
3.35	11	
2	10	
1.18	9	SAND
0.6	7	
0.425	7	
0.3	6	
0.15	5	
0.063	4	SILT/CLAY

Contract No: 18963 Report No. R72074

Contract: GCTP Phase 3 - Contact 1

BH: BH3/54

Sample No. AA11 Lab. Sample No. A16/1339

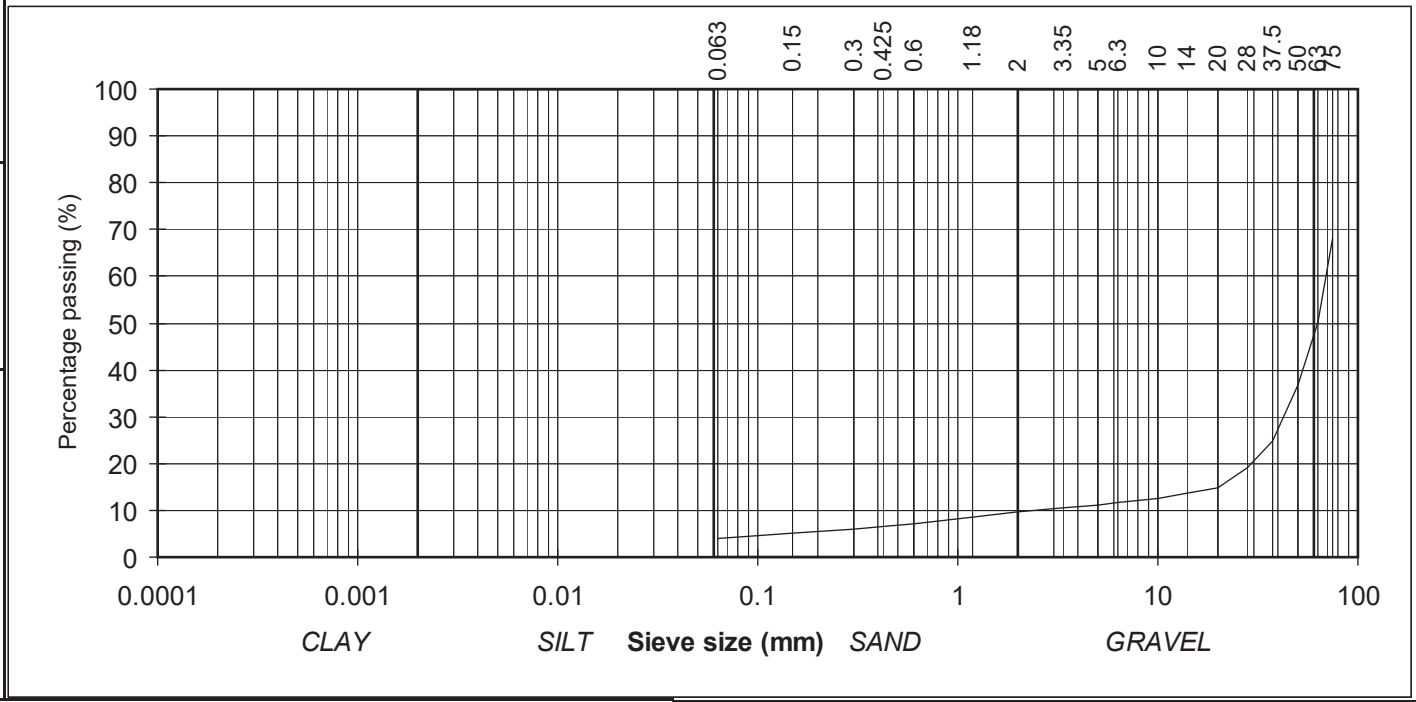
Sample Type: B

Depth (m) 2.00 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 29-04-16

Description: Light brown/grey slightly silty, sandy, GRAVEL with many cobbles

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

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

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	84	COBBLES
63	84	
50	55	GRAVEL
37.5	47	
28	44	
20	40	
14	38	
10	35	
6.3	33	
5	31	
3.35	30	
2	28	
1.18	26	SAND
0.6	24	
0.425	23	
0.3	21	
0.15	18	
0.063	13	SILT/CLAY

Contract No: 18963 Report No. R72075

Contract: GCTP Phase 3 - Contact 1

BH: BH3/54

Sample No. AA12 Lab. Sample No. A16/1340

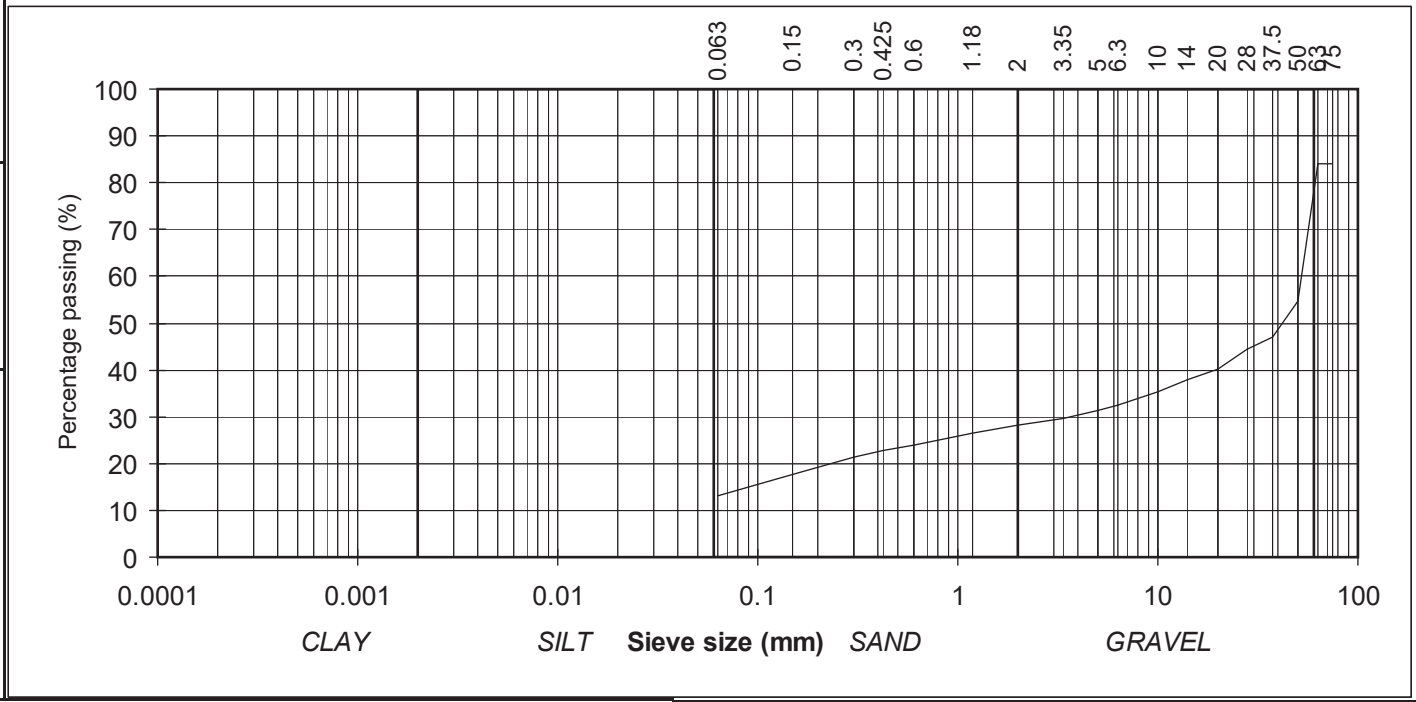
Sample Type: B

Depth (m) 3.00 Customer: Galway Co.Co.

Date Received 05-04-16 Date Testing started 27-04-16

Description: Mottled light brown/grey silty, sandy, GRAVEL with some cobbles

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

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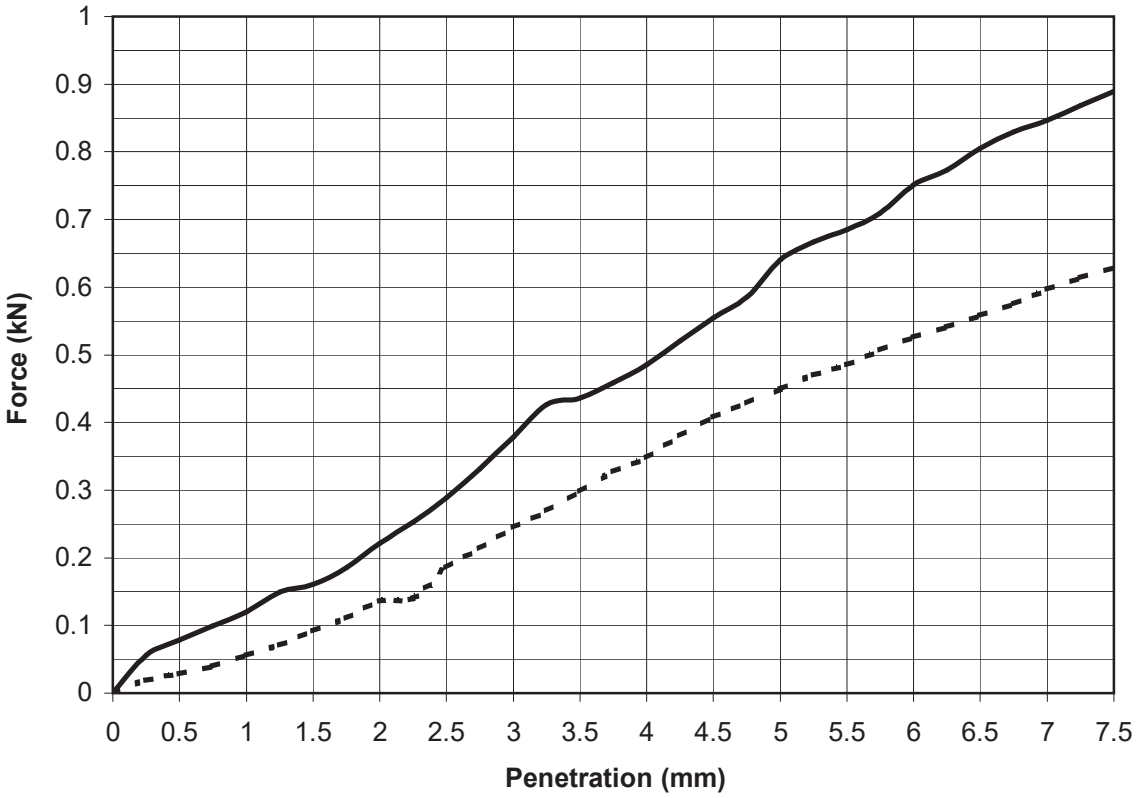
Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

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	ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

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: ———— Top ---------- Base

Description:	Light brown/grey slightly 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 Compaction Method 2		

Test Result	Top	Base
CBR %	**3.2**	**2.3**
Moisture Content %	13	12

Persons authorized to approve reports

J Barrett (Quality Manager)

H Byrne (Laboratory Manager)

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	H Byrne	14-06-16	1 of 1

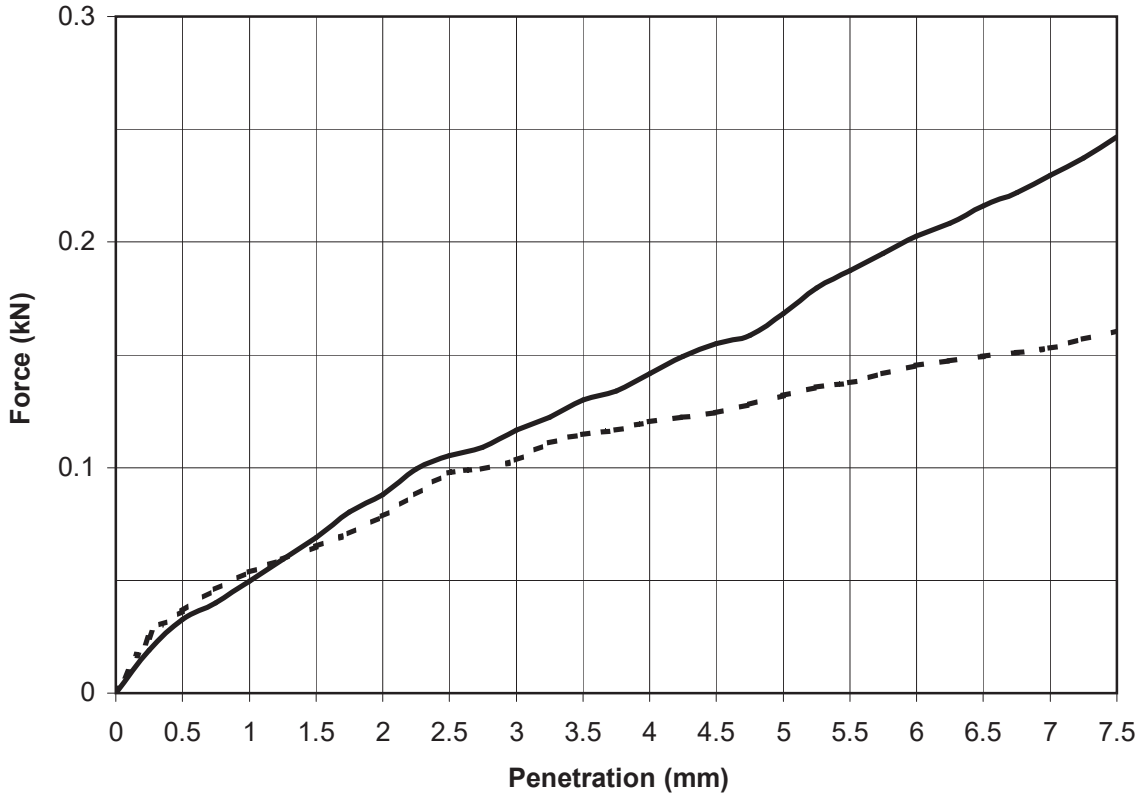
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)

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

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1337

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: ———— Top ---------- Base

Description:	Mottled light brown slightly sandy, slightly gravelly, SILT with many cobbles		
Initial Condition:	Soaked 4 Day		
Moisture Content (%):	13	Bulk Density (Mg/m^3):	2.10
Surcharge (kg):	4	Dry Density (Mg/m^3):	1.94
% Material >20mm:	11		
Method of compaction:	Static Compaction Method 2		

Test Result	Top	Base
CBR %	**0.8**	**0.7**
Moisture Content %	13	14

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

IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
H Byrne	14-06-16	1 of 1

One dimensional Consolidation

BS1377:Part 5:1990

Report No. R72448

Contract: GCTP Phase 3 Contract number: 18963

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

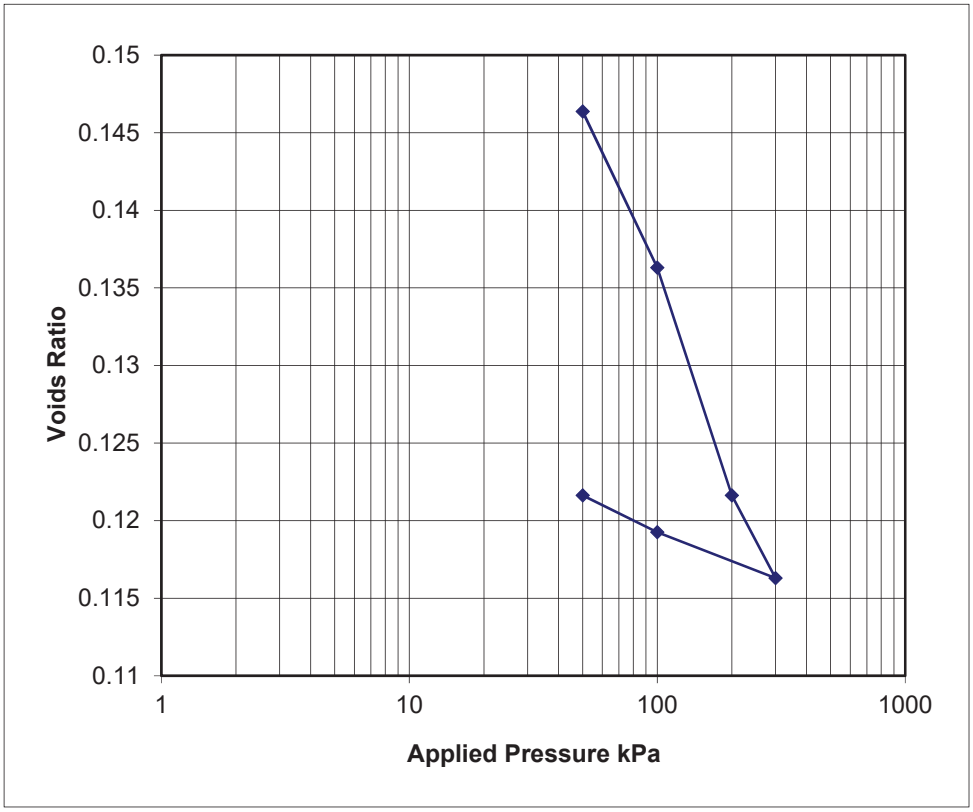
Description Greyish brown sandy gravelly silty CLAY (Remoulded specimen included some gravel)

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

	Initial	Final
Moisture content %	8.8	8.4
Bulk density Mg/m^3	2.42	2.53
Dry density Mg/m^3	2.23	2.34
Void ratio	0.190	0.122

Assumed Particle density Mg/m^3 2.65

Applied Pressure (kPa)	m_v (m^2/MN)	c_v (m^2/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



IGSL Ltd.

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

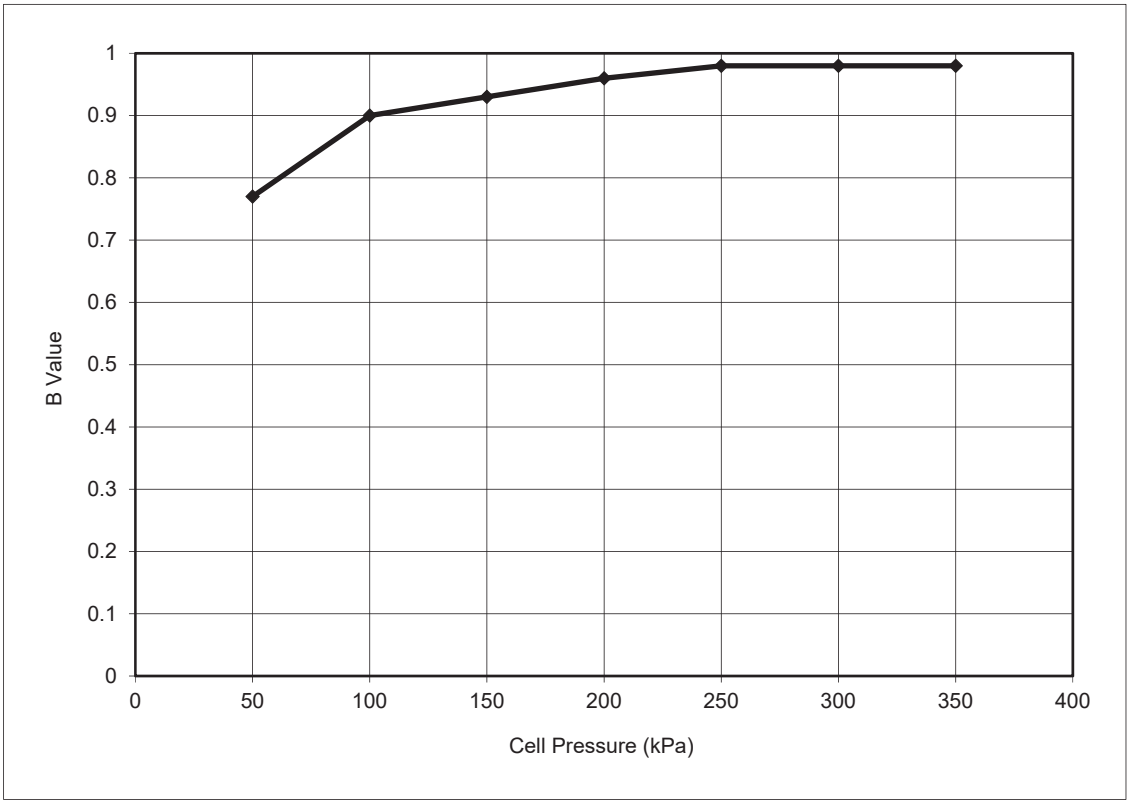
Height (mm)	200.0	Diameter (mm)	102.0	Side drains fitted	Yes

	Initial	Final
Moisture Content (%)	9.9	8.2
Bulk Density (Mg/m^3)	2.34	2.37
Dry Density (Mg/m^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



Number of days saturating 3

IGSL Ltd.

Consolidated undrained Triaxial Compression with pore pressure measurement

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

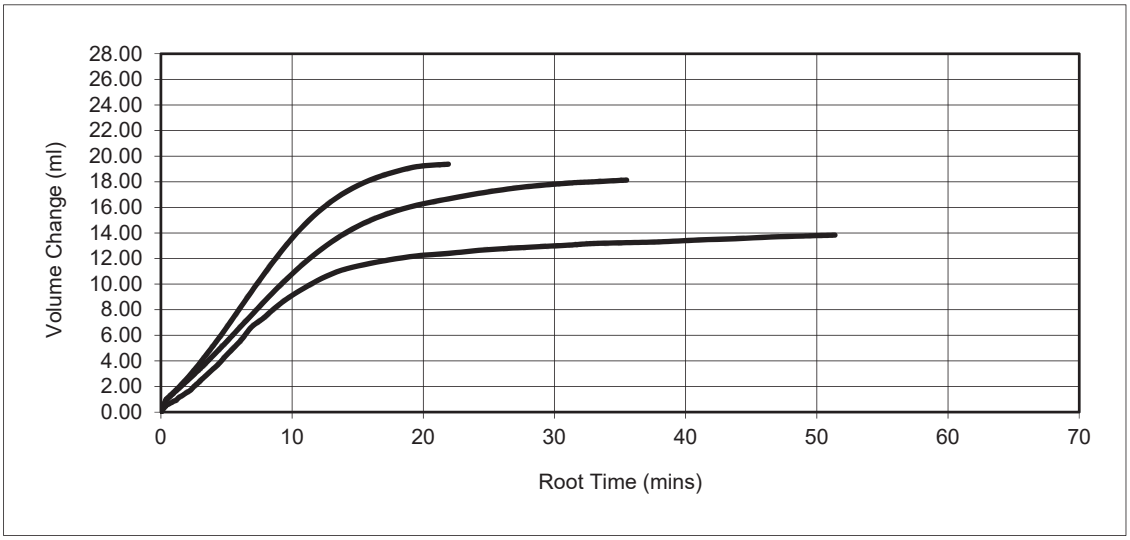
Report No. **R72456** Lab Sample no. **A16/1329**

Contract No. **18963** Contract Name **GCTP Phase 3**

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

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 Dissipation	98	95	99



Number of days consolidating 3

Compression Stage

Failure criteria	Maximum Effective Principal Stress Ratio		
Stage	1	2	3
Effective Stress (kPa)	50	100	150
Rate of Strain (mm/min)	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 failure (kPa)	75	213.4	455.5
Pore Pressure at failure (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

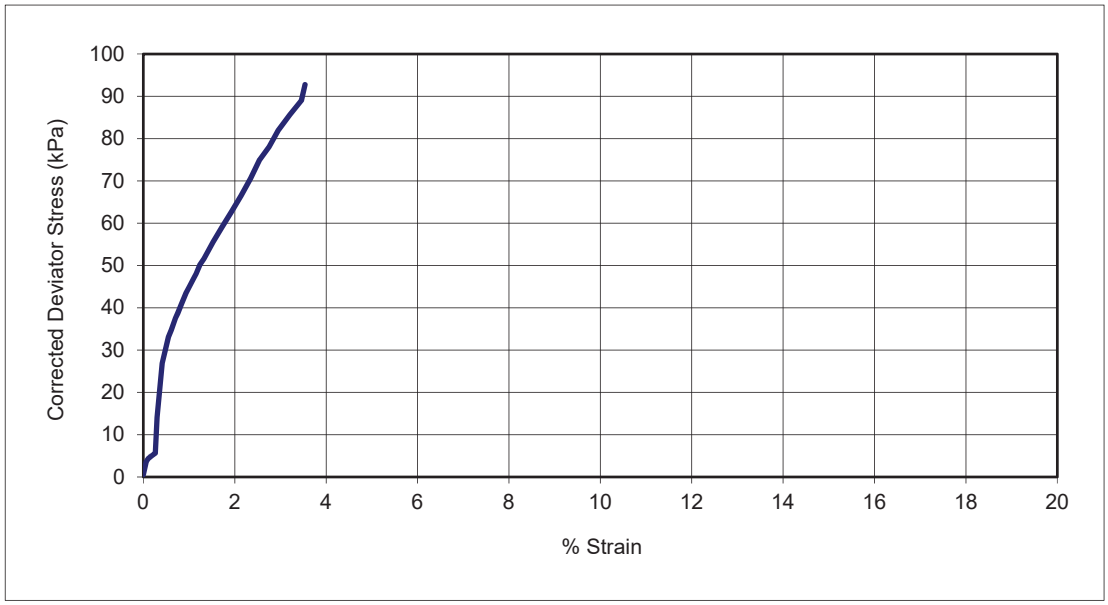
Number of days in compression 3

Total Number of days on test 9

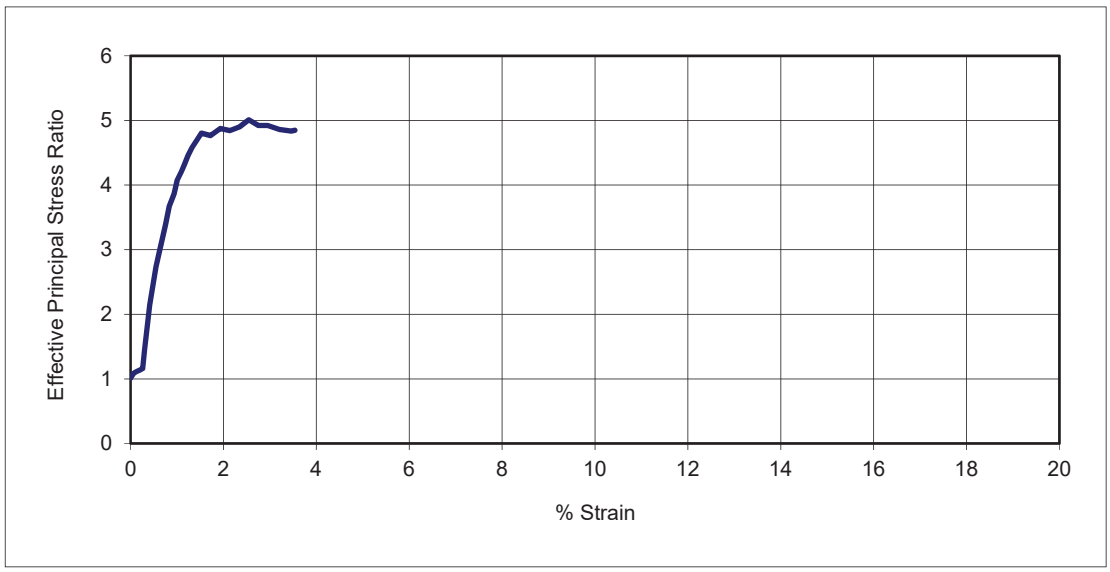
IGSL Ltd.

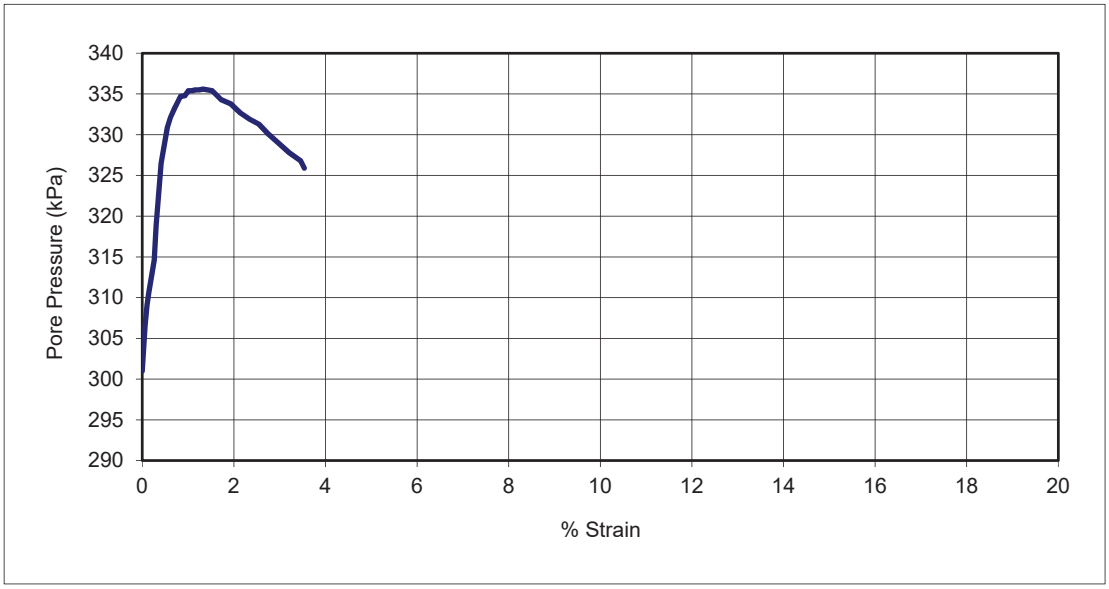
Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

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



Stage 1

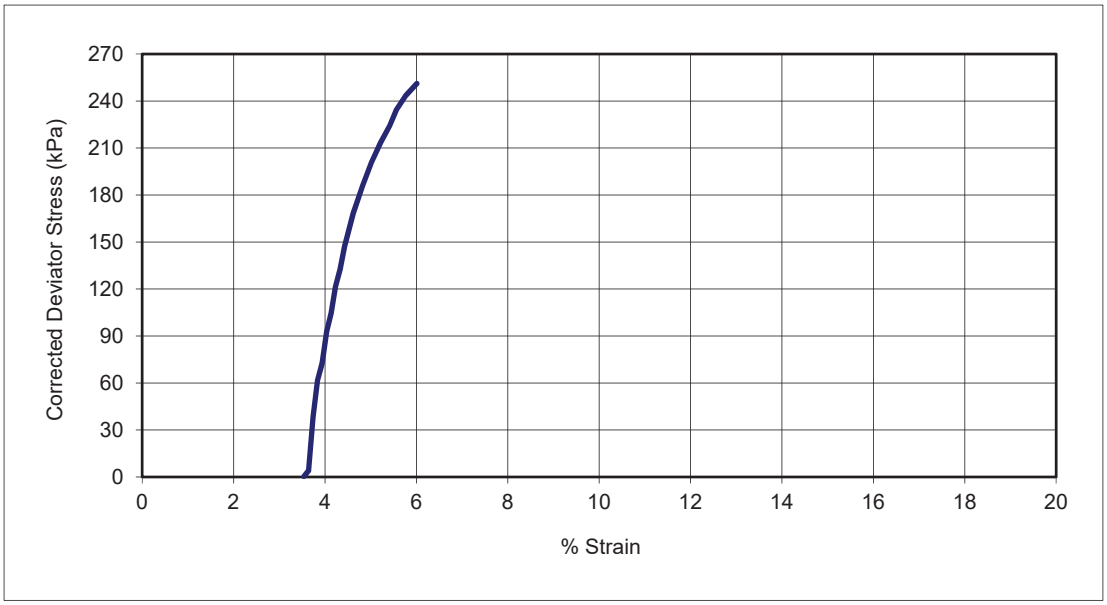




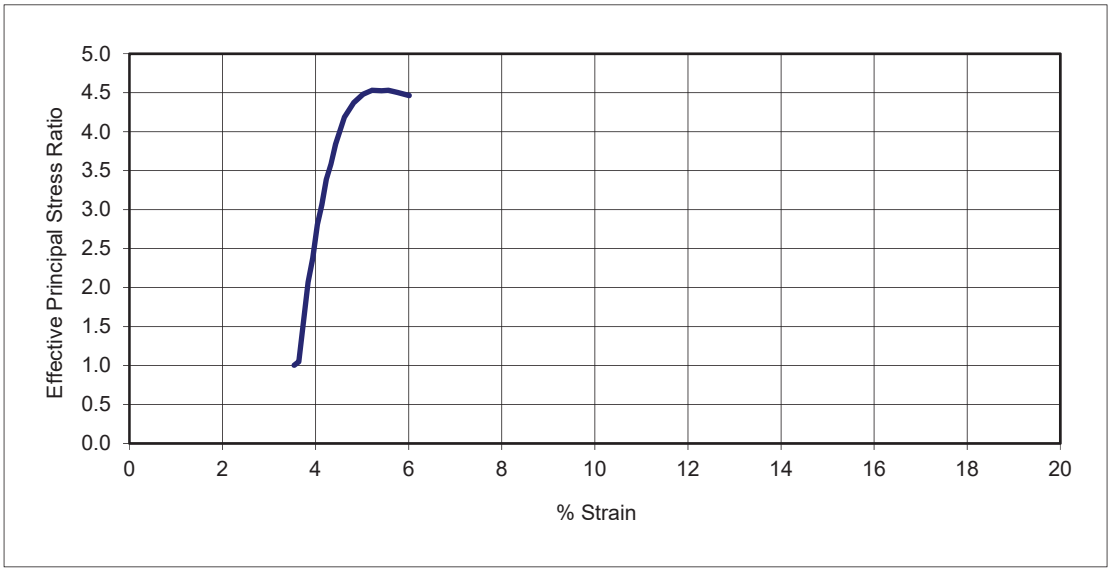
IGSL Ltd.

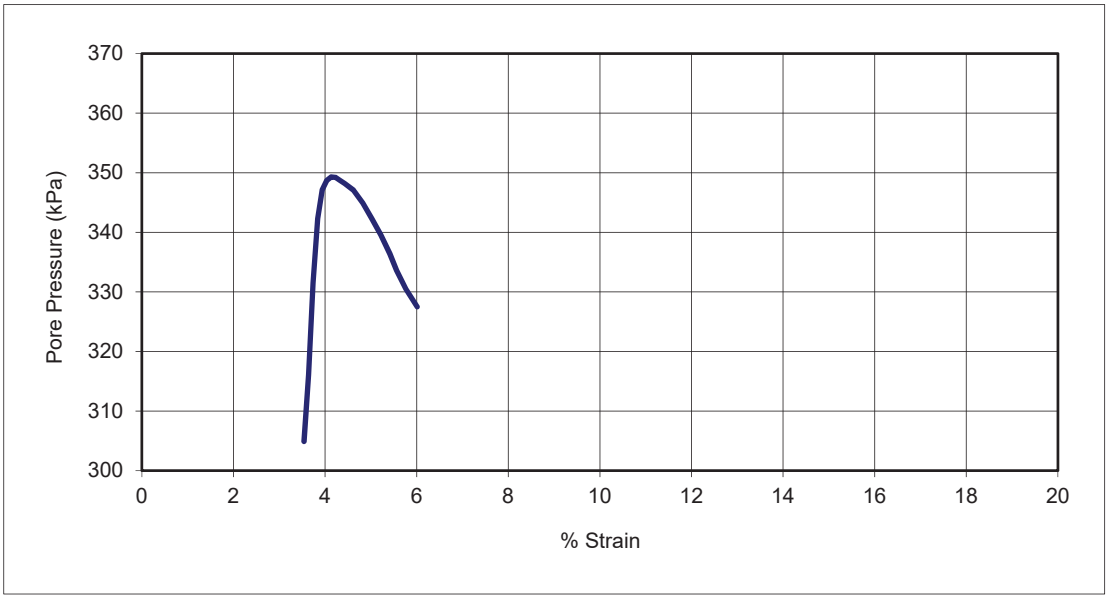
Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

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



Stage 2



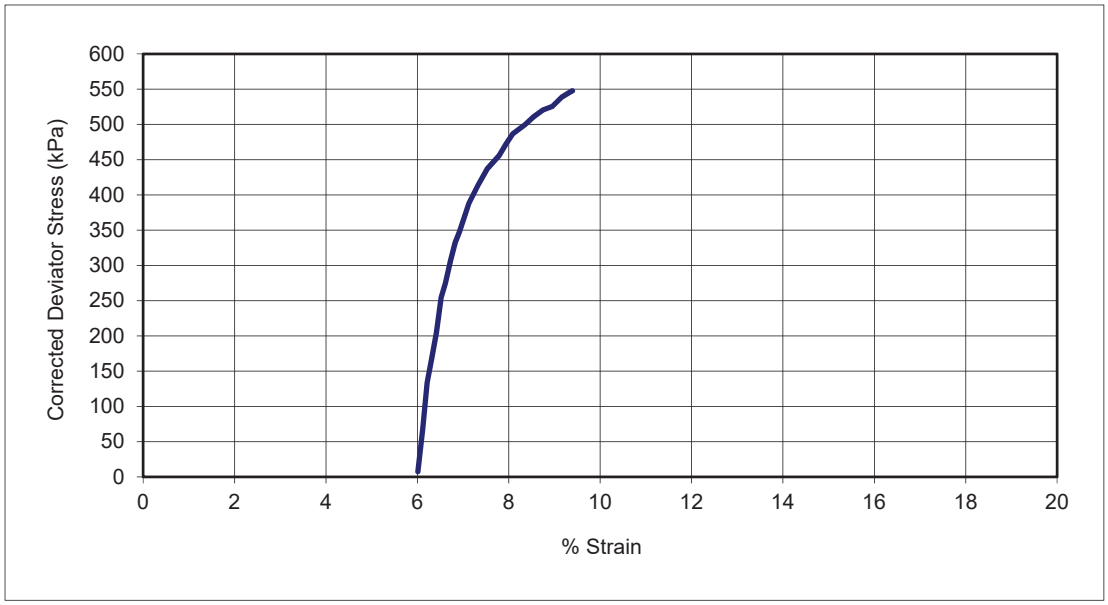


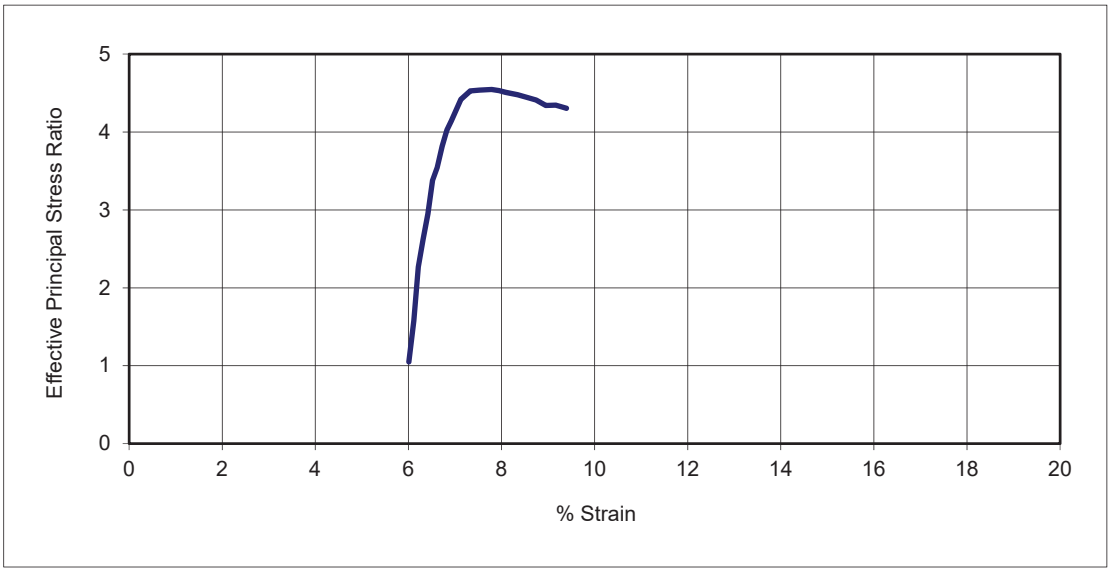
IGSL Ltd.

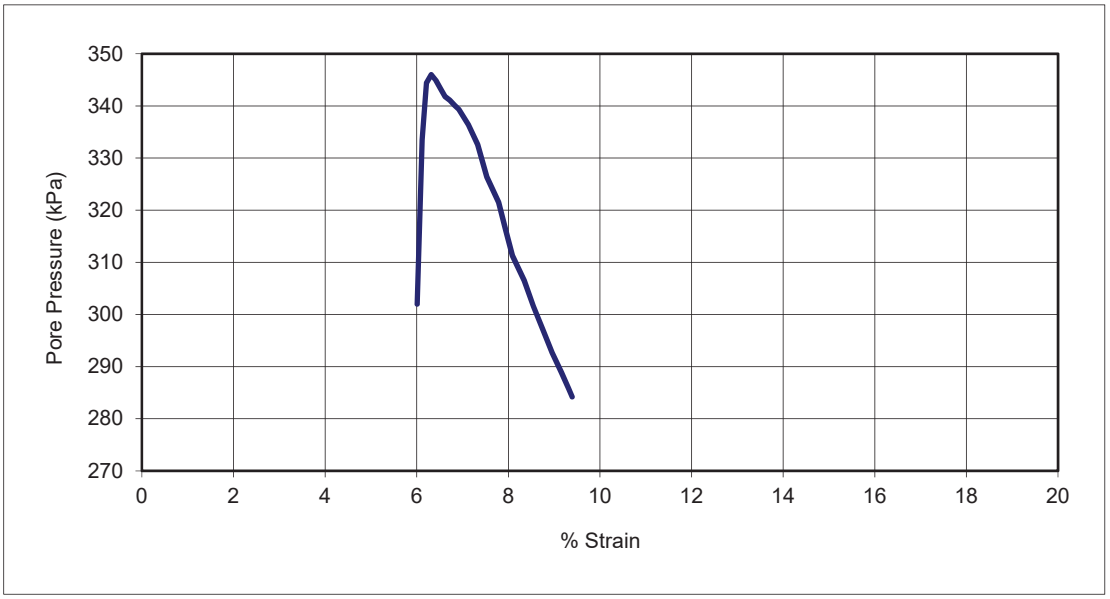
Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

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

Stage 3



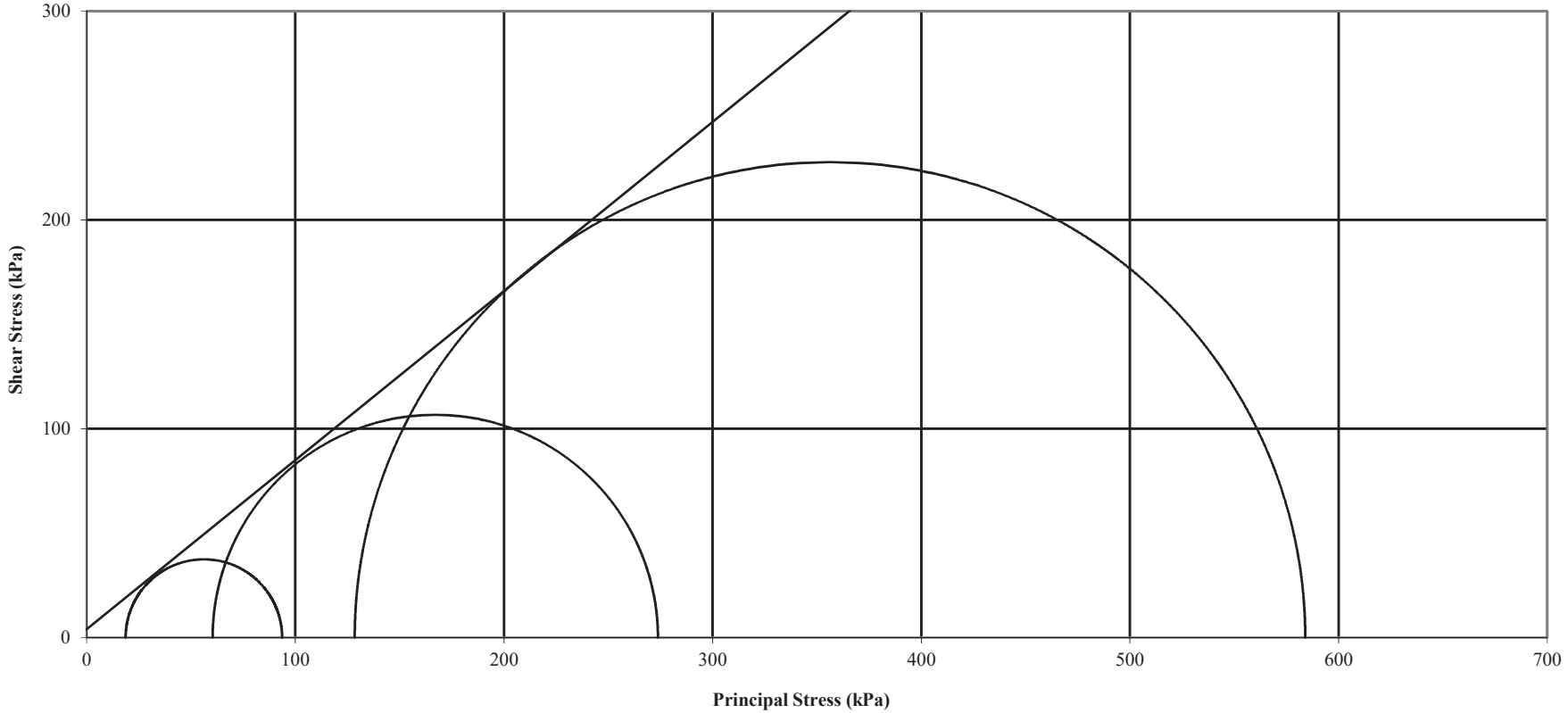




CONSOLIDATED UNDRAINED TRIAXIAL TEST - MOHR CIRCLES

In accordance with BS1377:Part 8:1990 and K H Head *Manual of Soils Laboratory Testing* Vol 3

Borehole 3/35CF Sample Number: AA1 Depth (m): 5.00



IGSL Ltd M7 Business Park Naas Co. Kildare	C'	4	ϕ'	39	Job No 18963
	Failure Criteria: Maximum effective principal stress ratio				
	Contract GCTP Phase 3				Page

IGSL Ltd.

Consolidated undrained Triaxial Compression with pore pressure measurement

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

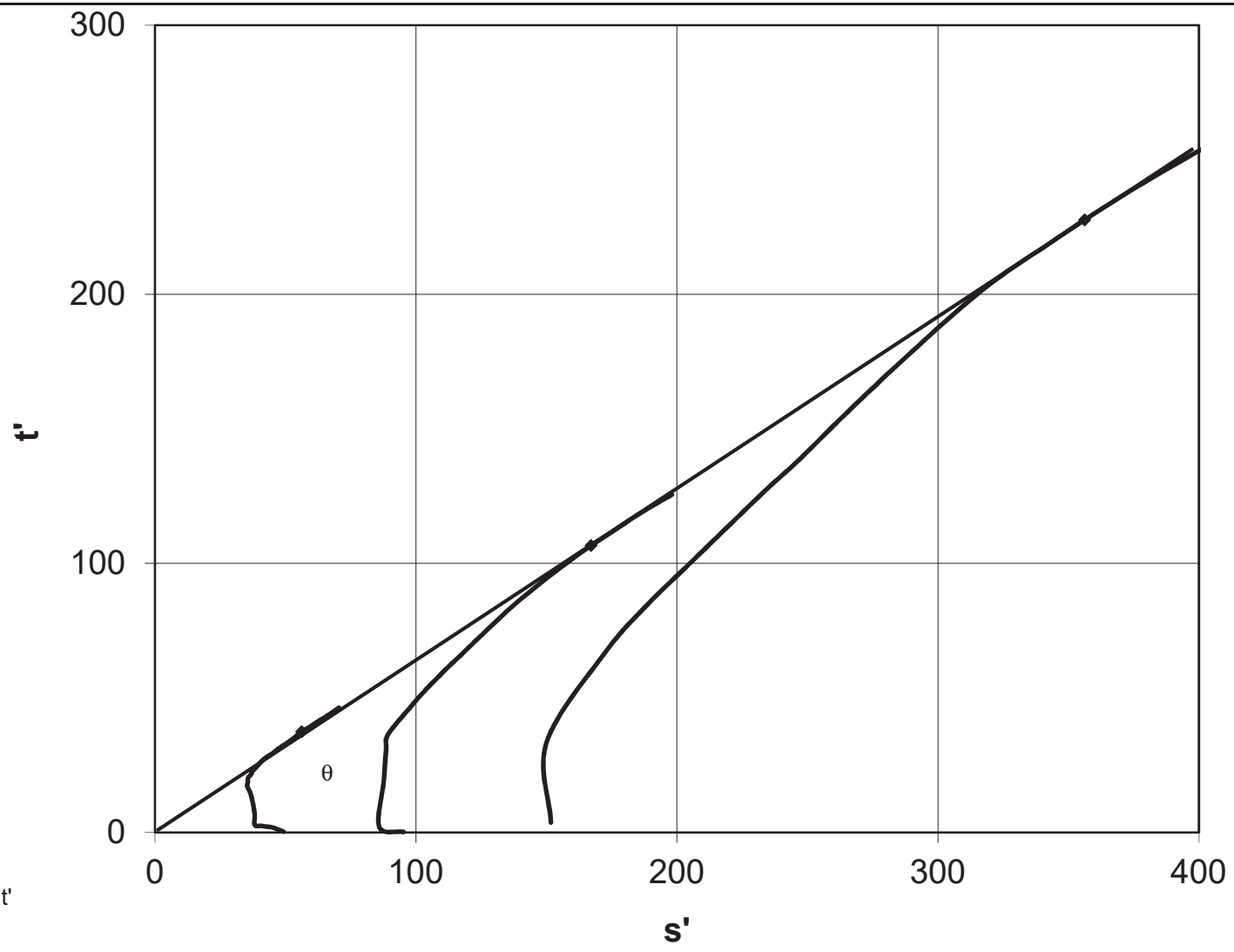
Contract No.	18963
Location	BH3/35CF
Sample No.	AA1
Depth (m)	0.5

Shear strength parameters

c'	4
ϕ'	40.5
θ	33

$\sin \phi' = \tan \theta$

$c' = t'_o / \cos \phi'$



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

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 1331

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 Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
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 sieved; AR - As received; NP - Non plastic
Liquid Limit Clause: 4.3 Cone Penetrometer definitive method; 4.4 Cone Penetrometer one point method
Sample Type: B - bulk disturbed; U - Undisturbed

Remarks:

NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014
Opinions and interpretations are outside the scope of accreditation.
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	Date	Page
H Byrne	20-07-16	1 of 1

One dimensional Consolidation

BS1377:Part 5:1990

Report No. R72732

Contract: GCTP Phase 3 Contract number: 18963

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

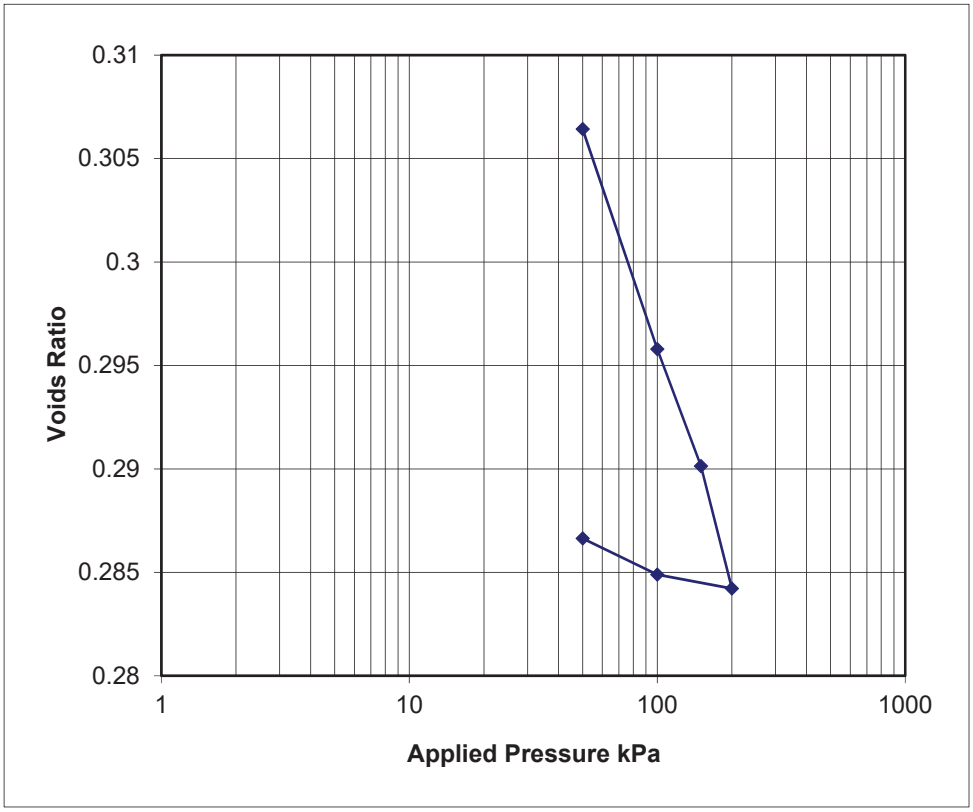
Description Grey slightly sandy slightly gravelly CLAY

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

	Initial	Final
Moisture content %	10	15
Bulk density Mg/m^3	2.17	2.27
Dry density Mg/m^3	1.97	1.98
Void ratio	0.346	0.287

Assumed Particle density Mg/m^3 2.65

Applied Pressure (kPa)	m_v (m^2/MN)	c_v (m^2/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



One dimensional Consolidation

BS1377:Part 5:1990

Report No. R72752

Contract: GCTP Phase 3 Contract number: 18963

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

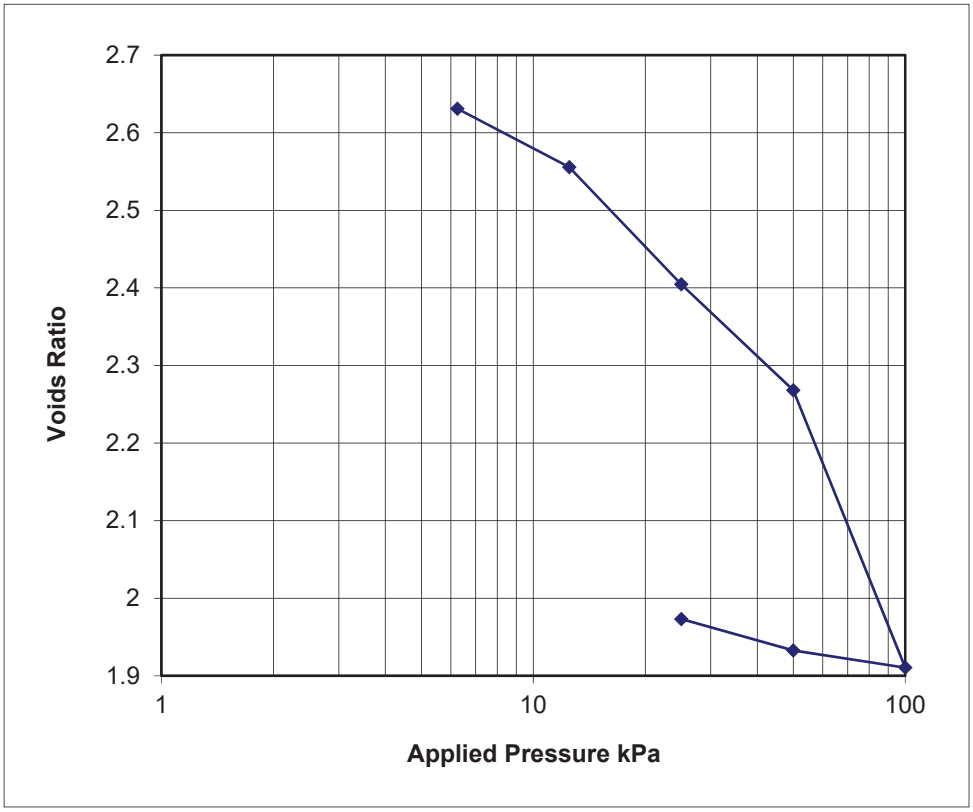
Description Dark brown fibrous PEAT with occasional light greyish brown clay

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

	Initial	Final
Moisture content %	177	161
Bulk density Mg/m^3	1.11	1.29
Dry density Mg/m^3	0.40	0.49
Void ratio	2.749	1.973

Assumed Particle density Mg/m^3 1.50

Applied Pressure (kPa)	m_v (m^2/MN)	c_v (m^2/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



One dimensional Consolidation

BS1377:Part 5:1990

Report No. R72753

Contract: GCTP Phase 3 Contract number: 18963

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

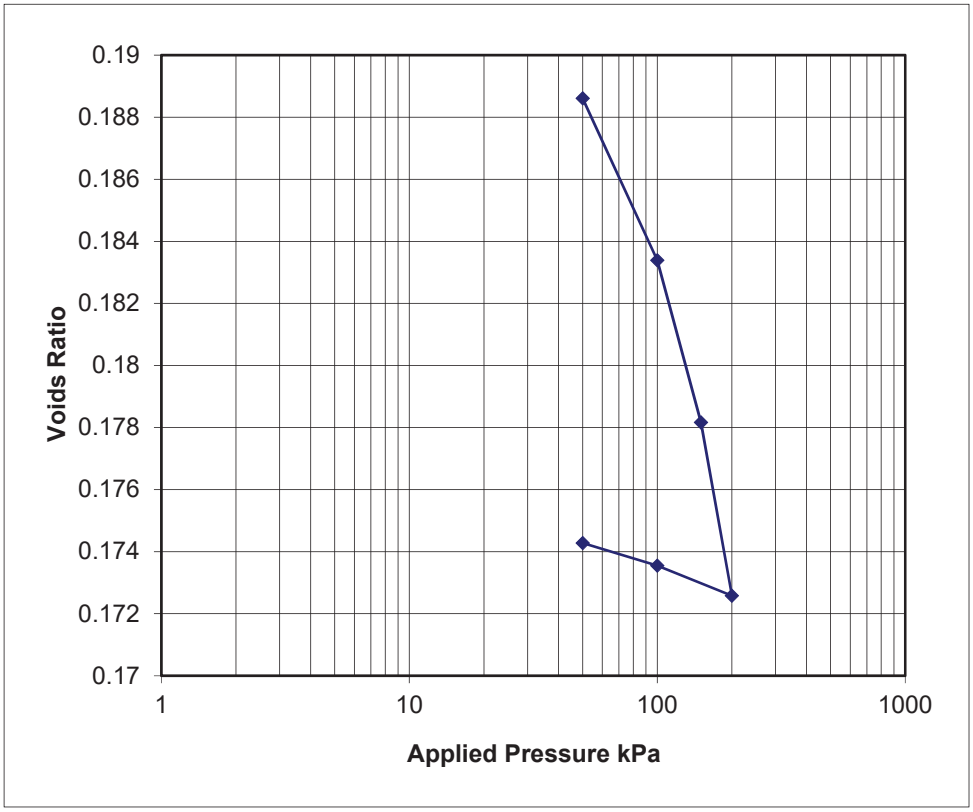
Description Light grey slightly sandy slightly gravelly CLAY

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

	Initial	Final
Moisture content %	9.1	8.8
Bulk density Mg/m^3	2.38	2.44
Dry density Mg/m^3	2.18	2.24
Void ratio	0.214	0.174

Assumed Particle density Mg/m^3 2.65

Applied Pressure (kPa)	m_v (m^2/MN)	c_v (m^2/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



IGSL Ltd.

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 with fine rootlets			Test Type	Multi-stage

Initial Dimensions and condition

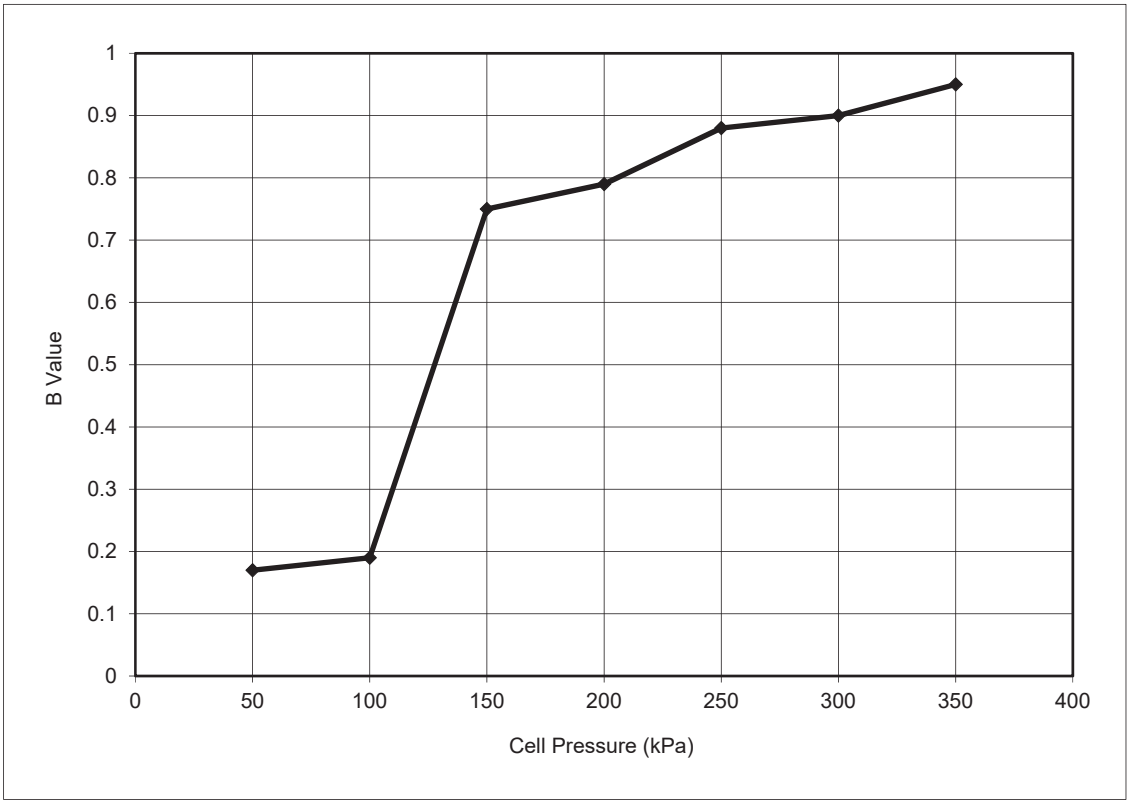
Height (mm)	76.0	Diameter (mm)	38.0	Side drains fitted	No

	Initial	Final
Moisture Content (%)	23	29
Bulk Density (Mg/m^3)	1.74	2.00
Dry Density (Mg/m^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



Number of days saturating 4

IGSL Ltd.

Consolidated undrained Triaxial Compression with pore pressure measurement

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

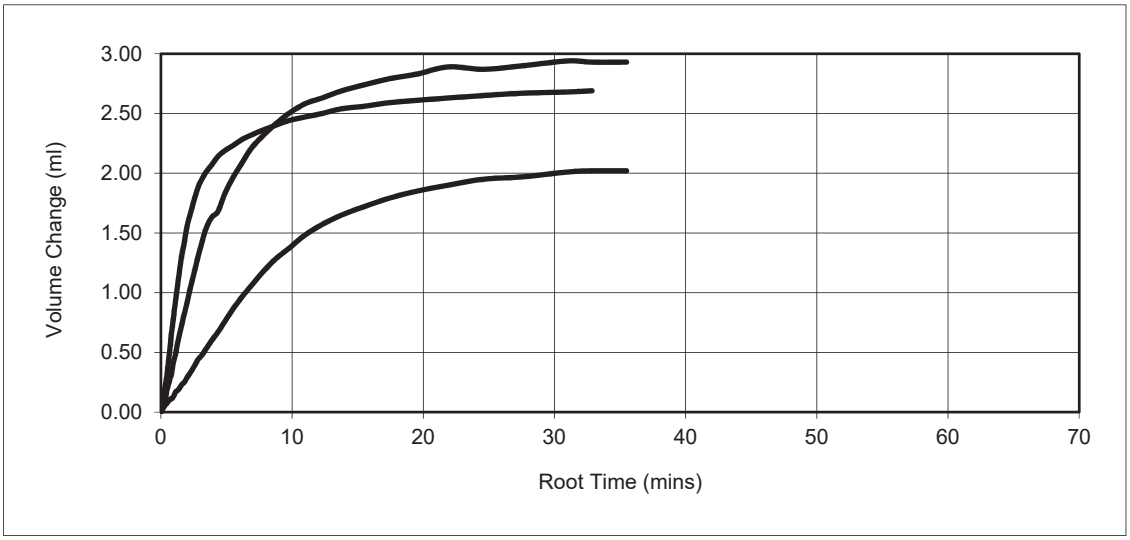
Report No. **R73541** Lab Sample no. **-**

Contract No. **18963** Contract Name **GCTP Phase 3**

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

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)	300	299	302
Volume Change (ml)	2.69	2.92	2.02
% Pore Pressure Dissipation	100	100	99



Number of days consolidating 3

Compression Stage

Failure criteria	Maximum Effective Principal Stress Ratio		
Stage	1	2	3
Effective Stress (kPa)	50	100	150
Rate of Strain (mm/min)	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 failure (kPa)	54.9	115.8	188.5
Pore Pressure at failure (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

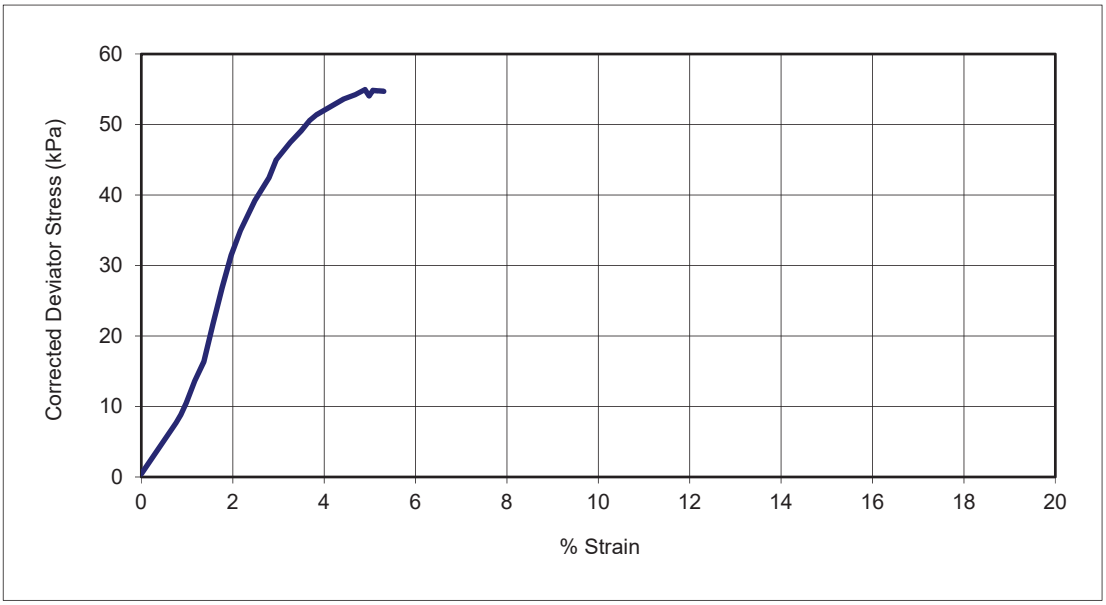
Number of days in compression 3

Total Number of days on test 10

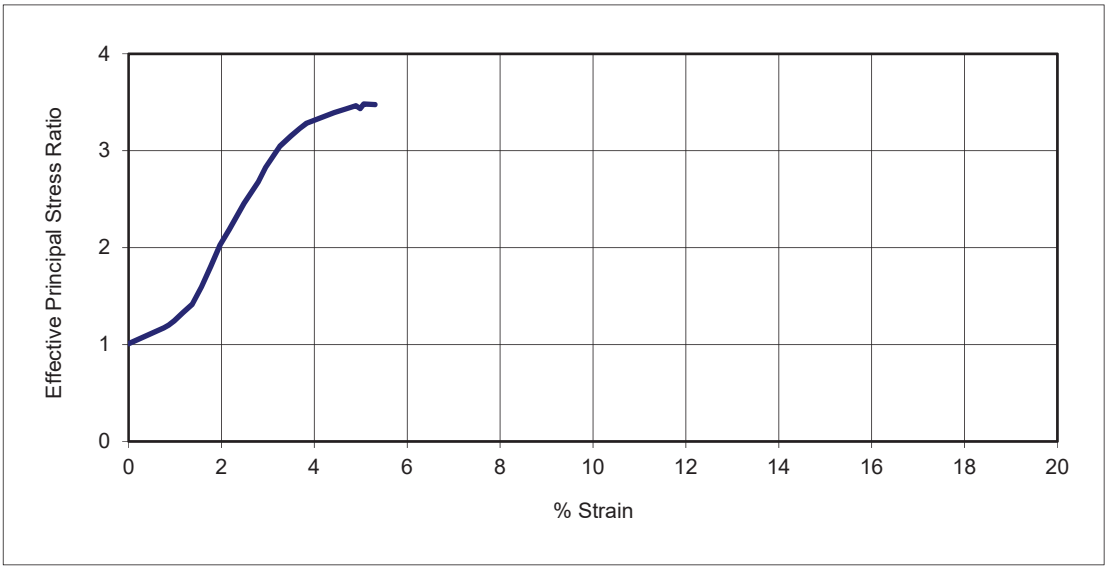
IGSL Ltd.

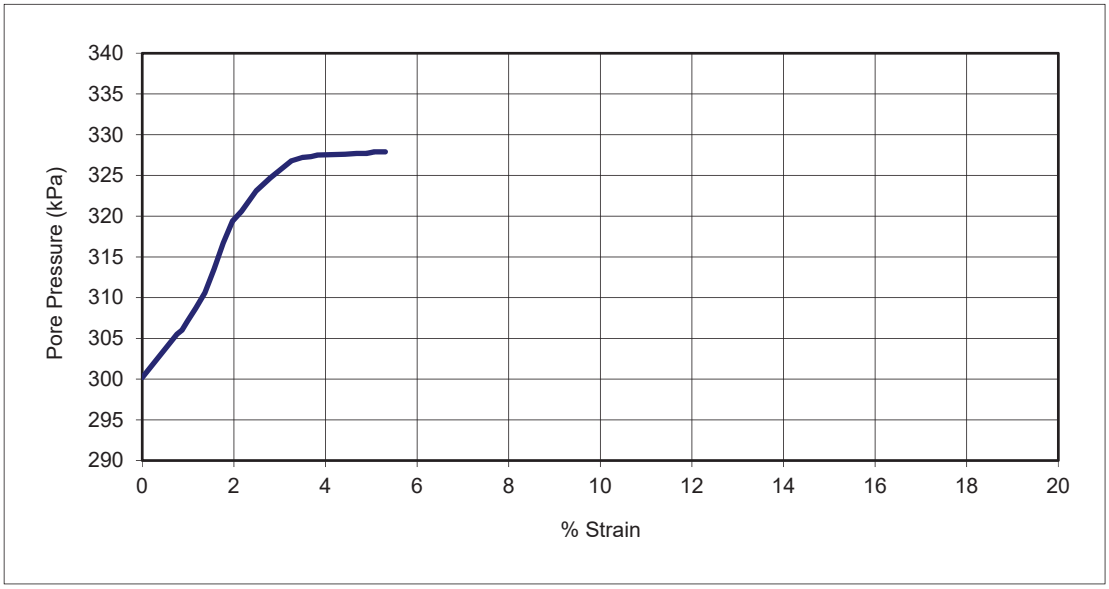
Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

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



Stage 1

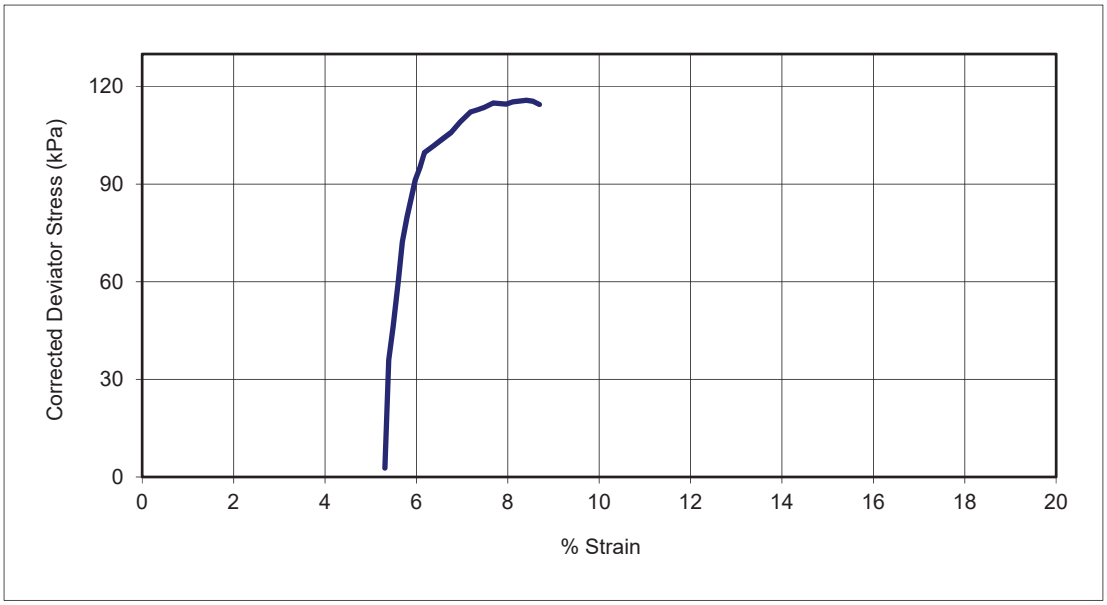




IGSL Ltd.

Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

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



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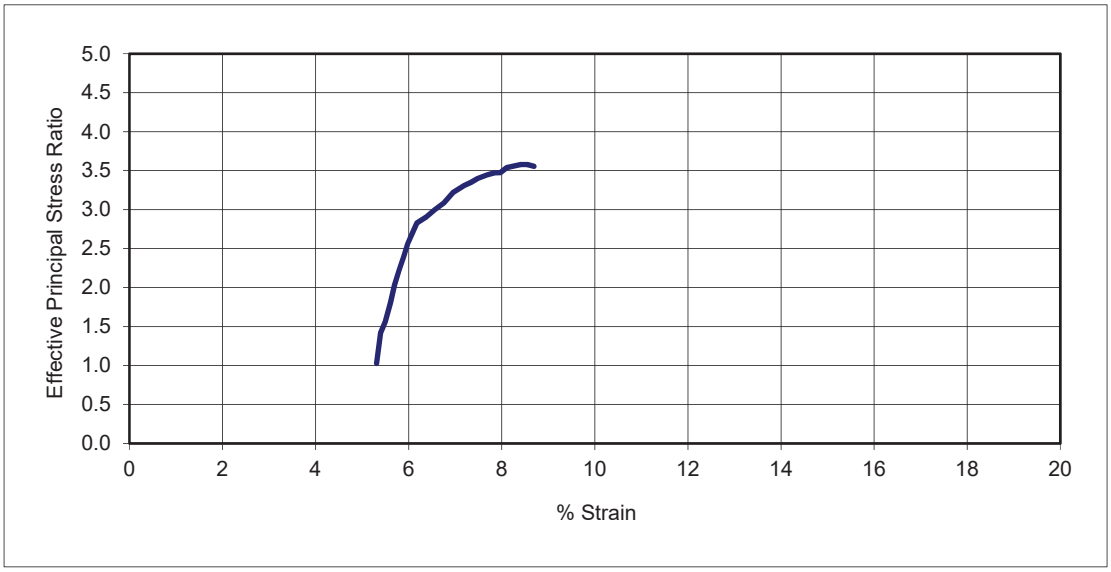
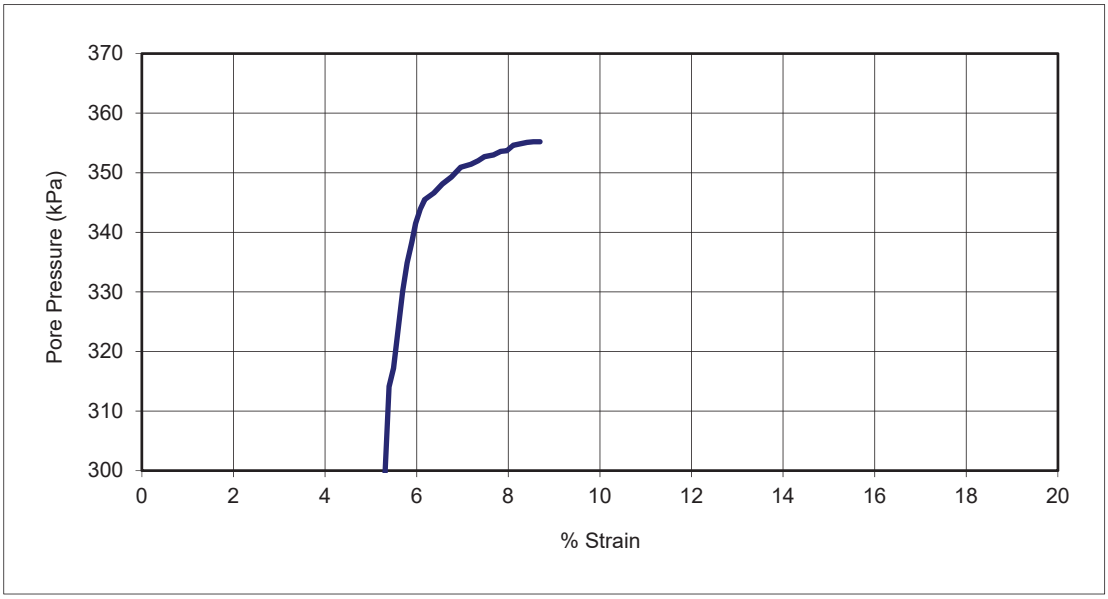


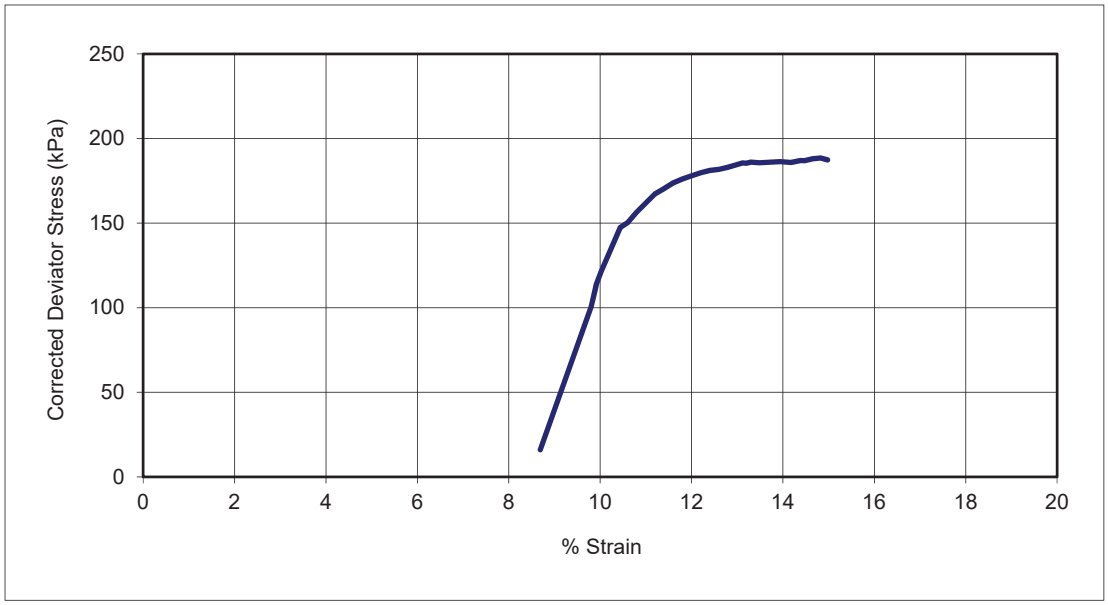


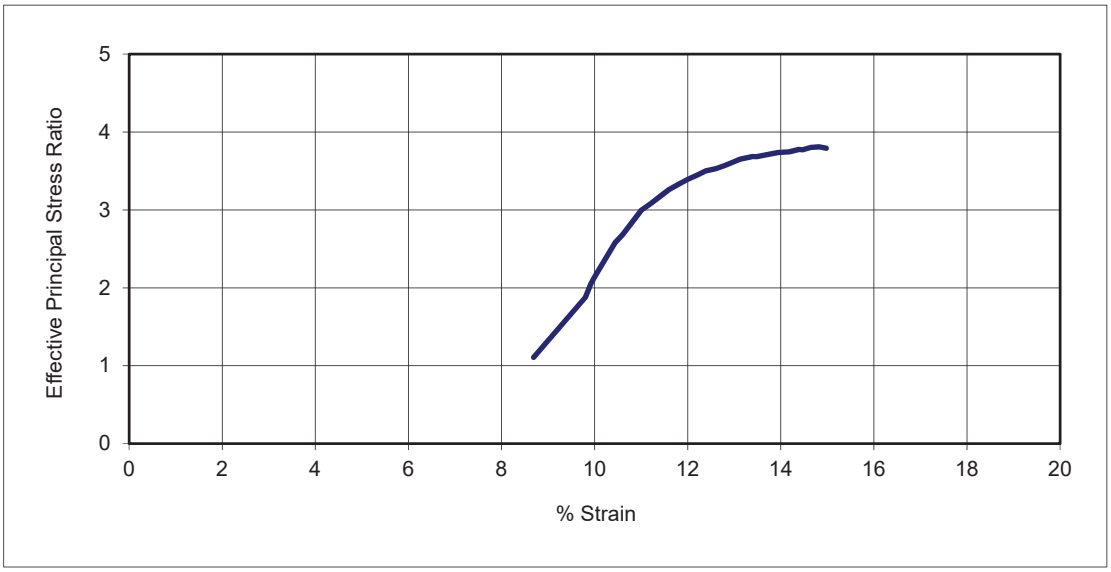
IGSL Ltd.

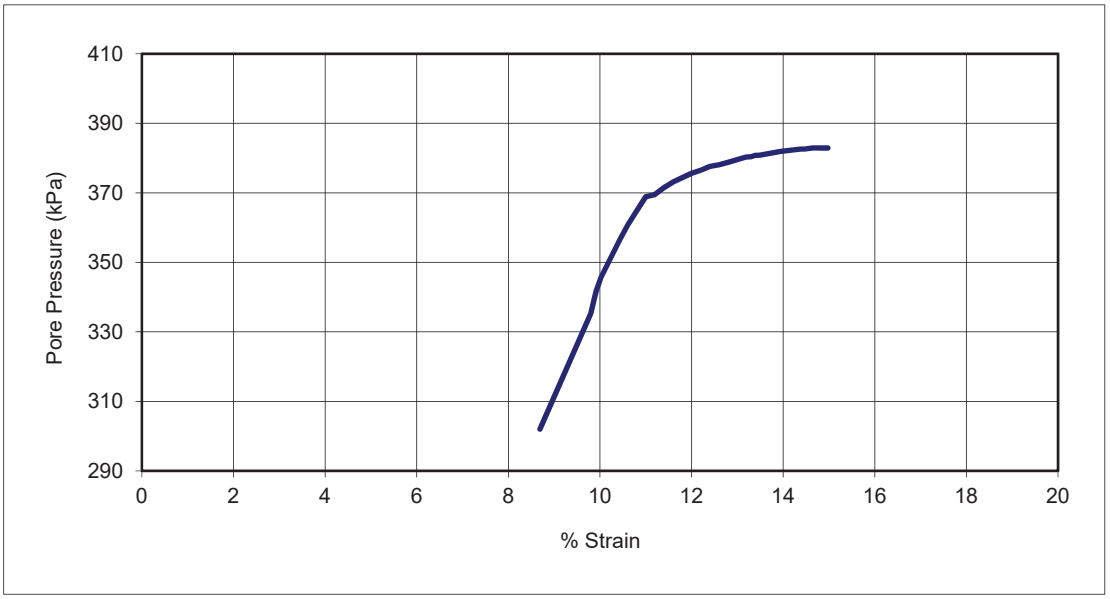
Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

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

Stage 3



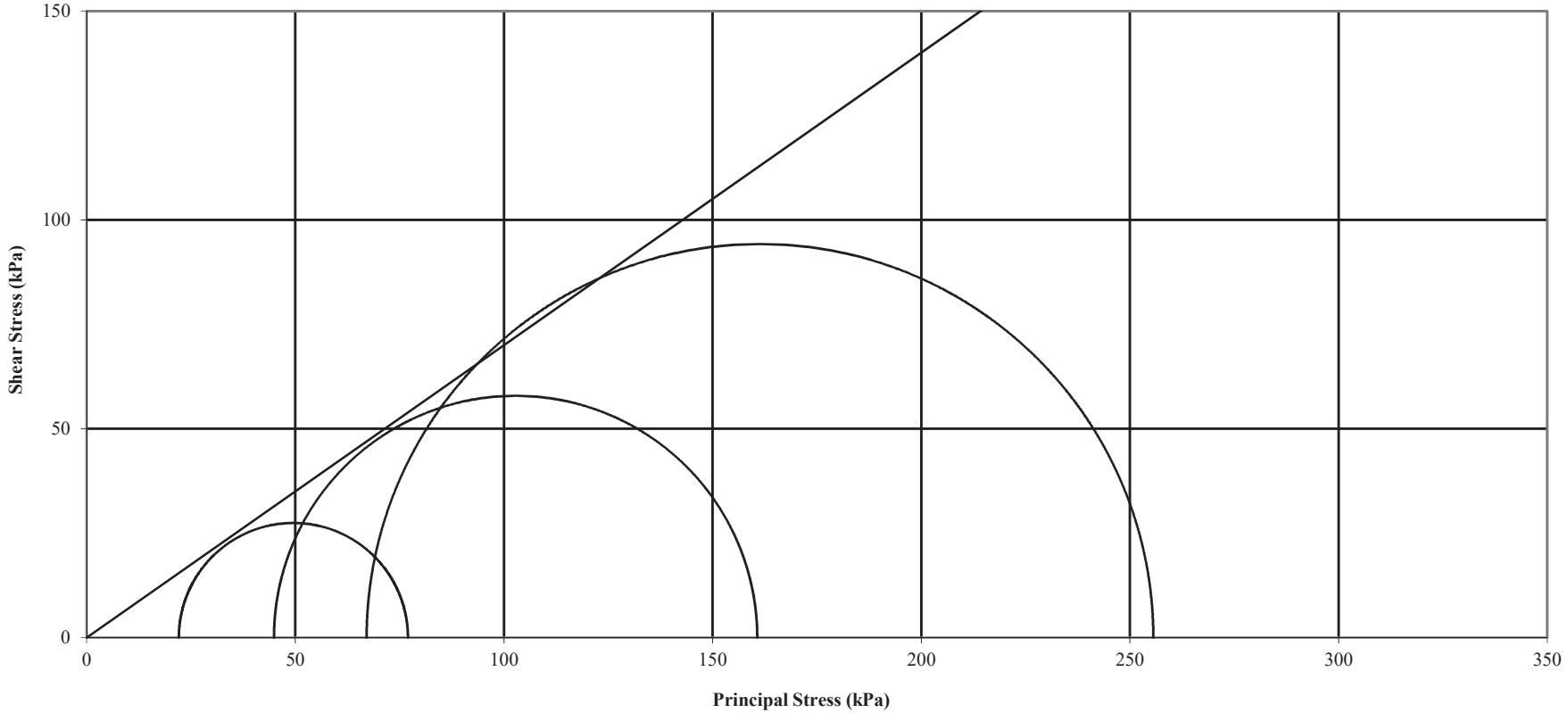




CONSOLIDATED UNDRAINED TRIAXIAL TEST - MOHR CIRCLES

In accordance with BS1377:Part 8:1990 and K H Head *Manual of Soils Laboratory Testing* Vol 3

Borehole WS3/03 Sample Number: Depth (m): 0.50



IGSL Ltd M7 Business Park Naas Co. Kildare	C'	0	ϕ'	35	Job No 18963
	Failure Criteria: Maximum effective principal stress ratio				
	Contract GCTP Phase 3				Page

IGSL Ltd.

Consolidated undrained Triaxial Compression with pore pressure measurement

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

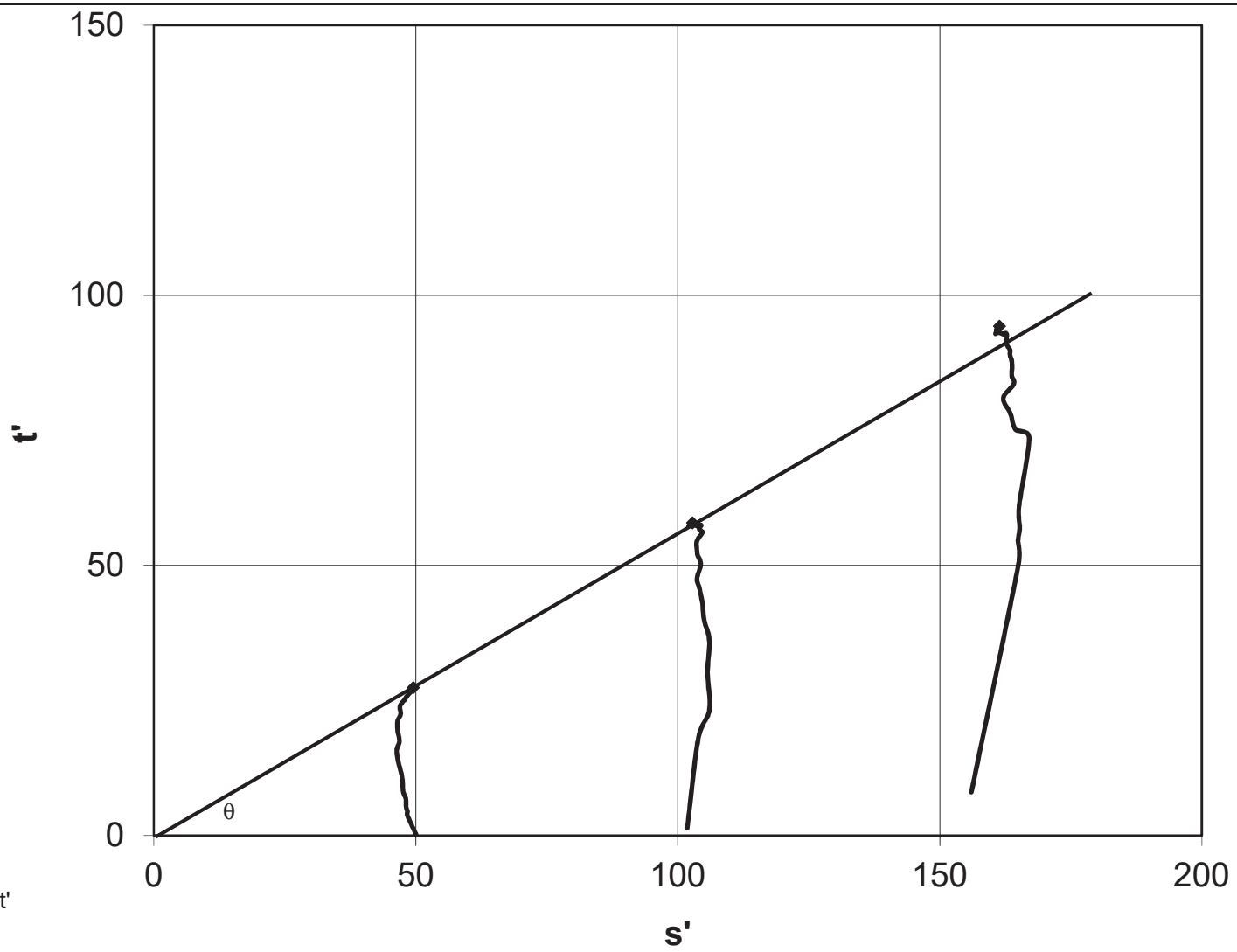
Contract No.	18963
Location	WS3/03
Sample No.	-
Depth (m)	0.5

Shear strength parameters

c'	0
ϕ'	35
θ	30

$\sin \phi' = \tan \theta$

$c' = t'_o / \cos \phi'$



Plot of Stress Path Parameters s' v t'

IGSL Ltd.

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.	**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

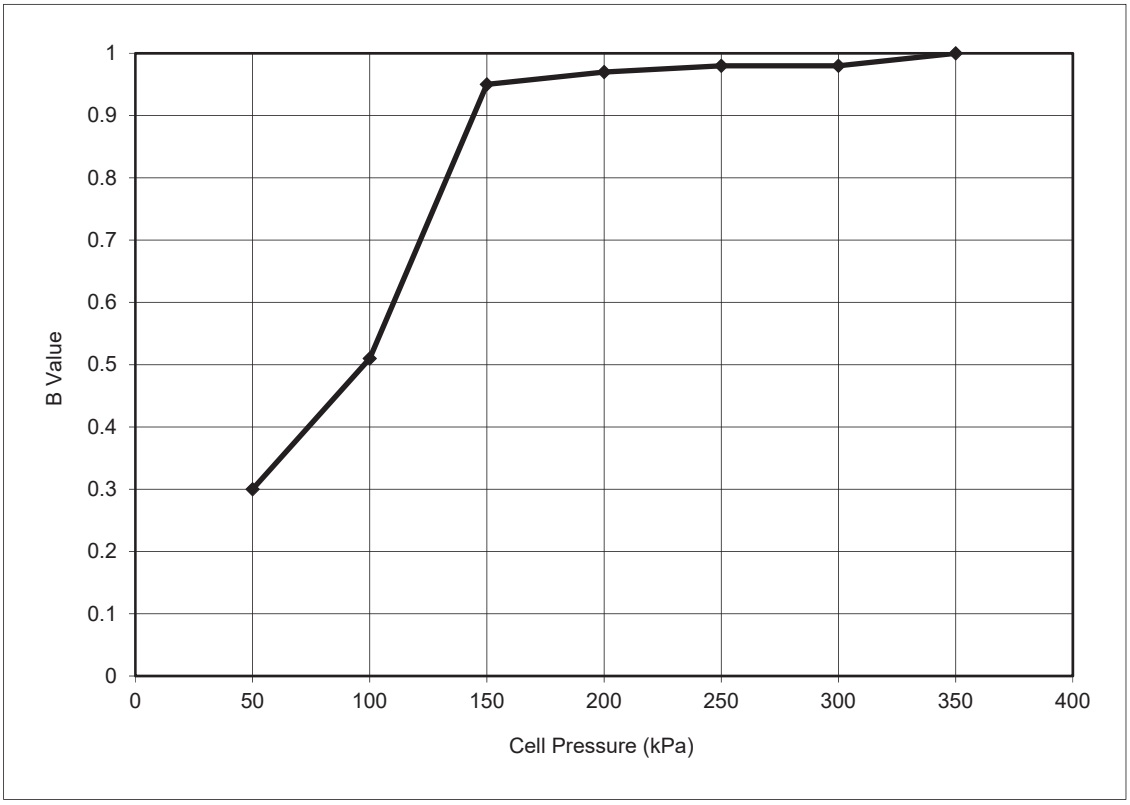
Height (mm)	76.0	Diameter (mm)	38.0	Side drains fitted	No

	Initial	Final
Moisture Content (%)	10	10
Bulk Density (Mg/m^3)	2.30	2.41
Dry Density (Mg/m^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



Number of days saturating 4

IGSL Ltd.

Consolidated undrained Triaxial Compression with pore pressure measurement

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

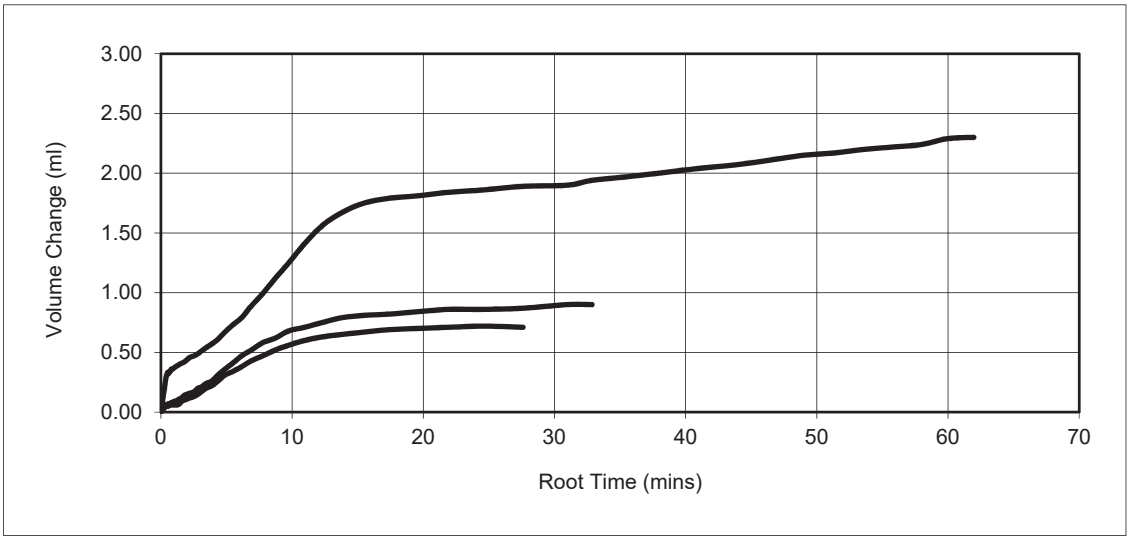
Report No. **R72964** Lab Sample no. **-**

Contract No. **18963** Contract Name **GCTP Phase 3**

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

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)	300	305	300
Volume Change (ml)	2.30	0.90	0.71
% Pore Pressure Dissipation	100	100	100



Number of days consolidating 3

Compression Stage

Failure criteria	Maximum Effective Principal Stress Ratio		
Stage	1	2	3
Effective Stress (kPa)	50	100	150
Rate of Strain (mm/min)	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 failure (kPa)	289.5	504.4	795.5
Pore Pressure at failure (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

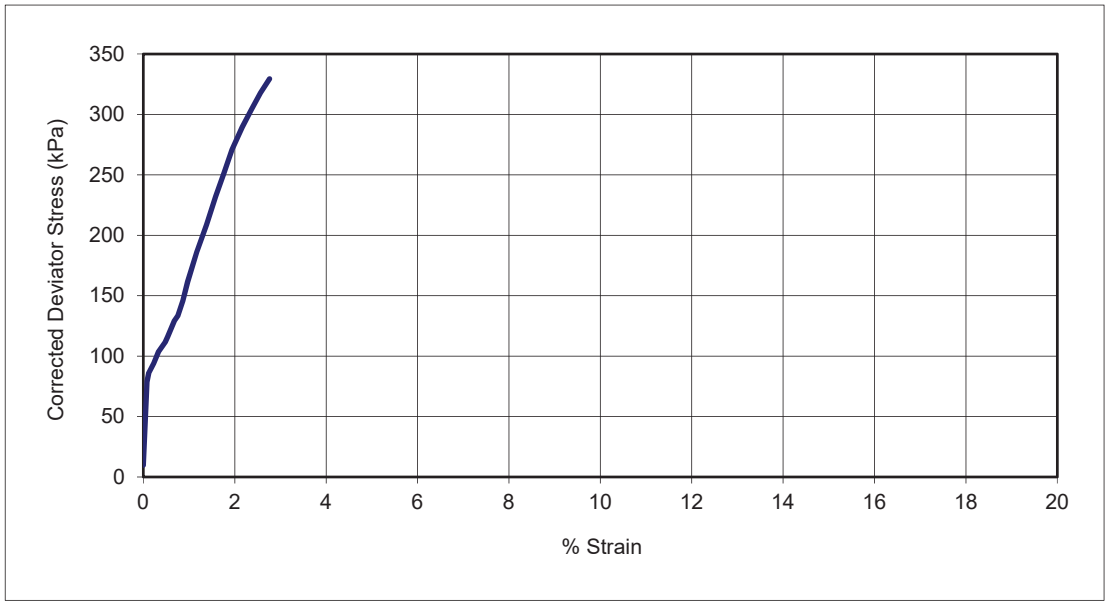
Number of days in compression 3

Total Number of days on test 10

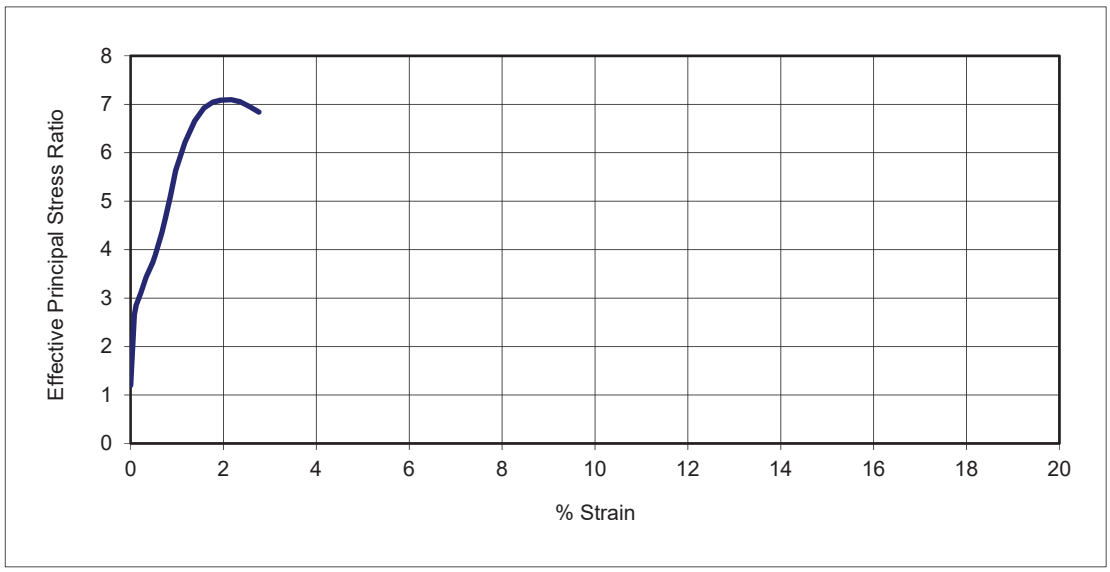
IGSL Ltd.

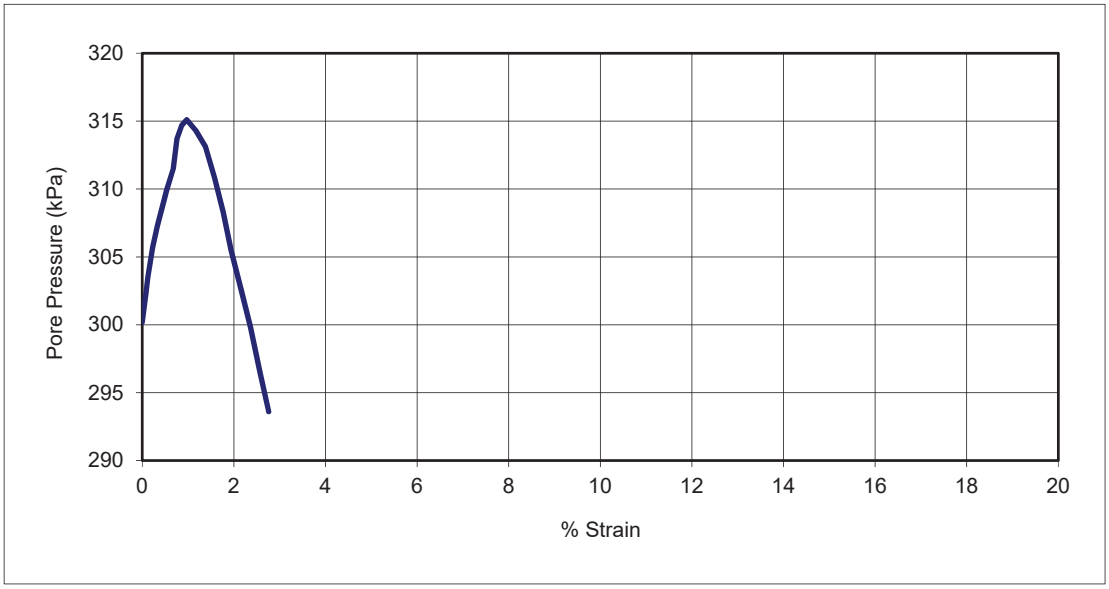
Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

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



Stage 1

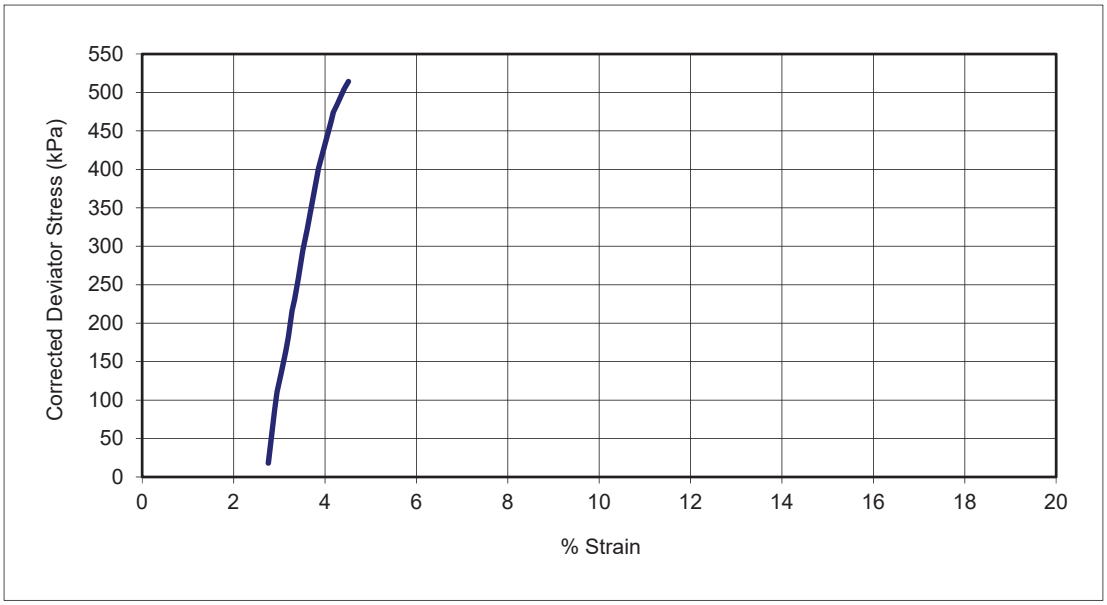




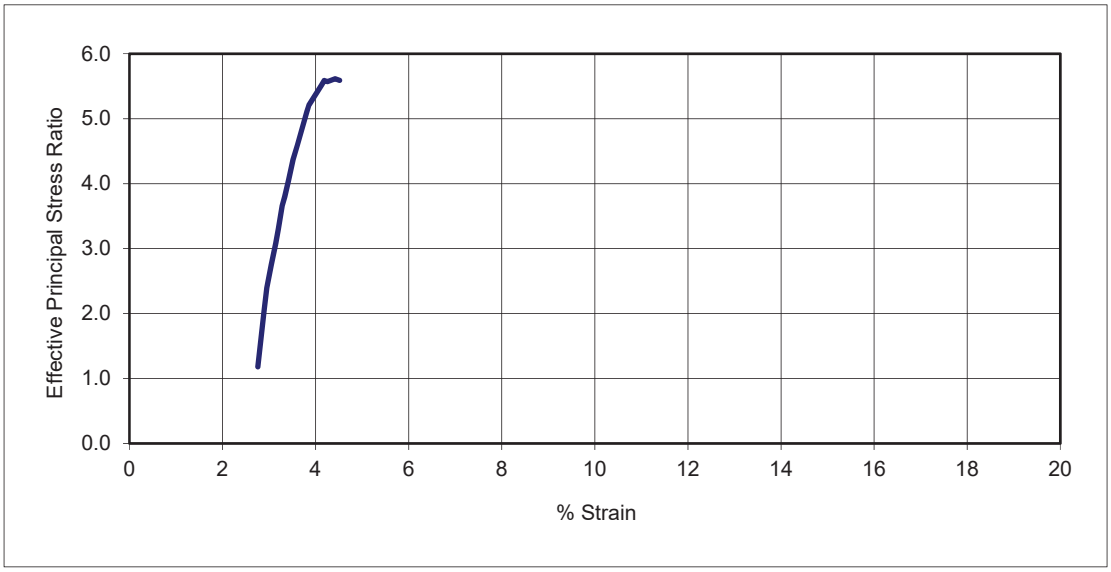
IGSL Ltd.

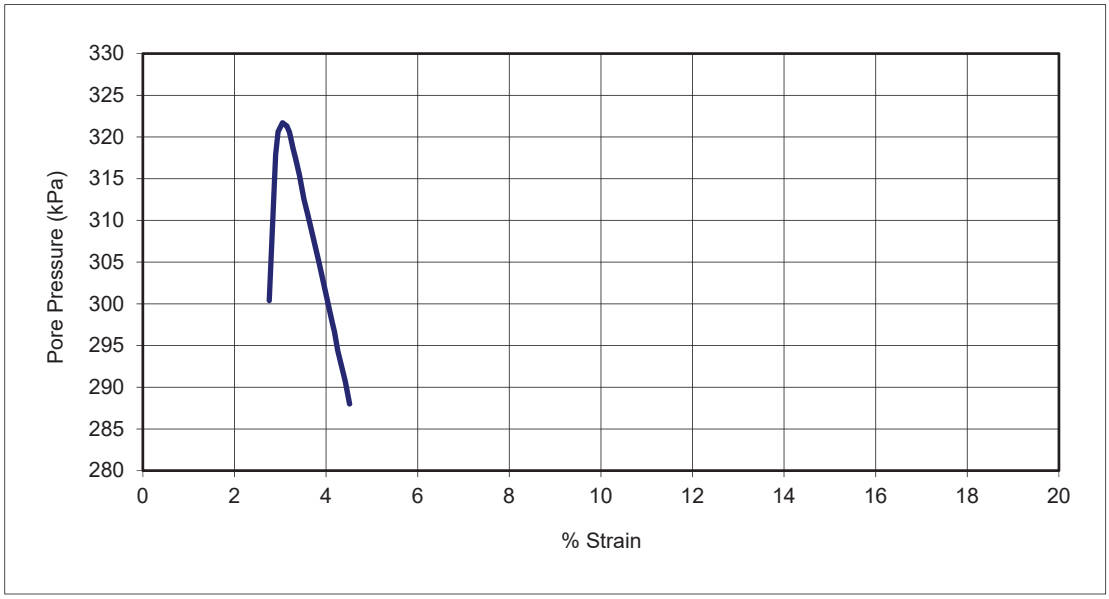
Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

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



Stage 2



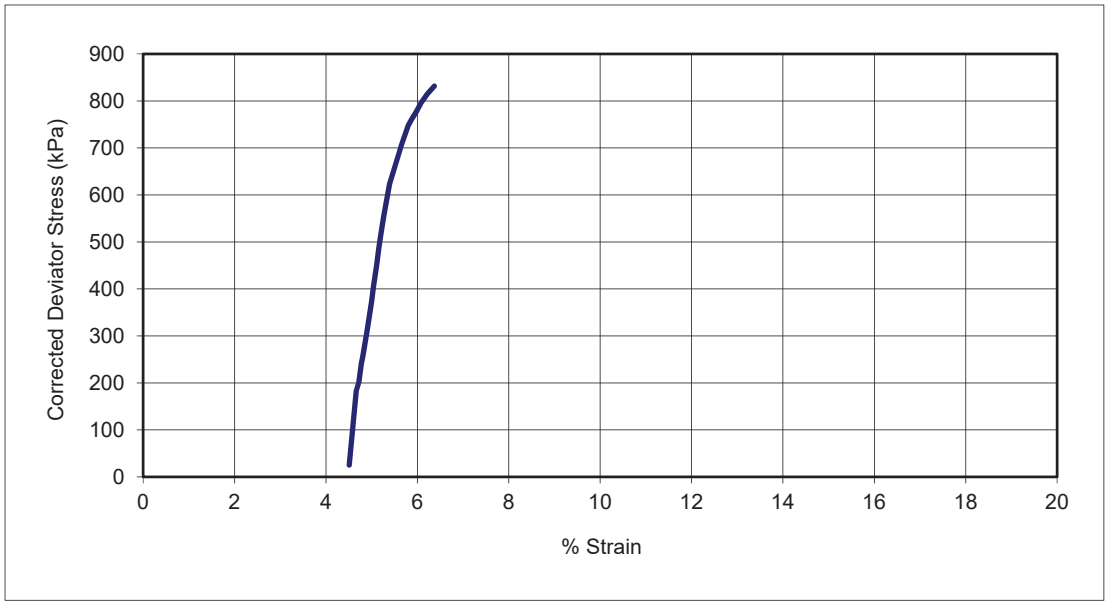


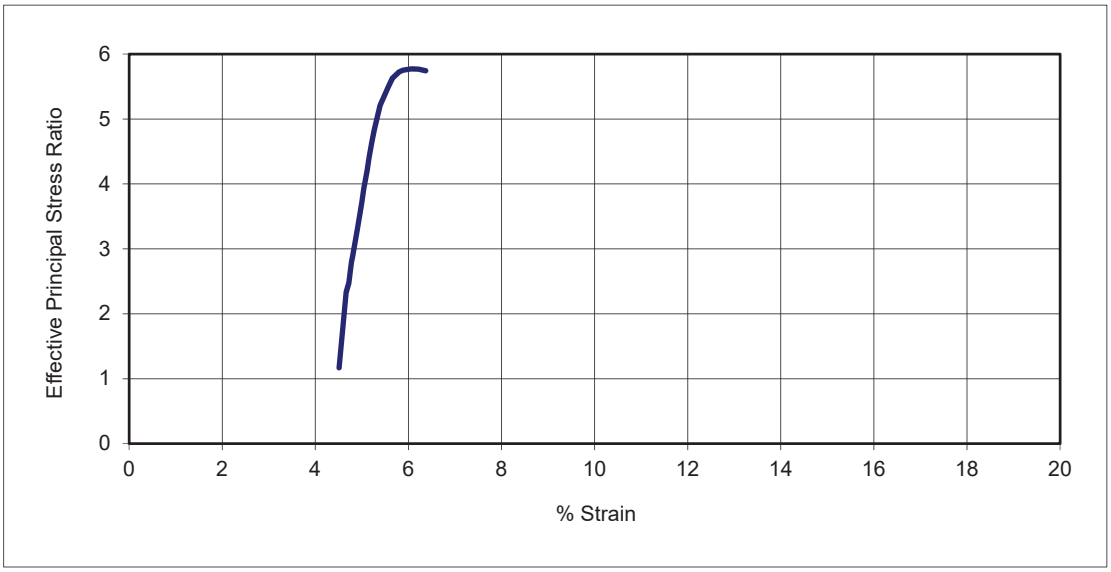
IGSL Ltd.

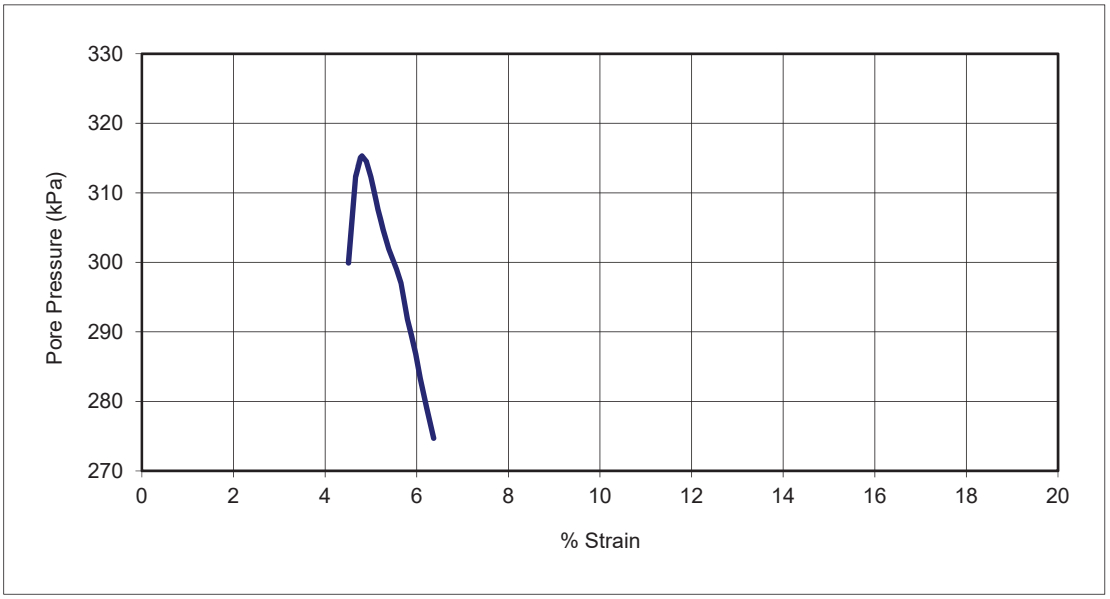
Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

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

Stage 3



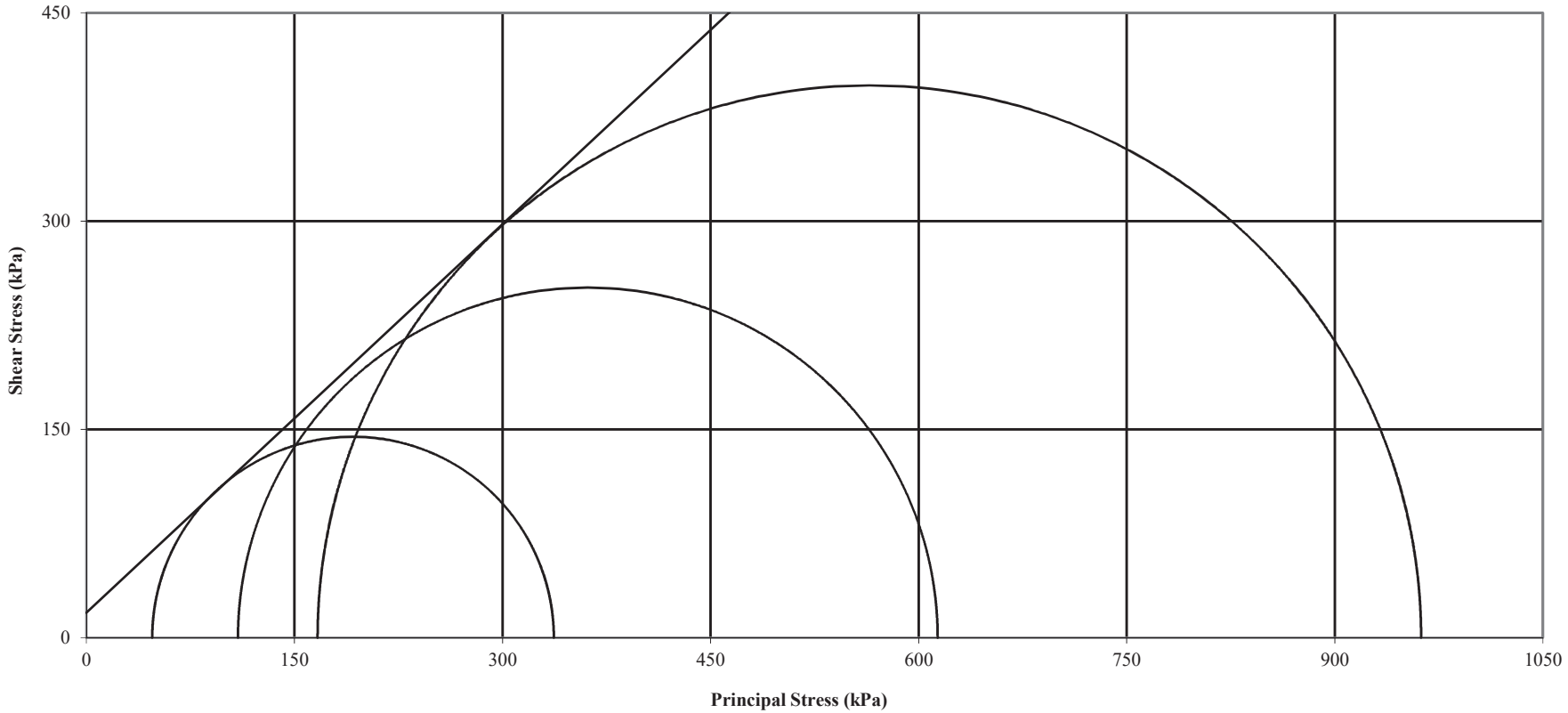




CONSOLIDATED UNDRAINED TRIAXIAL TEST - MOHR CIRCLES

In accordance with BS1377:Part 8:1990 and K H Head *Manual of Soils Laboratory Testing* Vol 3

Borehole WS3/04 Sample Number: Depth (m): 2.00



IGSL Ltd M7 Business Park Naas Co. Kildare	C'	18	ϕ'	43	Job No 18963
	Failure Criteria: Maximum effective principal stress ratio				
	Contract GCTP Phase 3				Page

IGSL Ltd.

Consolidated undrained Triaxial Compression with pore pressure measurement

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

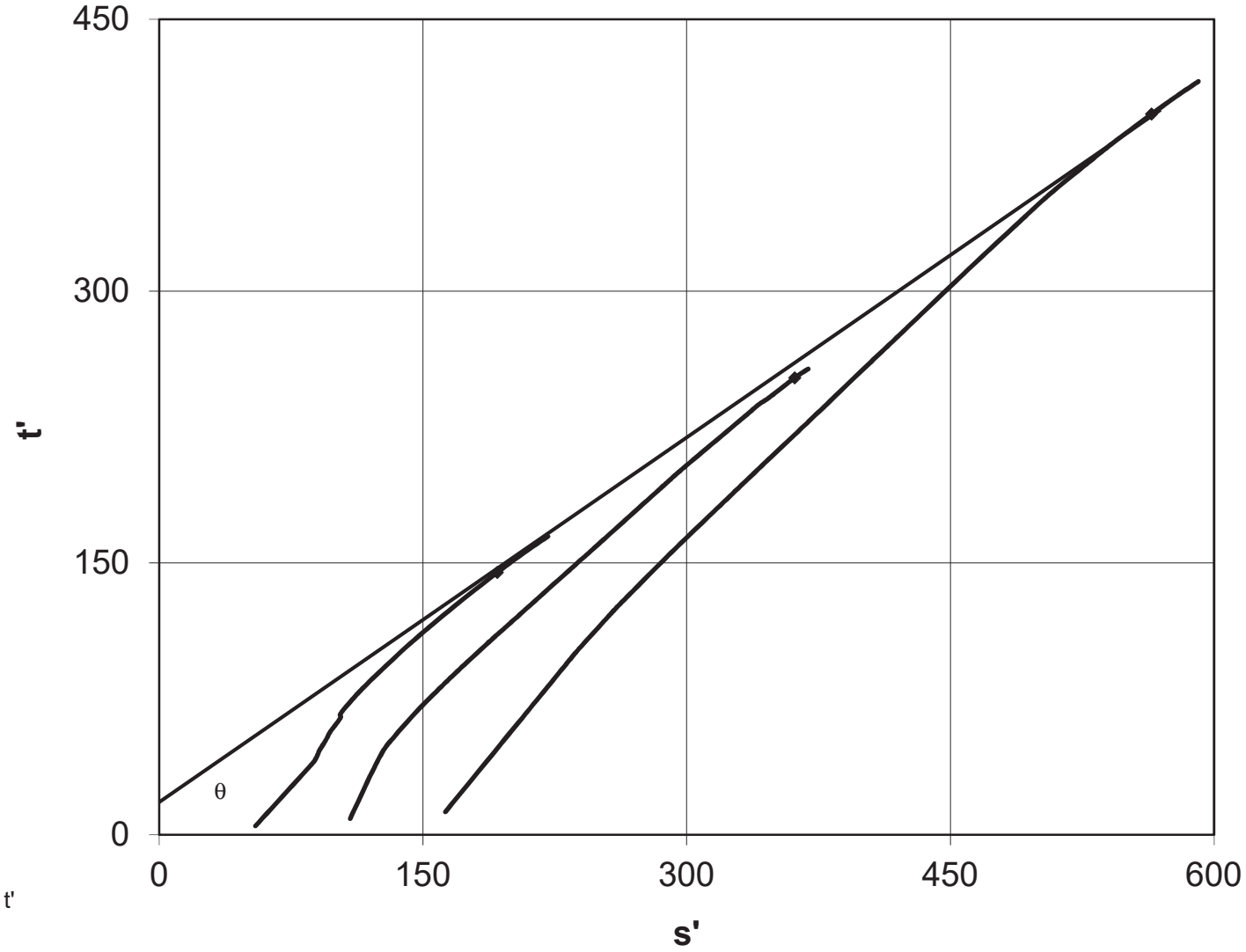
Contract No.	18963
Location	WS3/04
Sample No.	-
Depth (m)	2.0

Shear strength parameters

c'	15
ϕ'	42
θ	34

$\sin \phi' = \tan \theta$

$c' = t'_o / \cos \phi'$



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

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 1331

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 Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
SW3/02	AA46069	0.5	A16/1921	B	23								Brown sandy, slightly gravelly, SILT/CLAY
SW3/02	AA46070	1.0	A16/1922	B	10								Light brown slightly sandy, gravelly, SILT/CLAY
TP3/36	AA43065	0.4	A16/1923	B	25								Brown slightly sandy, slightly gravelly, SILT/CLAY
TP3/36	AA43066	0.4	A16/1924	B	27								Brown slightly sandy, slightly gravelly, SILT/CLAY
TP3/36	AA43067	0.8	A16/1925	B	11								Brown slightly sandy, gravelly, SILT/CLAY
TP3/36	AA43068	0.8	A16/1926	B	10								Brown slightly sandy, gravelly, SILT/CLAY
TP3/37	AA49488	0.5	A16/1927	B	15								Dark brown clayey/silty, very sandy, GRAVEL
TP3/37	AA49489	1.0	A16/1928	B	14								Brown very sandy very gravelly CLAY
TP3/39	AA49491	0.5	A16/1929	B	9.9								Dark brown slightly clayey/silty, sandy, GRAVEL
TP3/39	AA49492	1.1	A16/1930	B	54								Brown very sandy GRAVEL
TP3/40	AA49490	0.3	A16/1931	B	16								Dark brown clayey/silty, very sandy, GRAVEL
TP3/41	AA43057	0.5	A16/1932	B	19								Orange/Brown sandy, slightly gravelly, CLAY
TP3/41	AA43058	0.5	A16/1933	B	21	38	17	21	56	WS	4.4	C I	Orange/Brown sandy, slightly gravelly, CLAY
TP3/42	AA43059	0.4	A16/1934	B	17								Dark brown sandy gravelly SILT/CLAY
TP3/42	AA43060	0.8	A16/1935	B	12	19	11	8	75	WS	4.4	C L	Light brown slightly sandy, slightly gravelly, CLAY

Notes: Preparation: WS - Wet sieved; AR - As received; NP - Non plastic

Sample Type: B - bulk disturbed; U - Undisturbed

Liquid Limit Clause: 4.3 Cone Penetrometer definitive method; 4.4 Cone Penetrometer one point method

Remarks:

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

Opinions and interpretations are outside the scope of accreditation.

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: H Byrne

Date: 17-06-16

Page: 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

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 1331

Report No. **R72103** 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
TP3/42	AA43061	0.8	A16/1936	D	11								Light brown slightly sandy, slightly gravelly, CLAY
TP3/42	AA43062	1.5	A16/1937	B	8.3								Brown clayey/silty, gravelly, SAND
TP3/42	AA43063	2.5	A16/1938	B	8.6								Brown slightly clayey gravelly SAND
TP3/42	AA43064	3.5	A16/1939	B	8.5								Brown clayey/silty, very sandy, GRAVEL
TP3/44	AA49493	1.0	A16/1940	B	9.8								Brown slightly sandy, slightly gravelly, SILT/CLAY
TP3/44	AA49494	1.0	A16/1941	B	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	B	9.5								Light brown/grey slightly sandy, slightly gravelly, CLAY
TP3/44	AA49497	2.0	A16/1944	B	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	C L	Light brown/grey slightly sandy, slightly gravelly, CLAY
TP3/45	AA43051	1.5	A16/1946	B	11								Brown slightly sandy, slightly gravelly, SILT/CLAY
TP3/45	AA43052	1.5	A16/1947	B	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	B	8.3								Light brown/grey slightly sandy, slightly gravelly, SILT/CLAY
TP3/45	AA43055	2.5	A16/1950	B	9.1								Light brown/grey slightly sandy, slightly gravelly, SILT/CLAY

Notes:
Preparation: WS - Wet sieved; AR - As received; NP - Non plastic
Sample Type: B - bulk disturbed; U - Undisturbed
Liquid Limit Clause: 4.3 Cone Penetrometer definitive method; 4.4 Cone Penetrometer one point method

Remarks:

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

Date: 17-06-16

Page: 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

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 1331

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	B	12	20	10	10	62	WS	4.4	C L	Light brown/grey slightly sandy, slightly gravelly, CLAY

Notes: Preparation: WS - Wet sieved; AR - As received; NP - Non plastic
Liquid Limit Clause: 4.3 Cone Penetrometer definitive method; 4.4 Cone Penetrometer one point method
Sample Type: B - bulk disturbed; U - Undisturbed

Remarks:

NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014
Opinions and interpretations are outside the scope of accreditation.
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	Date	Page
H Byrne	17-06-16	1 of 1

TEST REPORT
Determination of Particle Size Distribution

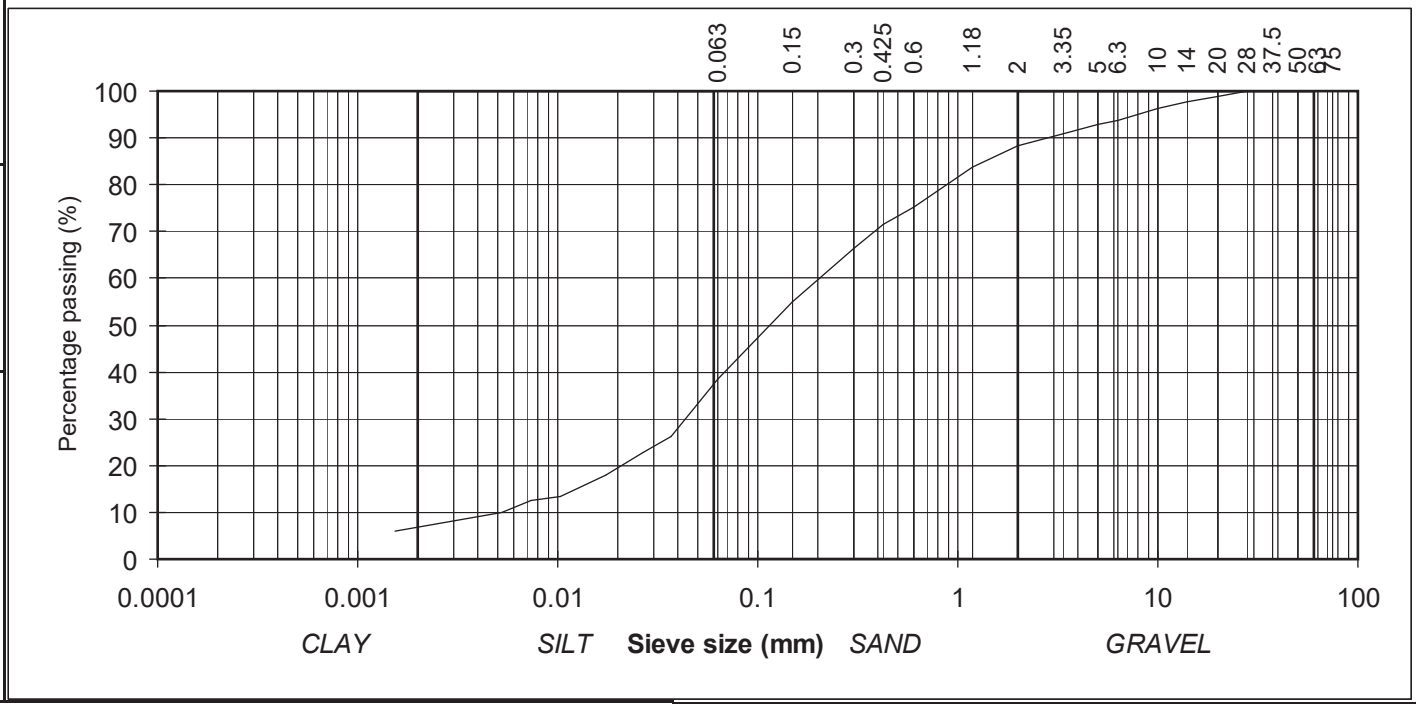
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	99	
14	98	
10	96	
6.3	94	
5	93	
3.35	91	
2	88	
1.18	84	SAND
0.6	75	
0.425	71	
0.3	66	
0.15	55	
0.063	39	SILT/CLAY
0.037	26	
0.027	23	
0.017	18	
0.010	13	
0.007	12	
0.005	10	
0.002	6	

Contract No: 18963 Report No. R72689
Contract: GCTP Phase 3 - Contact 1
BH/TP: SW3/02
Sample No. AA46096 Lab. Sample No. A16/1921
Sample Type: B
Depth (m) 0.50 Customer: Galway Co.Co.
Date Received 10-05-16 Date Testing started 27-05-16
Description: Brown sandy, slightly gravelly, SILT/CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	14-06-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

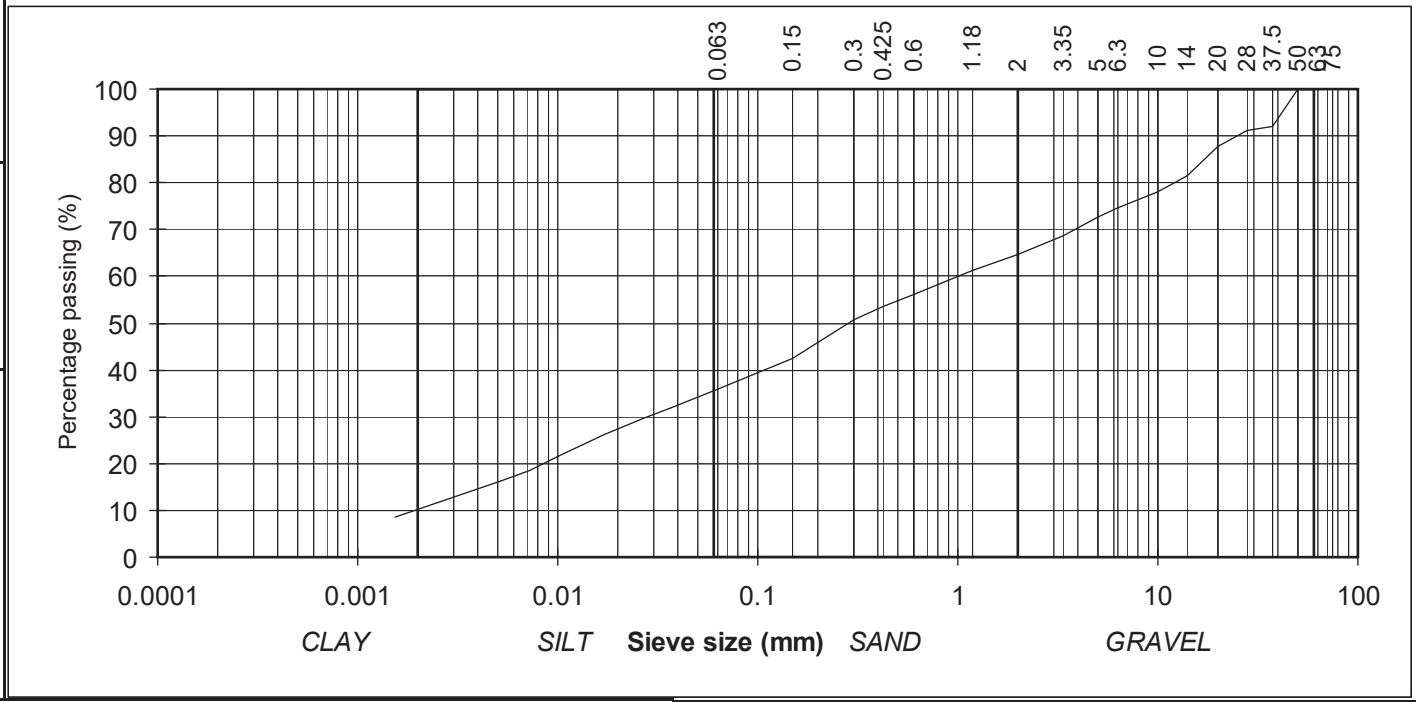
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	92	
28	91	
20	88	
14	82	
10	78	
6.3	75	
5	73	
3.35	69	
2	65	
1.18	61	SAND
0.6	56	
0.425	54	
0.3	51	
0.15	42	
0.063	36	SILT/CLAY
0.037	32	
0.027	30	
0.017	26	
0.010	22	
0.007	18	
0.005	16	
0.002	8	

Contract No: 18963 Report No. R72469
Contract: GCTP Phase 3 - Contact 1
BH/TP: SW3/02
Sample No. AA46070 Lab. Sample No. A16/1922
Sample Type: B
Depth (m) 1.00 Customer: Galway Co.Co.
Date Received 16-05-16 Date Testing started 27-05-16
Description: Light brown slightly sandy, gravelly, SILT/CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	14-06-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

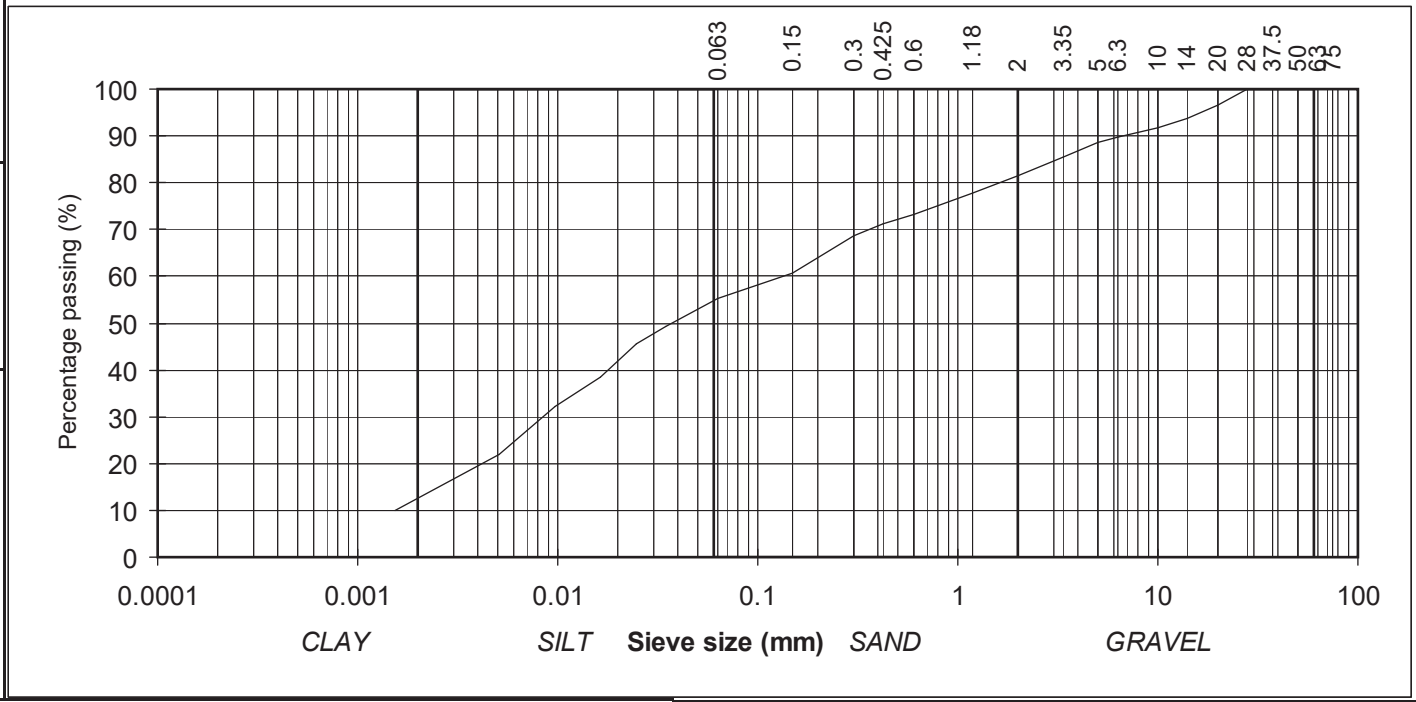
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	97	
14	94	
10	92	
6.3	90	
5	89	
3.35	86	
2	82	
1.18	78	SAND
0.6	73	
0.425	71	
0.3	69	
0.15	61	
0.063	55	SILT/CLAY
0.034	49	
0.025	46	
0.016	38	
0.010	32	
0.007	27	
0.005	22	
0.002	10	

Contract No: 18963 Report No. R72470
Contract: GCTP Phase 3 - Contact 1
TP: TP3/36
Sample No. AA43065 Lab. Sample No. A16/1923
Sample Type: B
Depth (m) 0.40 Customer: Galway Co.Co.
Date Received 16-05-16 Date Testing started 27-05-16
Description: Brown slightly sandy, slightly gravelly, SILT/CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	14-06-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

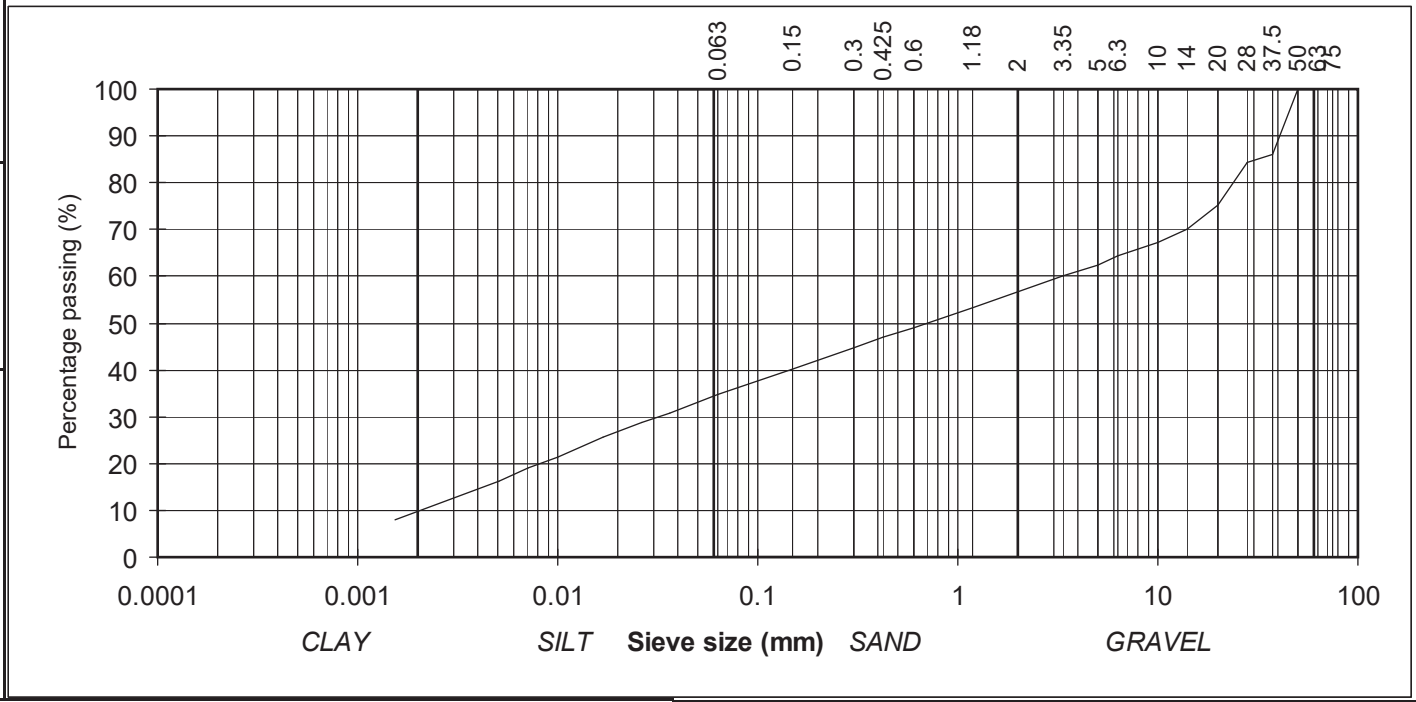
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	86	
28	84	
20	75	
14	70	
10	67	
6.3	64	
5	62	
3.35	60	
2	57	
1.18	53	SAND
0.6	49	
0.425	47	
0.3	45	
0.15	40	
0.063	35	SILT/CLAY
0.036	31	
0.026	29	
0.017	26	
0.010	21	
0.007	19	
0.005	16	
0.002	8	

Contract No: 18963 Report No. R72531
Contract: GCTP Phase 3 - Contact 1
TP: TP3/36
Sample No. AA43067 Lab. Sample No. A16/1925
Sample Type: B
Depth (m) 0.80 Customer: Galway Co.Co.
Date Received 16-05-16 Date Testing started 27-05-16
Description: Brown slightly sandy, gravelly, SILT/CLAY

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	14-06-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

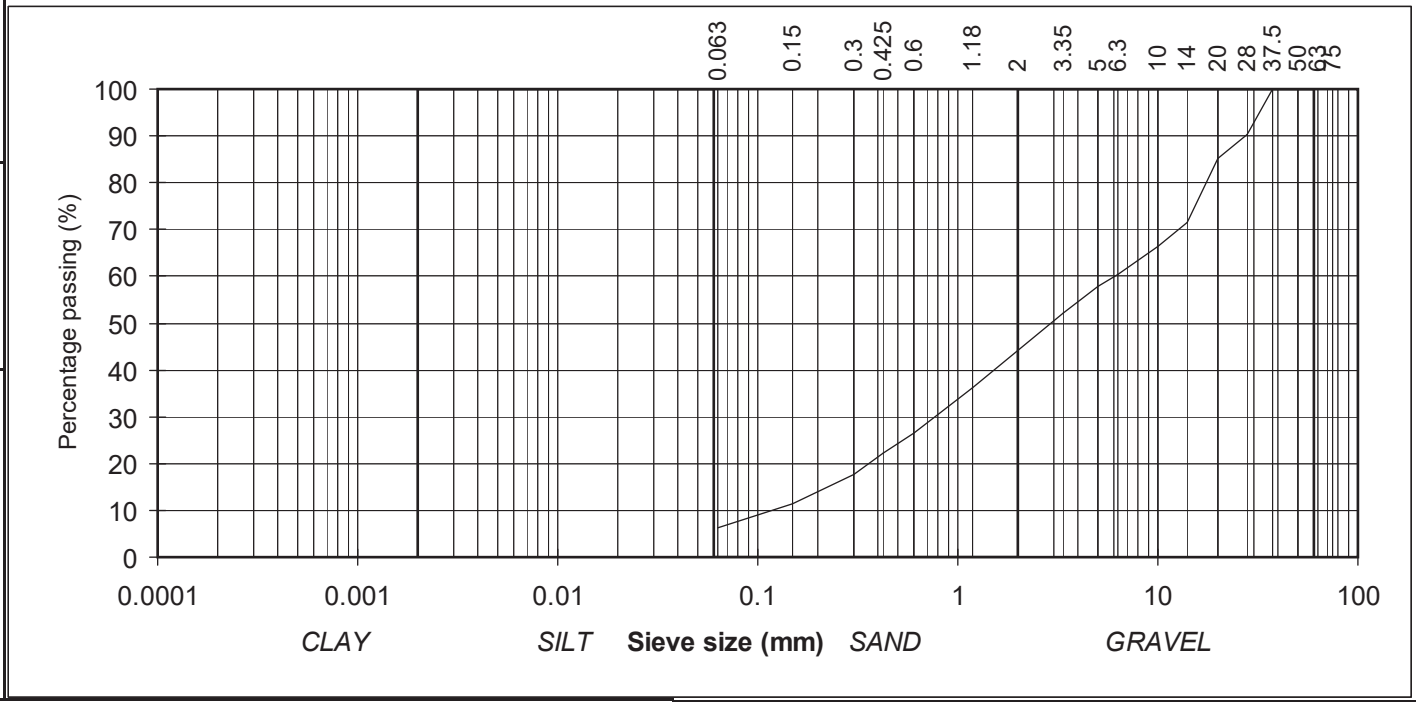
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	90	
20	85	
14	72	
10	66	
6.3	60	
5	58	
3.35	52	
2	44	
1.18	36	SAND
0.6	27	
0.425	22	
0.3	18	
0.15	11	
0.063	6	SILT/CLAY

Contract No: 18963 Report No. R72467
Contract: GCTP Phase 3 - Contact 1
TP: TP3/37
Sample No. AA49488 Lab. Sample No. A16/1927
Sample Type: B
Depth (m) 0.50 Customer: Galway Co.Co.
Date Received 16-05-16 Date Testing started 27-05-16
Description: Dark brown clayey/silty, very sandy, GRAVEL

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

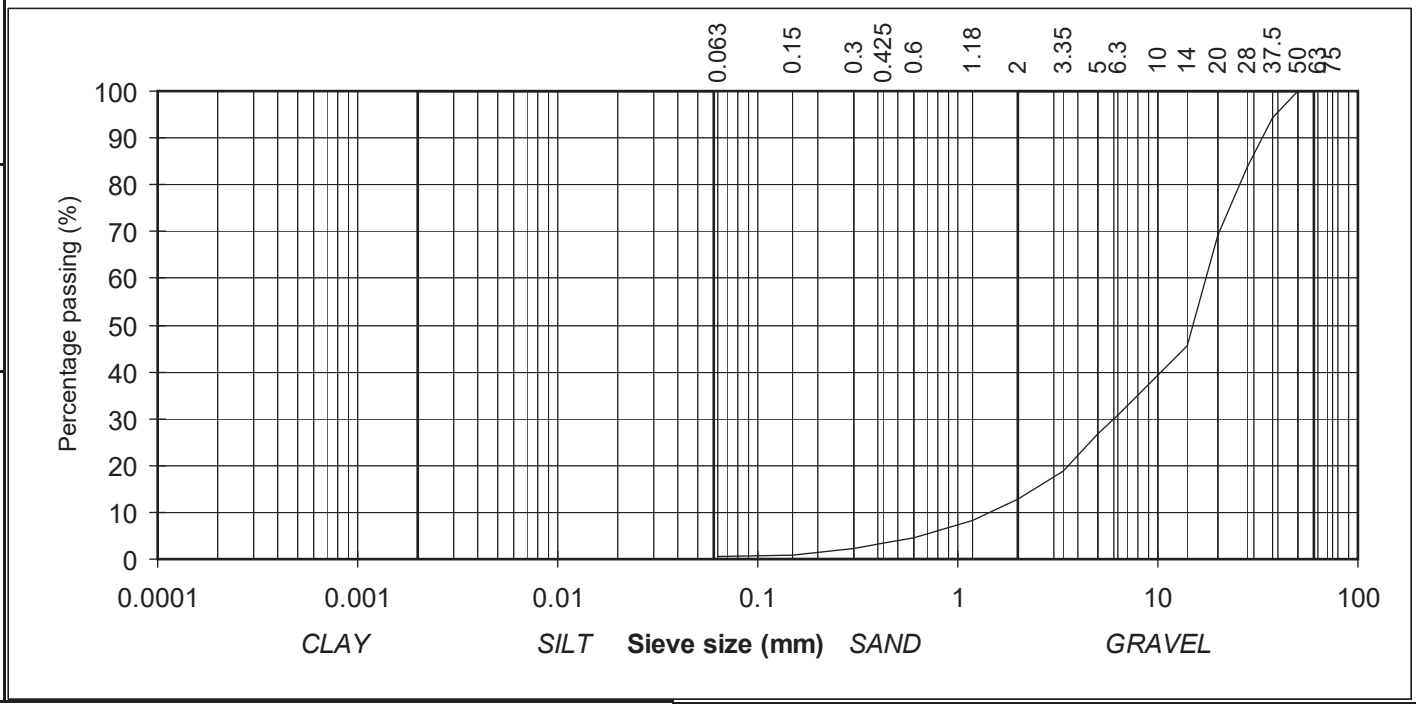
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	94	
28	84	
20	69	
14	46	
10	39	
6.3	31	
5	27	
3.35	19	
2	13	
1.18	8	SAND
0.6	4	
0.425	3	
0.3	2	
0.15	1	
0.063	1	SILT/CLAY

Contract No: 18963 Report No. R72471
Contract: GCTP Phase 3 - Contact 1
TP: TP3/39
Sample No. AA49491 Lab. Sample No. A16/1929
Sample Type: B
Depth (m) 0.50 Customer: Galway Co.Co.
Date Received 16-05-16 Date Testing started 27-05-16
Description: Dark brown slightly clayey/silty, sandy, GRAVEL

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

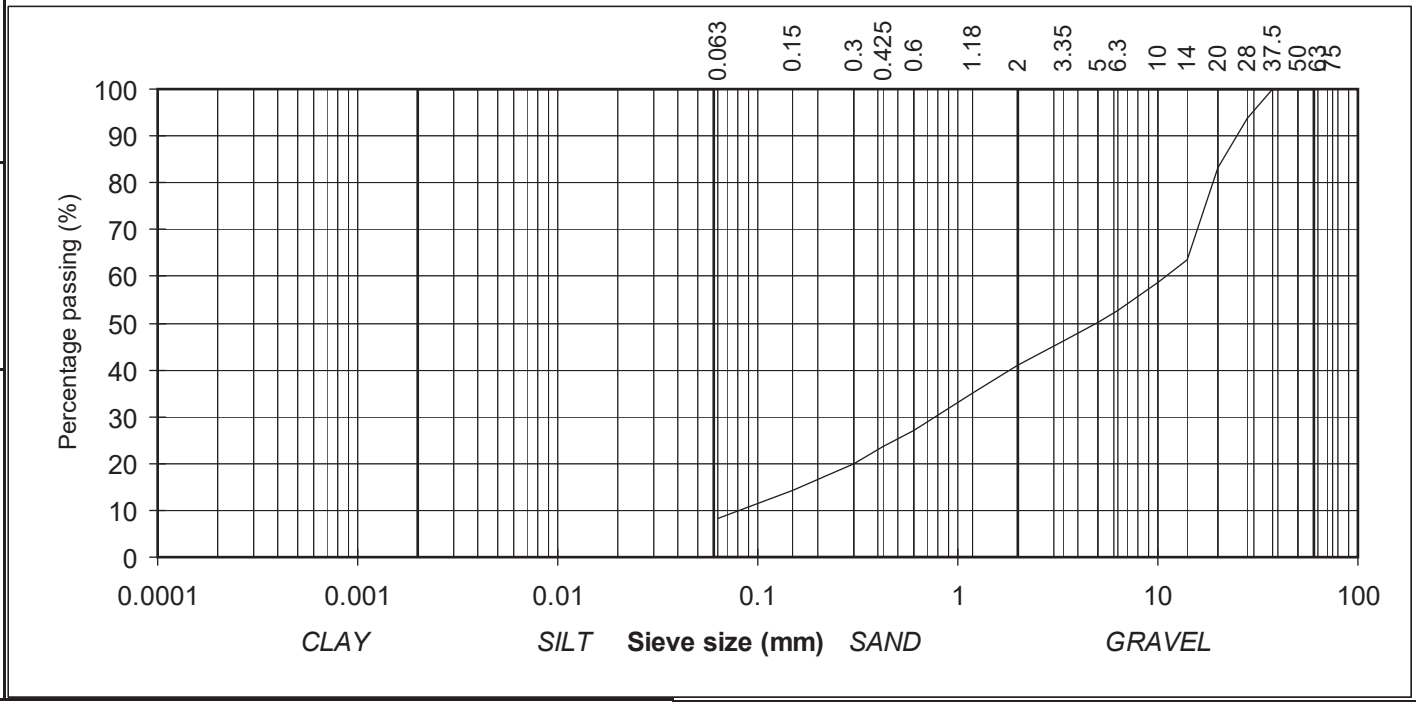
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	94	
20	83	
14	63	
10	59	
6.3	53	
5	50	
3.35	46	
2	41	
1.18	35	SAND
0.6	27	
0.425	24	
0.3	20	
0.15	14	
0.063	8	SILT/CLAY

Contract No: 18963 Report No. R72620
Contract: GCTP Phase 3 - Contact 1
TP: TP3/40
Sample No. AA49490 Lab. Sample No. A16/1931
Sample Type: B
Depth (m) 0.30 Customer: Galway Co.Co.
Date Received 10-05-16 Date Testing started 27-05-16
Description: Dark brown clayey/silty, very sandy, GRAVEL

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	14-06-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

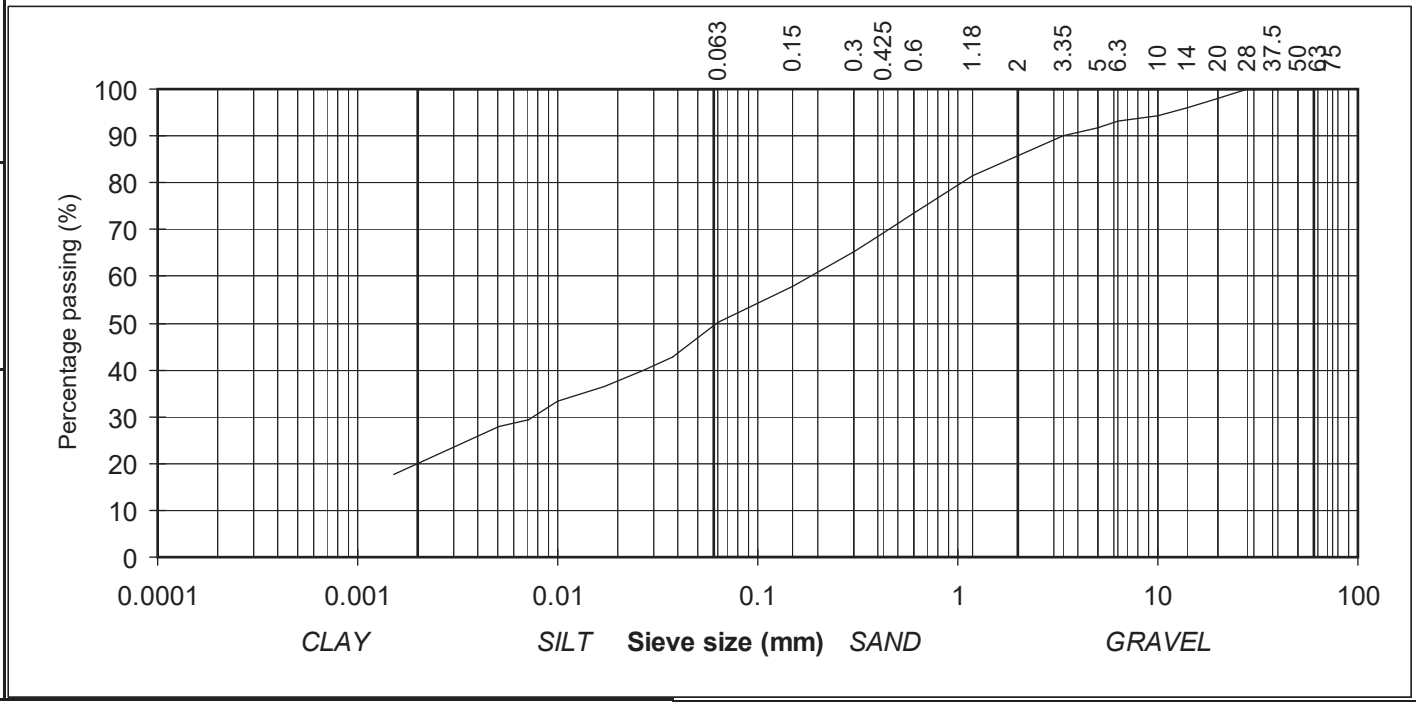
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	98	
14	96	
10	94	
6.3	93	
5	92	
3.35	90	
2	86	
1.18	82	SAND
0.6	74	
0.425	69	
0.3	65	
0.15	58	
0.063	50	SILT/CLAY
0.037	43	
0.027	40	
0.017	37	
0.010	33	
0.007	29	
0.005	28	
0.002	18	

Contract No: 18963 Report No. R72621
Contract: GCTP Phase 3 - Contact 1
TP: TP3/41
Sample No. AA43057 Lab. Sample No. A16/1932
Sample Type: B
Depth (m) 0.50 Customer: Galway Co.Co.
Date Received 10-05-16 Date Testing started 27-05-16
Description: Orange/Brown sandy, slightly gravelly, CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

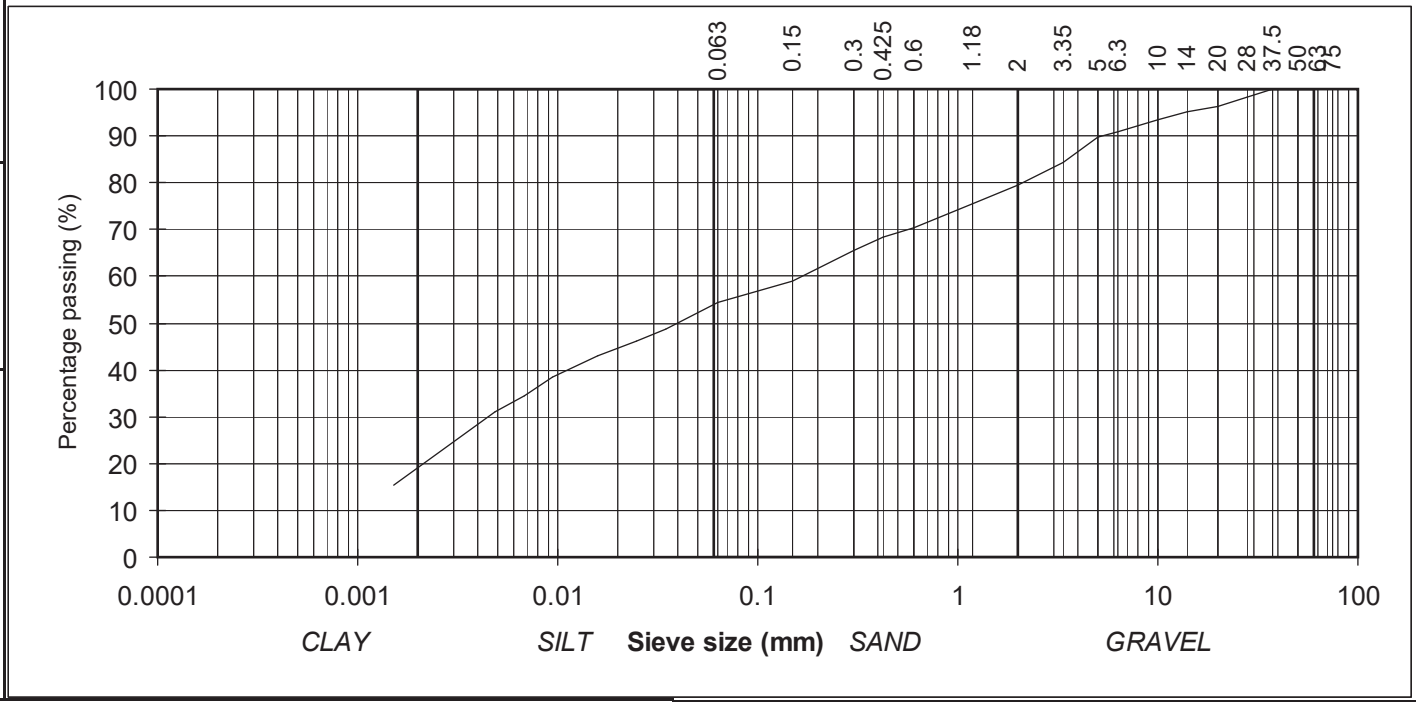
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	98	
20	96	
14	95	
10	93	
6.3	91	
5	90	
3.35	84	
2	80	
1.18	75	SAND
0.6	70	
0.425	68	
0.3	66	
0.15	59	
0.063	54	SILT/CLAY
0.034	49	
0.025	46	
0.016	43	
0.009	38	
0.007	34	
0.005	31	
0.002	15	

Contract No: 18963 Report No. R72472
Contract: GCTP Phase 3 - Contact 1
TP: TP3/42
Sample No. AA43060 Lab. Sample No. A16/1935
Sample Type: B
Depth (m) 0.80 Customer: Galway Co.Co.
Date Received 16-05-16 Date Testing started 27-05-16
Description: Light brown slightly sandy, slightly gravelly, CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

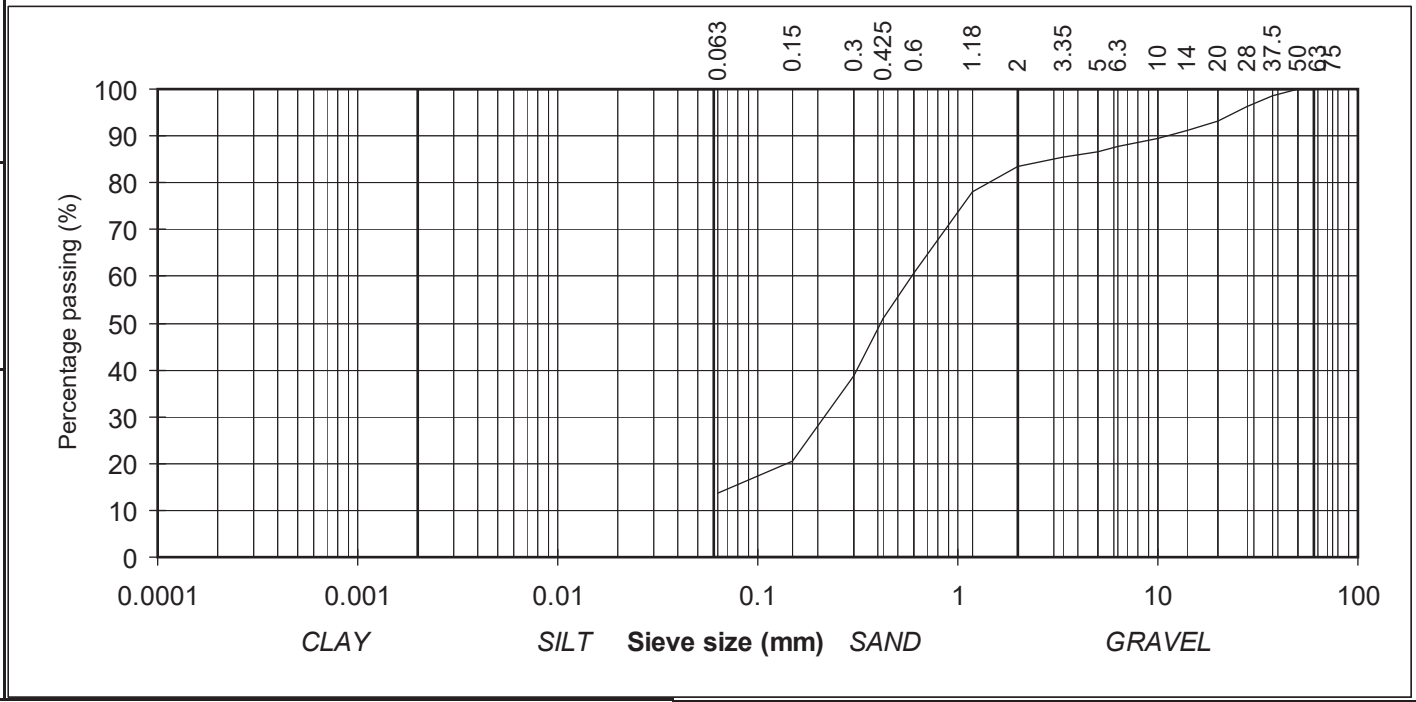
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	99	
28	96	
20	93	
14	91	
10	89	
6.3	88	
5	87	
3.35	85	
2	84	
1.18	78	SAND
0.6	61	
0.425	51	
0.3	39	
0.15	21	
0.063	14	SILT/CLAY

Contract No: 18963 Report No. R72532
Contract: GCTP Phase 3 - Contact 1
TP: TP3/42
Sample No. AA43062 Lab. Sample No. A16/1937
Sample Type: B
Depth (m) 1.50 Customer: Galway Co.Co.
Date Received 16-05-16 Date Testing started 27-05-16
Description: Brown clayey/silty, gravelly, SAND

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

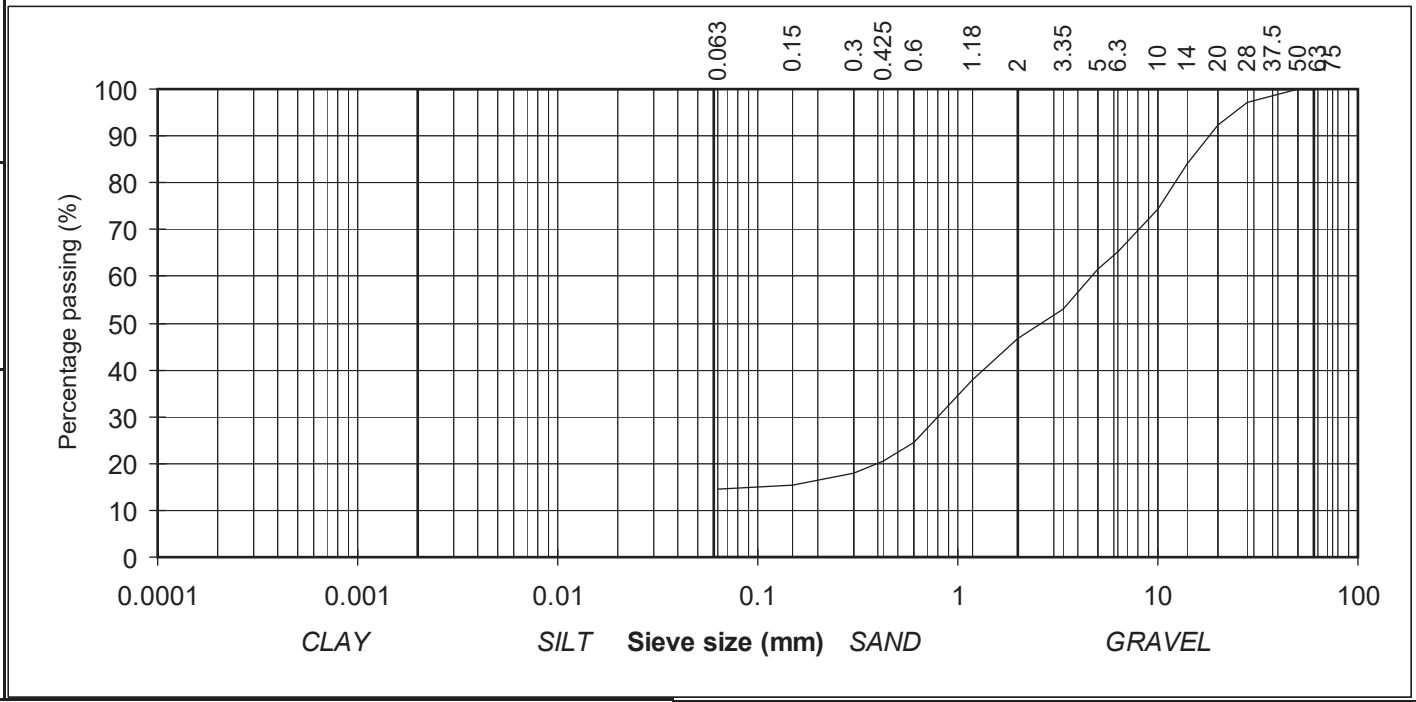
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	99	
28	97	
20	92	
14	84	
10	74	
6.3	65	
5	61	
3.35	53	
2	47	
1.18	38	SAND
0.6	25	
0.425	21	
0.3	18	
0.15	15	
0.063	14	SILT/CLAY

Contract No: 18963 Report No. R72473
Contract: GCTP Phase 3 - Contact 1
TP: TP3/42
Sample No. AA43064 Lab. Sample No. A16/1939
Sample Type: B
Depth (m) 3.50 Customer: Galway Co.Co.
Date Received 16-05-16 Date Testing started 27-05-16
Description: Brown clayey/silty, very sandy, GRAVEL

Remarks



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Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

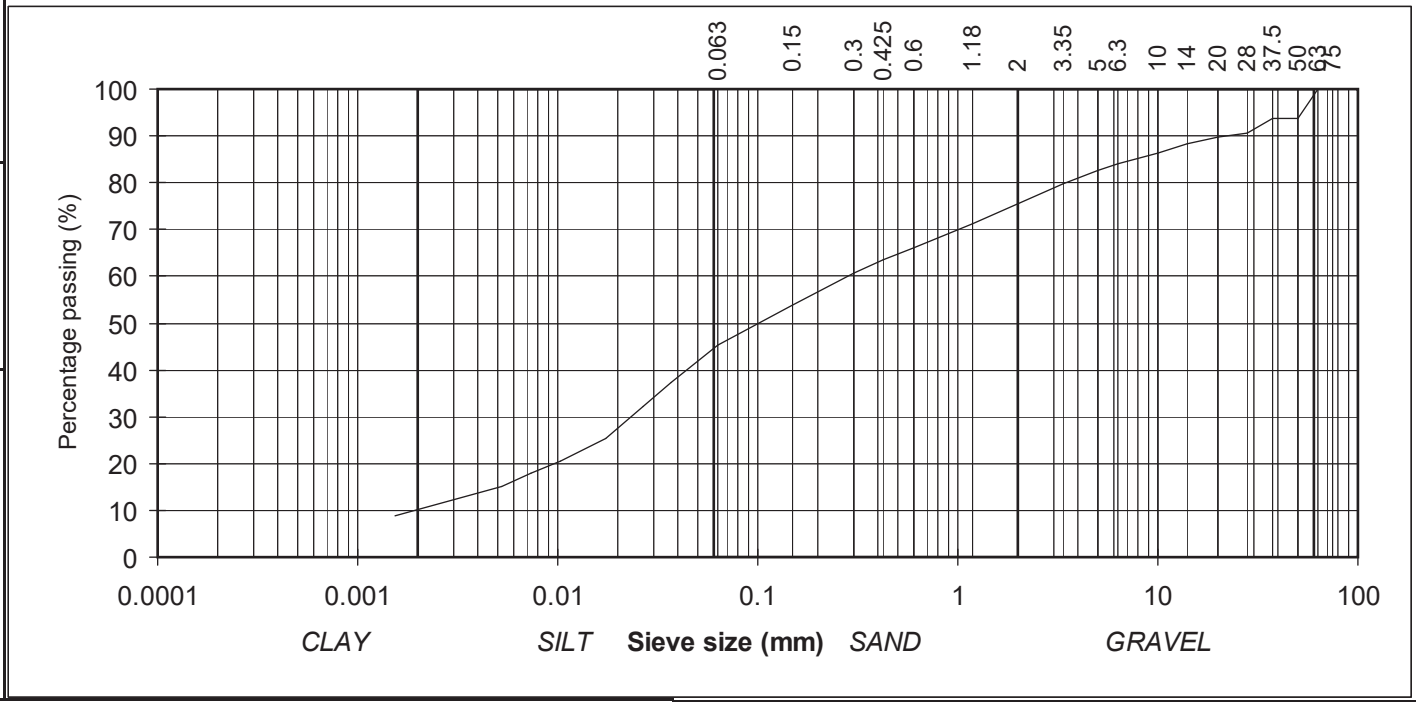
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	94	GRAVEL
37.5	94	
28	91	
20	90	
14	88	
10	86	
6.3	84	
5	83	
3.35	80	
2	76	
1.18	71	SAND
0.6	66	
0.425	63	
0.3	61	
0.15	54	
0.063	45	SILT/CLAY
0.037	37	
0.027	32	
0.017	25	
0.010	21	
0.007	18	
0.005	15	
0.002	9	

Contract No: 18963 Report No. R72687
Contract: GCTP Phase 3 - Contact 1
TP: TP3/44
Sample No. AA49493 Lab. Sample No. A16/1940
Sample Type: B
Depth (m) 1.00 Customer: Galway Co.Co.
Date Received 10-05-16 Date Testing started 27-05-16
Description: Brown slightly sandy, slightly gravelly, SILT/CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

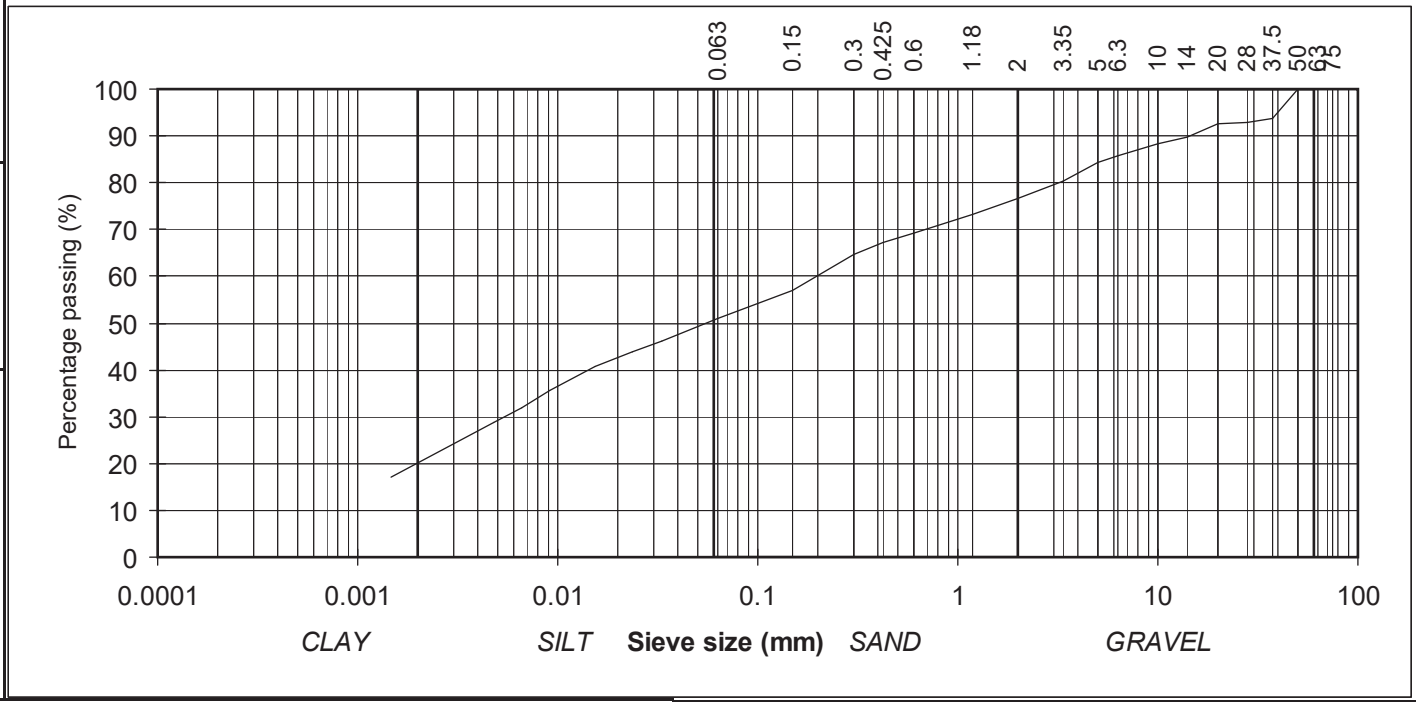
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	94	
28	93	
20	93	
14	90	
10	88	
6.3	86	
5	84	
3.35	80	
2	77	
1.18	73	SAND
0.6	69	
0.425	67	
0.3	65	
0.15	57	
0.063	51	SILT/CLAY
0.033	46	
0.024	44	
0.015	41	
0.009	36	
0.007	32	
0.005	29	
0.001	17	

Contract No: 18963 Report No. R72474
Contract: GCTP Phase 3 - Contact 1
TP: TP3/44
Sample No. AA49496 Lab. Sample No. A16/1943
Sample Type: B
Depth (m) 2.00 Customer: Galway Co.Co.
Date Received 16-05-16 Date Testing started 27-05-16
Description: Light brown/grey slightly sandy, slightly gravelly, CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	14-06-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

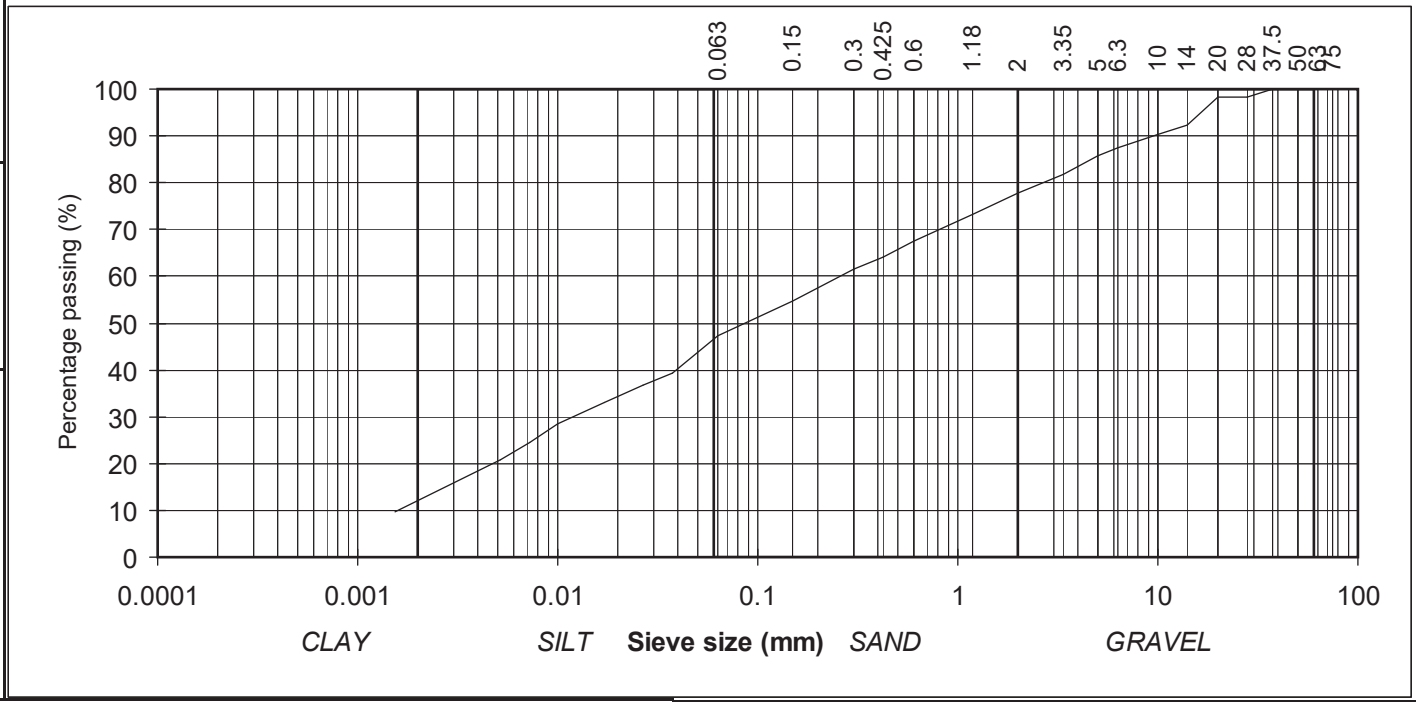
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	98	
20	98	
14	92	
10	90	
6.3	87	
5	86	
3.35	82	
2	78	
1.18	73	SAND
0.6	68	
0.425	64	
0.3	62	
0.15	55	
0.063	47	SILT/CLAY
0.037	39	
0.027	37	
0.017	33	
0.010	28	
0.007	24	
0.005	21	
0.002	10	

Contract No: 18963 Report No. R72622
Contract: GCTP Phase 3 - Contact 1
TP: TP3/45
Sample No. AA43051 Lab. Sample No. A16/1946
Sample Type: B
Depth (m) 1.50 Customer: Galway Co.Co.
Date Received 10-05-16 Date Testing started 27-05-16
Description: Brown slightly sandy, slightly gravelly, SILT/CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	14-06-16	1 of 1

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

TEST REPORT
Determination of Particle Size Distribution

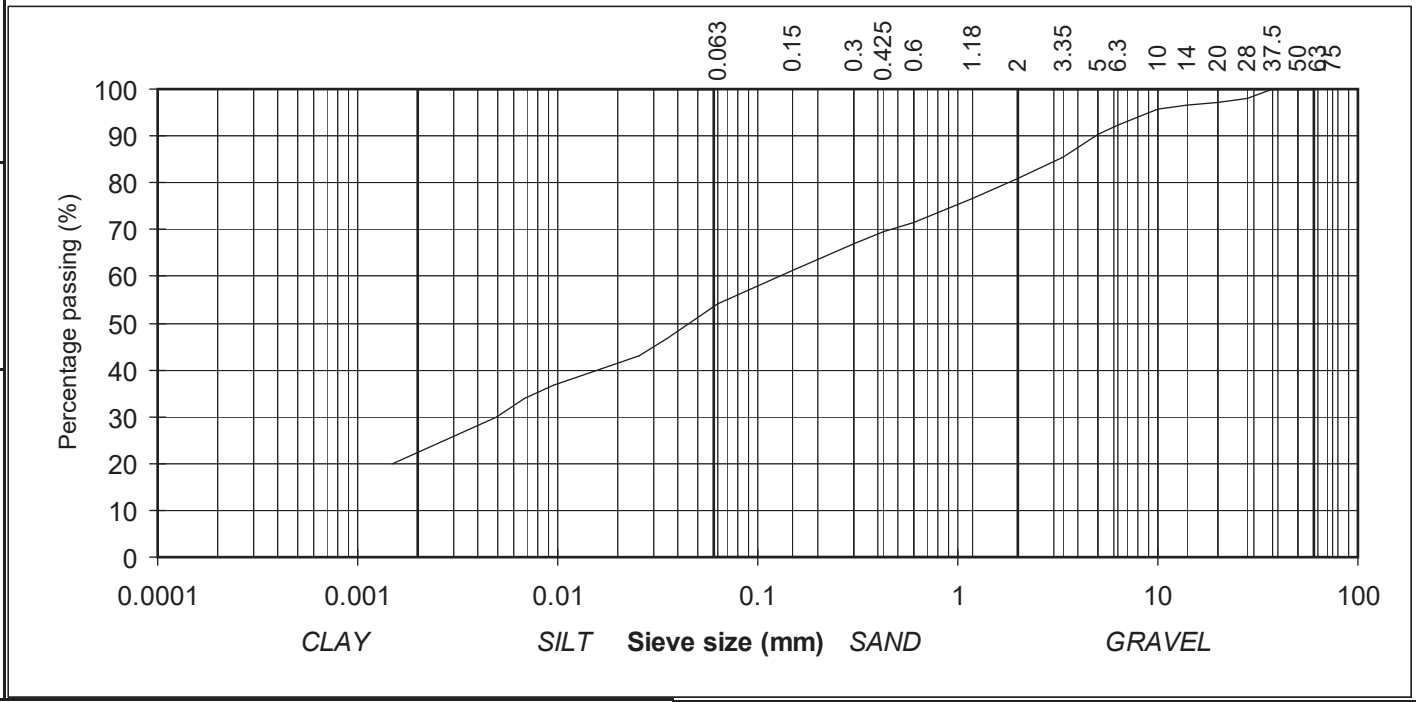
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	98	
20	97	
14	97	
10	96	
6.3	92	
5	90	
3.35	86	
2	81	
1.18	77	SAND
0.6	72	
0.425	69	
0.3	67	
0.15	61	
0.063	54	SILT/CLAY
0.035	47	
0.025	43	
0.016	40	
0.010	37	
0.007	34	
0.005	30	
0.001	20	

Contract No: 18963 Report No. R72688
Contract: GCTP Phase 3 - Contact 1
TP: TP3/45
Sample No. AA43054 Lab. Sample No. A16/1949
Sample Type: B
Depth (m) 2.50 Customer: Galway Co.Co.
Date Received 10-05-16 Date Testing started 27-05-16
Description: Light brown/grey slightly sandy, slightly gravelly, SILT/CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

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

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

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:	B
Lab Sample No.	A16/1934
Source (if applicable)	unknown
Material Type (if applicable):	B
Sample Received:	12-05-16
Date Tested:	30-05-16
Sample Cert:	N/A
Moisture Content (%):	22
% Particles > 20mm (By dry mass):	1.2
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)

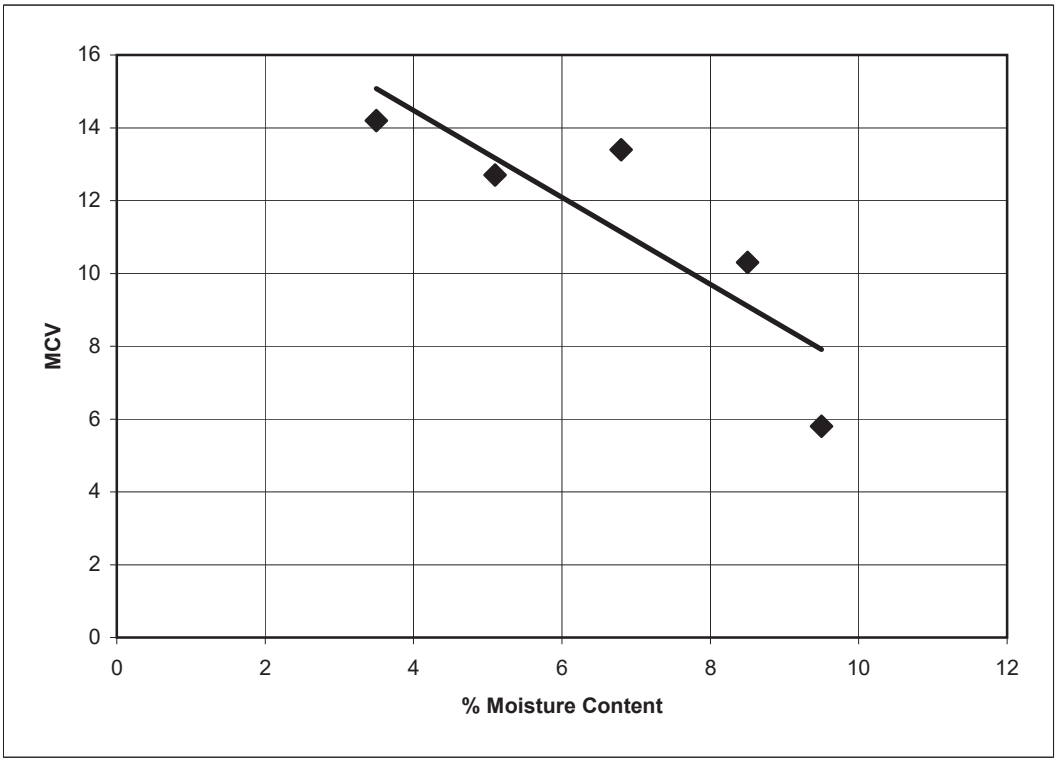
IGSL Ltd Materials Laboratory

Approved by	Date	Page
H Byrne	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)

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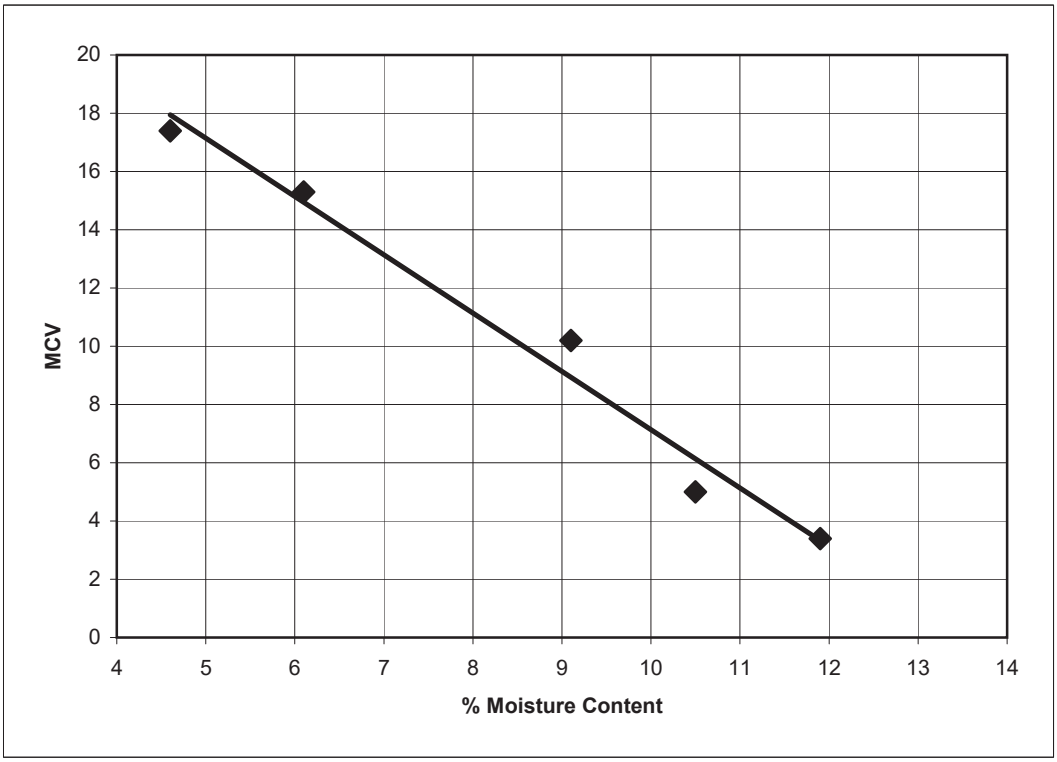
IGSL Ltd
Materials Laboratory
M7 Business Park
Naas Co.Kildare
045 846176

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

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

Report No.	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)

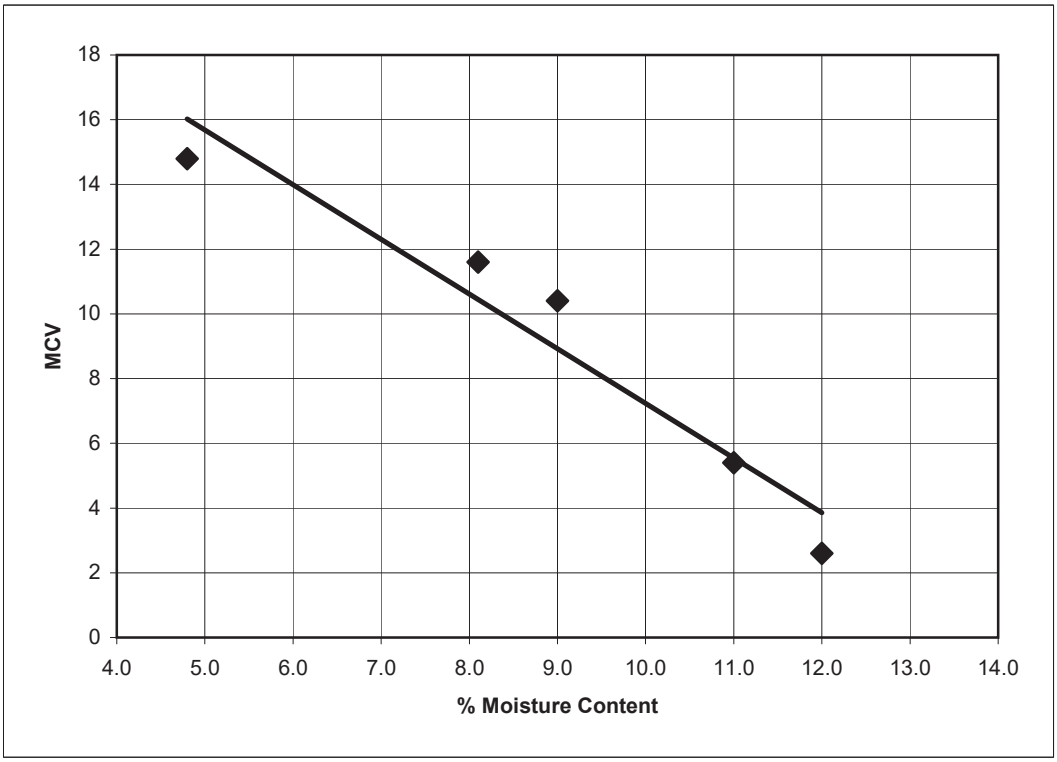
IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
H Byrne	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.	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)

IGSL Ltd Materials Laboratory	Approved by	Date	Page No.
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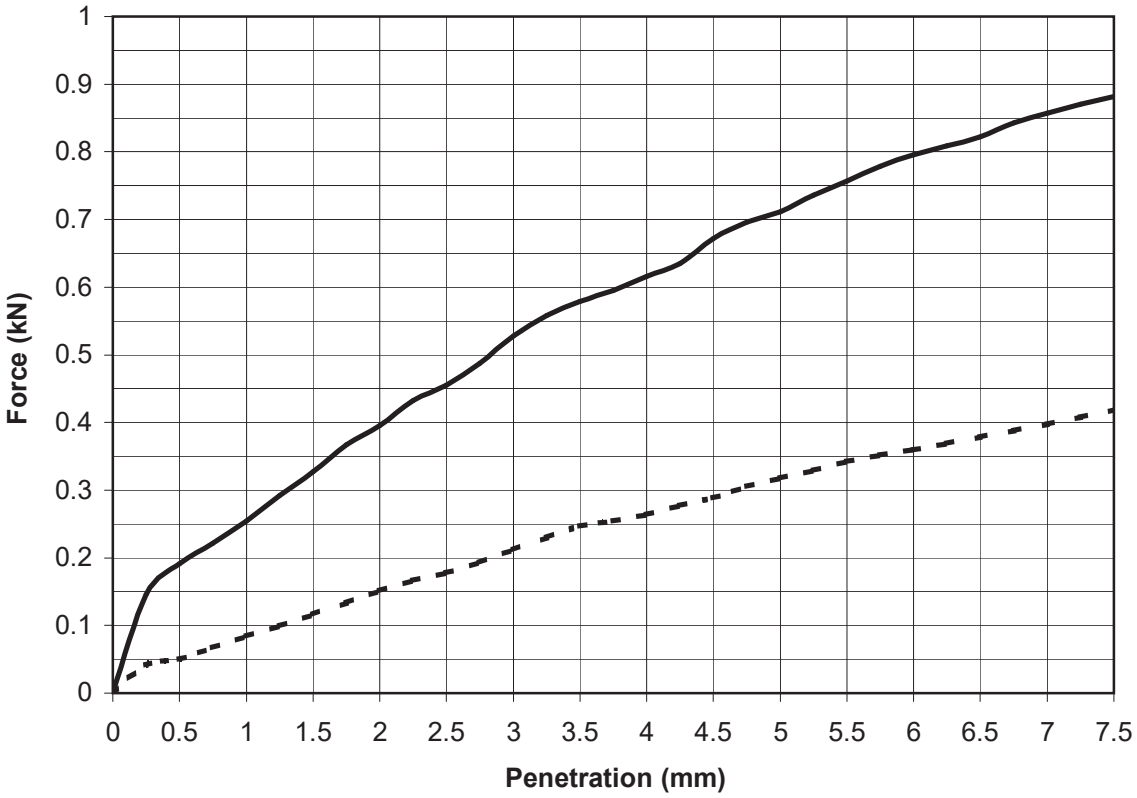
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)

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

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1337

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: ———— Top ---------- Base

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

Test Result	Top	Base
CBR %	**4**	**2**
Moisture Content %	10	11

Persons authorized to approve reports

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

IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
H Byrne	09-06-16	1 of 1

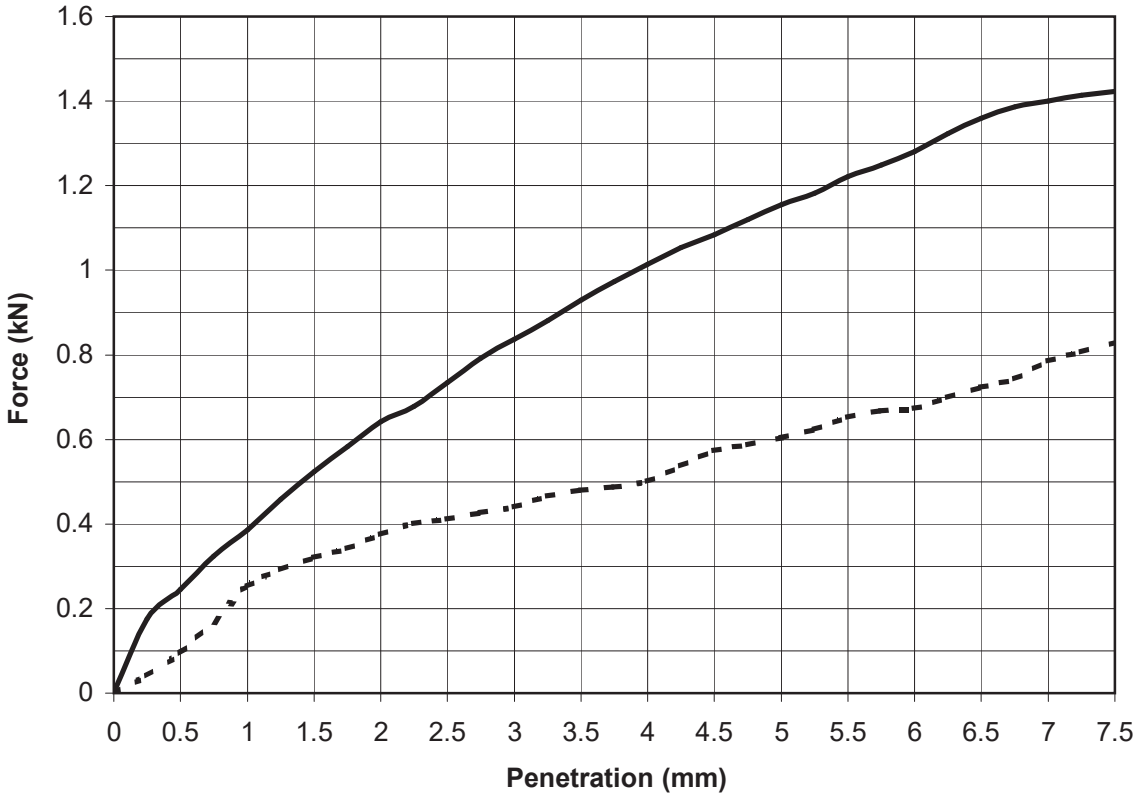
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

TEST REPORT
Determination of California Bearing Ratio (CBR)

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

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

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: ———— Top ---------- Base

Description:	Light brown/grey slightly sandy, slightly gravelly, SILT/CLAY		
Initial Condition:	Soaked 4 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	Top	Base
CBR %	**5.8**	**3.1**
Moisture Content %	10	11

Persons authorized to approve reports

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

IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
H Byrne	09-06-16	1 of 1

Laboratory Report

2788

GEO Site & Testing Services Ltd

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) Non Accredited Test - @ Non Accredited Test	1
Disposal of Samples on Project	1

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

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.

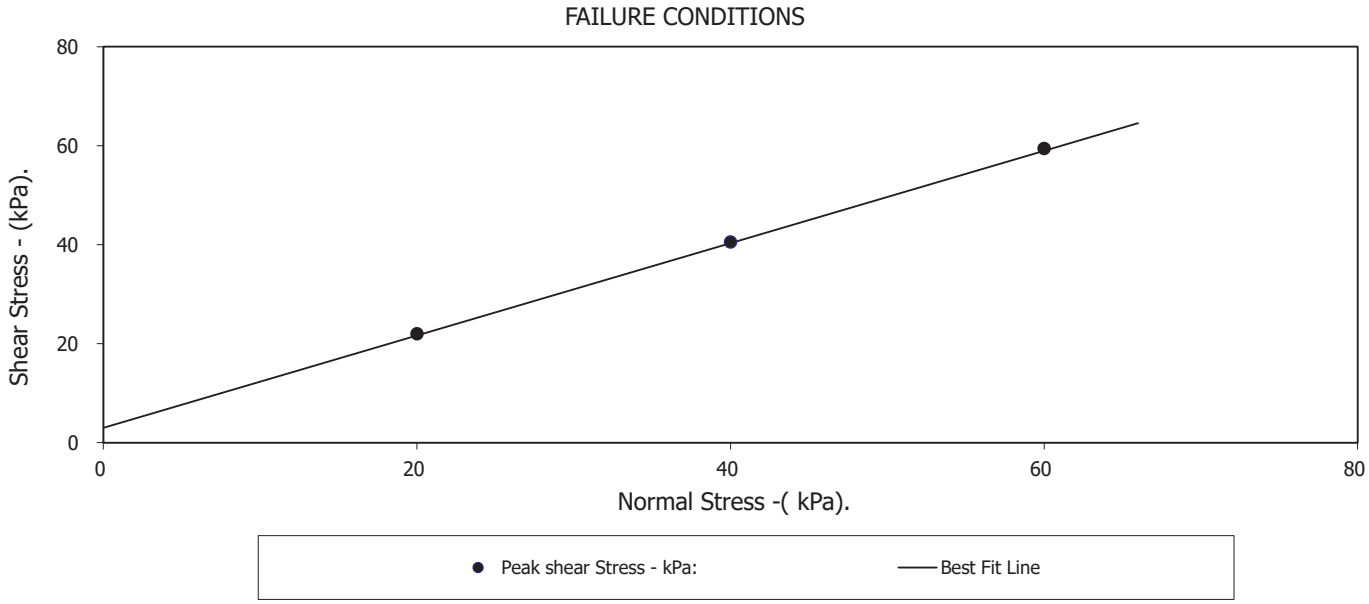
Borehole:	TP3/42	Depth (m) from:	2.50
Sample Number :	A16/1938	Depth (m) to:	2.50

Sample Type:	D
Particle Density - Mg/m3:	2.65 (Assumed)
Specimen Tested:	Submerged, Remoulded material above 2.00mm removed

Sample Description:
Grey brown slightly silty slightly clayey 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:(~~θ~~)	**43.0**
Effective Cohesion - kPa:	**3**



D P Evans 03/06/16
Checked Page 1 by: Date

D P Evans 03/06/16
Approved Page 1 by: Date

Contract No.:
31135

Client Ref Number:
8952

GSTL
GEO SITE & TESTING SERVICES LTD

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

**Sample result from BH3/03 contained in Jones Report 16/12147 featured in Appendix 15

Jones Environmental Laboratory

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

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

IGSL
Unit F
M7 Business Park
Naas
Co Kildare
Ireland

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 :	1

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
JE Job No.: 16/4934

Report : Solid

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

J E Sample No.	1	2	3	4-5	6	7	8	9	10	11	LOD/LOR	Units	Method No.
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			
COC No / misc													
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	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
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			
Chloride #	-	-	47	-	-	-	-	-	-	42	<2	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	-	0.0357	-	0.0341	-	0.0154	-	0.0362	0.0127	0.0072	<0.0015	g/l	TM38/PM20
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

Please see attached notes for all abbreviations and acronyms

Client Name: IGSL
Reference: 18963
Location: GCTP Phane 3 Contract 1 GI
Contact: Darren Keogh
JE Job No.: 16/4934

Report : Solid

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

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 see attached notes for all abbreviations and acronyms		
COC No / misc													
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	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
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	LOD/LOR	Units	Method 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
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

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

J E Sample No.	22	23	24	25	26	27	28	29	30	31	LOD/LOR	Units	Method No.
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			
COC No / misc													
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	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
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			
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

Please see attached notes for all abbreviations and acronyms

Client Name: IGSL
Reference: 18963
Location: GCTP Phane 3 Contract 1 GI
Contact: Darren Keogh
JE Job No.: 16/4934

Report : Solid

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

J E Sample No.	32	33	34	35							LOD/LOR	Units	Method No.
Sample ID	TP3/29	TP3/34	TP3/35	TP3/17									
Depth	1.60-1.80	0.50	0.50	0.50									
COC No / misc													
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									
Date of Receipt	15/02/2016	15/02/2016	15/02/2016	15/02/2016									
Chloride #	53	-	-	-							<2	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.0197	-	-	0.0174							<0.0015	g/l	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

Please see attached notes for all abbreviations and acronyms

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 HCl (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.
B	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
TB	Trip Blank Sample
OC	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

Jones Environmental Laboratory

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

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

IGSL
Unit F
M7 Business Park
Naas
Co Kildare
Ireland

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 :	1

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

Report : Solid

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

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									
COC No / misc												
Containers	J	J	J									
Sample Date	25/02/2016	25/02/2016	25/02/2016									
Sample Type	Soil	Soil	Soil									
Batch Number	1	1	1									
Date of Receipt	26/02/2016	26/02/2016	26/02/2016									
Organic Matter	70.8	30.6	4.9								<0.2	%	TM21/PM24
Loss on Ignition #	79.1	45.2	5.2								<1.0	%	TM22/PM0
pH #	5.50	5.64	8.16								<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

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.

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WATERS

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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

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.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS) accredited - UK.
B	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
TB	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

Jones Environmental Laboratory

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Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

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

IGSL
Unit F
M7 Business Park
Naas
Co Kildare
Ireland

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

Client Name: IGSL
Reference: 18963
Location: GCTP Phase 3
Contact: Darren Keogh
JE Job No.: 16/9137

Report : Solid

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

J E Sample No.	1	2									LOD/LOR	Units	Method No.
Sample ID	BH321	BH321											
Depth	0.5	1.7											
COC No / misc													
Containers	J	J											
Sample Date	16/05/2016	16/05/2016											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	19/05/2016	19/05/2016											
Organic Matter	<0.2	0.3									<0.2	%	TM21/PM24
pH #	8.78	8.56									<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

Client Name: IGSL
Reference: 18963
Location: GCTP Phase 3
Contact: Darren Keogh

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

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
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NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 16/9137

SOILS

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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.

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SURROGATES

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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

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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.
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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

Jones Environmental Laboratory

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IGSL
Unit F
M7 Business Park
Naas
Co Kildare
Ireland

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 :	1

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

Report : Solid

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

J E Sample No.	1	2									LOD/LOR	Units	Method No.
Sample ID	BH3131	BH3152											
Depth	0.50	0.50											
COC No / misc													
Containers	J	J											
Sample Date	26/04/2016	26/04/2016											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	29/04/2016	29/04/2016											
Organic Matter	0.7	<0.2									<0.2	%	TM21/PM24
pH #	7.97	8.49									<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

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.
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NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 16/8318

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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.
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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: 16/8318

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

Jones Environmental Laboratory

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IGSL
Unit F
M7 Business Park
Naas
Co Kildare
Ireland

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 :	1

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
Reference: 18963
Location:
Contact: Darren Keogh
JE Job No.: 16/10473

Report : Solid

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

J E Sample No.	1	2	3	4	5	6	7				LOD/LOR	Units	Method No.
Sample ID	WS3/01	WS3/02	WS3/02	WS3/02	WS3/03	WS3/04	WS3/04						
Depth	0.40	0.80	1.20	2.30	0.60	0.40	1.00						
COC No / misc													
Containers	T	T	T	T	T	T	T						
Sample Date	<>	<>	<>	<>	<>	<>	<>						
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil						
Batch Number	1	1	1	1	1	1	1						
Date of Receipt	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016						
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

Please see attached notes for all abbreviations and acronyms

Client Name: IGSL

Matrix : Solid

Reference: 18963

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

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JE Job No.: 16/10473

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OC	Outside Calibration Range

JE Job No: 16/10473

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

Jones Environmental Laboratory

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

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

IGSL
Unit F
M7 Business Park
Naas
Co Kildare
Ireland

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 :	1

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
JE Job No.: 16/9709

Report : Solid

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

J E Sample No.	1	2											
Sample ID	A16/1940/TP2/44	A16/1946/TP3/45											
Depth	1.0	1.5											
COC No / misc													
Containers	J	J											
Sample Date	27/05/2016	27/05/2016											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	01/06/2016	01/06/2016											
Organic Matter	0.3	0.3										<0.2	%	TM21/PM24
pH #	8.72	8.35										<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

Client Name: IGSL
Reference: 18963
Location: GCTP Phase 3
Contact: Darren Keogh

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

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

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 HCl (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.
B	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
TB	Trip Blank Sample
OC	Outside Calibration Range

JE Job No: 16/9709

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

Jones Environmental Laboratory

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

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

IGSL
Unit F
M7 Business Park
Naas
Co Kildare
Ireland

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

Report : Solid

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

J E Sample No.	1-2	3									LOD/LOR	Units	Method No.
Sample ID	TP3/20	BH3/03											
Depth	1.0	0.5											
COC No / misc													
Containers	V J	J											
Sample Date	25/07/2016	25/07/2016											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	26/07/2016	26/07/2016											
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 #	<0.04	-									<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.09	-									<0.03	mg/kg	TM4/PM8
Anthracene #	0.04	-									<0.04	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	mg/kg	TM5/PM8
C8-C40 Mineral Oil (Calculation)	39	-									<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

Please see attached notes for all abbreviations and acronyms

Client Name: IGSL
Reference:
Location:
Contact: Darren Keogh
JE Job No.: 16/12147

Report : Solid

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

J E Sample No.	1-2	3									LOD/LOR	Units	Method No.
Sample ID	TP3/20	BH3/03											
Depth	1.0	0.5											
COC No / misc													
Containers	V J	J											
Sample Date	25/07/2016	25/07/2016											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	26/07/2016	26/07/2016											
Ethylbenzene #	<5	-									<5	ug/kg	TM31/PM12
m/p-Xylene #	<5	-									<5	ug/kg	TM31/PM12
o-Xylene #	<5	-									<5	ug/kg	TM31/PM12
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 #	<5	-									<5	ug/kg	TM17/PM8
PCB 180 #	<5	-									<5	ug/kg	TM17/PM8
Total 7 PCBs #	<35	-									<35	ug/kg	TM17/PM8
Natural Moisture Content	10.2	412.7									<0.1	%	PM4/PM0
% Dry Matter 105°C	77.8	-									<0.1	%	NONE/PM4
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
Mass of raw test portion	0.1156	-										kg	NONE/PM17
Mass of dried test portion	0.09	-										kg	NONE/PM17

Please see attached notes for all abbreviations and acronyms

Client Name: IGSL
Reference:
Location:
Contact: Darren Keogh
JE Job No.: 16/12147

Report : CEN 10:1 1 Batch

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

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1-2												
Sample ID	TP3/20												
Depth	1.0												
COC No / misc													
Containers	V J												
Sample Date	25/07/2016												
Sample Type	Soil												
Batch Number	1												
Date of Receipt	26/07/2016												
											LOD/LOR	Units	Method 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	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)#	0.05										<0.03	mg/kg	TM30/PM17
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	<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#	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	0.874											l	NONE/PM17
Eluate Volume	0.8											l	NONE/PM17
Dissolved Organic Carbon	60										<20	mg/kg	TM60/PM0
Total Dissolved Solids#	4458										<350	mg/kg	TM20/PM0

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

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.

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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 HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

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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.

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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.
B	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
TB	Trip Blank Sample
OC	Outside Calibration Range

JE Job No: 16/12147

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

JE Job No: 16/12147

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 (Ion-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

JE Job No: 16/12147

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	

Jones Environmental Laboratory

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

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

IGSL
Unit F
M7 Business Park
Naas
Co Kildare
Ireland

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 :	1

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

Client Name: IGSL
Reference: N6 Galway
Location:
Contact: Darren Keogh
JE Job No.: 16/6459

Report : Solid

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

J E Sample No.	1										Please see attached notes for all abbreviations and acronyms		
Sample ID	BH 3/30												
Depth	0.50												
COC No / misc													
Containers	T												
Sample Date	01/03/2016												
Sample Type	Soil												
Batch Number	1												
Date of Receipt	17/03/2016												
											LOD/LOR	Units	Method 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										<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
PAH 17 Total	<0.64										<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05										<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02										<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	110										<0	%	TM4/PM8
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

Client Name: IGSL
Reference: N6 Galway
Location:
Contact: Darren Keogh
JE Job No.: 16/6459

Report : Solid

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

J E Sample No.	1												
Sample ID	BH 3/30												
Depth	0.50												
COC No / misc													
Containers	T												
Sample Date	01/03/2016												
Sample Type	Soil												
Batch Number	1												
Date of Receipt	17/03/2016												

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method 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
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 #	<5										<5	ug/kg	TM17/PM8
PCB 180 #	<5										<5	ug/kg	TM17/PM8
Total 7 PCBs #	<35										<35	ug/kg	TM17/PM8
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
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

Client Name: IGSL
Reference: N6 Galway
Location:
Contact: Darren Keogh
JE Job No.: 16/6459

Report : CEN 10:1 1 Batch

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

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1												
Sample ID	BH 3/30												
Depth	0.50												
COC No / misc													
Containers	T												
Sample Date	01/03/2016												
Sample Type	Soil												
Batch Number	1												
Date of Receipt	17/03/2016												
											LOD/LOR	Units	Method 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
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	<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
Mass of raw test portion	0.1077											kg	NONE/PM17
Leachant Volume	0.882											l	NONE/PM17
Eluate Volume	0.85											l	NONE/PM17
Dissolved Organic Carbon	30										<20	mg/kg	TM60/PM0
Total Dissolved Solids #	2920										<100	mg/kg	TM20/PM0

Mass of sample taken (kg)	0.1077	Dry Matter Content Ratio (%) =	83.4
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	0.882
Particle Size <4mm =	>95%	Eluate Volume (l)	0.85

JEFL Job No	**16/6459**	**Landfill Waste Acceptance Criteria Limits**		
Sample No	**1**			
Client Sample No	**BH 3/30**	**Inert**	**Stable Non-reactive**	**Hazardous**
Depth/Other	**0.50**			
Sample Date	**01/03/2016**			
Batch No	**1**			
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	-	-

Eluate Analysis	**10:1 concn leached**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
	A10			
	mg/kg	**mg/kg**		
Arsenic	<0.025	0.5	2	25
Barium	0.12	20	100	300
Cadmium	<0.005	0.04	1	5
Chromium	0.016	0.5	10	70
Copper	<0.07	2	50	100
Mercury	<0.01	0.01	0.2	2
Molybdenum	0.10	0.5	10	30
Nickel	<0.02	0.4	10	40
Lead	<0.05	0.5	10	50
Antimony	<0.02	0.06	0.7	5
Selenium	<0.03	0.1	0.5	7
Zinc	0.06	4	50	200
Chloride	-	800	15000	25000
Fluoride	<3	10	150	500
Sulphate as SO4	-	1000	20000	50000
Total Dissolved Solids	2920	4000	60000	100000
Phenol	<0.1	1	-	-
Dissolved Organic Carbon	30	500	800	1000

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

Notification of Deviating Samples

Client Name: IGSL
Reference: N6 Galway
Location:
Contact: Darren Keogh

Matrix : Solid

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 HCl (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.
B	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
TB	Trip Blank Sample
OC	Outside Calibration Range

JE Job No: 16/6459

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

JE Job No: 16/6459

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
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-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

JE Job No: 16/6459

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 STRENGTH INDEX TEST DATA

Contract: 18963 - N6 Galway City Transport Project
Date of test: 6/5/16

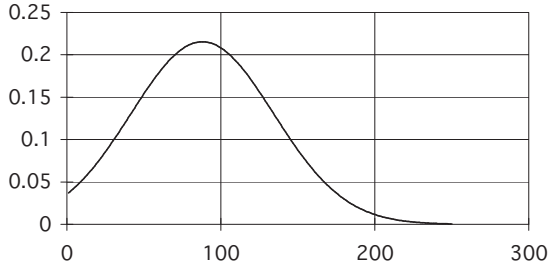
Sample Type: Core
Contract no. 18963

RC No.	Depth m	D (Diameter) mm	P (failure load) kN	F	Is (index strength) Mpa	Is(50) (index strength) Mpa	*UCS 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	//
	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	//
	7.3	78	16.0	1.222	2.63	3.21	64	d	//
BH3/13R	1.5	70	19.0	1.163	3.88	4.51	90	d	//
BH3/16R	3.7	78	12.0	1.222	1.97	2.41	48	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	//

Statistical Summary Data	Is(50)	UCS*
Number of Samples Tested	25	25
Minimum	0.40	8
Average	4.40	88
Maximum	9.24	185
Standard Dev.	2.32	46
Upper 95% Confidence Limit	8.94	178.73
Lower 95% Confidence Limit	-0.14	-2.79

Comments:
*UCS taken as k x Point Load Is(50): k= 20

*UCS Normal Distribution Curve



Abbreviations	
i	irregular
a	axial
b	block
d	diametral

approx. orientation to planes of weakness/bedding

U	unknown
P	perpendicular
//	parallel

POINT LOAD STRENGTH INDEX TEST DATA

Contract: 18963 - N6 Galway City Transport Project
Date of test: 6/5/16

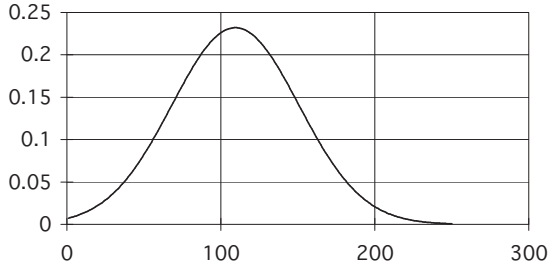
Sample Type: Core
Contract no. 18963

RC No.	Depth m	D (Diameter) mm	P (failure load) kN	F	Is (index strength) Mpa	Is(50) (index strength) Mpa	*UCS 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	//

Statistical Summary Data	Is(50)	UCS*
Number of Samples Tested	24	24
Minimum	1.20	24
Average	5.47	109
Maximum	8.83	177
Standard Dev.	2.06	41
Upper 95% Confidence Limit	9.52	190.31
Lower 95% Confidence Limit	1.43	28.59

Comments:
*UCS taken as k x Point Load Is(50): k= 20

*UCS Normal Distribution Curve



Abbreviations	
i	irregular
a	axial
b	block
d	diametral

approx. orientation to planes of weakness/bedding	
U	unknown
P	perpendicular
//	parallel

POINT LOAD STRENGTH INDEX TEST DATA

Contract: 18963 - N6 Galway City Transport Project
Date of test: 6/5/16

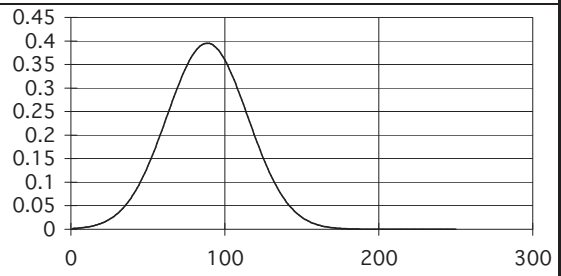
Sample Type: Core
Contract no. 18963

RC No.	Depth m	D (Diameter) mm	P (failure load) kN	F	Is (index strength) Mpa	Is(50) (index strength) Mpa	*UCS MPa	Type	Orienation
BH3/24R	2.0	78	18.0	1.222	2.96	3.61	72	d	//
	6.5	70	31.0	1.163	6.33	7.36	147	d	//
BH3/25R	4.6	78	13.0	1.222	2.14	2.61	52	d	//
	5.6	78	29.0	1.222	4.77	5.82	116	d	//
	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	//
	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	//

Statistical Summary Data	Is(50)	UCS*
Number of Samples Tested	26	26
Minimum	2.01	40
Average	4.43	89
Maximum	7.36	147
Standard Dev.	1.31	26
Upper 95% Confidence Limit	7.00	140.04
Lower 95% Confidence Limit	1.86	37.16

Comments:
*UCS taken as k x Point Load Is(50): k= 20

*UCS Normal Distribution Curve



Abbreviations

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b	block
d	diametral

approx. orientation to planes of weakness/bedding

U	unknown
P	perpendicular
//	parallel

POINT LOAD STRENGTH INDEX TEST DATA

Contract: 18963 - N6 Galway City Transport Project
Date of test: 6/5/16

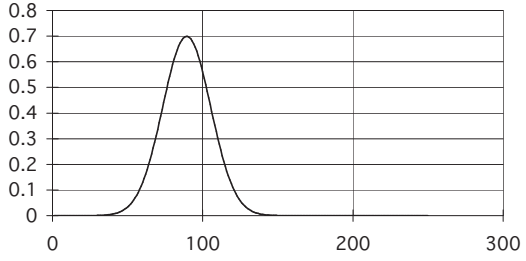
Sample Type: Core
Contract no. 18963

RC No.	Depth m	D (Diameter) mm	P (failure load) kN	F	Is (index strength) Mpa	Is(50) (index strength) Mpa	*UCS MPa	Type	Orienation
BH3/35R	21.7	78	22.0	1.222	3.62	4.42	88	d	//
BH3/36R	2.5	78	18.0	1.222	2.96	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 Summary Data	Is(50)	UCS*
Number of Samples Tested	28	28
Minimum	3.01	60
Average	4.47	89
Maximum	6.22	124
Standard Dev.	0.80	16
Upper 95% Confidence Limit	6.03	120.65
Lower 95% Confidence Limit	2.90	58.04

Comments:
*UCS taken as k x Point Load Is(50): k= 20

*UCS Normal Distribution Curve



Abbreviations	
i	irregular
a	axial
b	block
d	diametral

approx. orientation to planes of weakness/bedding

U	unknown
P	perpendicular
//	parallel

POINT LOAD STRENGTH INDEX TEST DATA

Contract: 18963 - N6 Galway City Transport Project
Date of test: 6/5/16

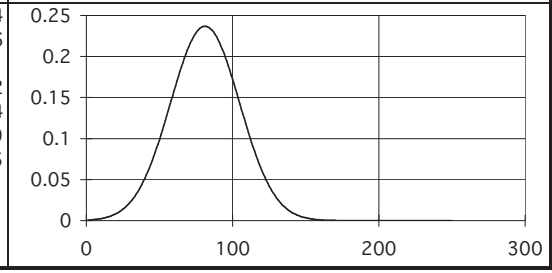
Sample Type: Core
Contract no. 18963

RC No.	Depth m	D (Diameter) mm	P (failure load) kN	F	Is (index strength) Mpa	Is(50) (index strength) Mpa	*UCS MPa	Type	Orienation
BH3/46R	2.6	78	9.0	1.222	1.48	1.81	36	d	//
	5.6	78	19.0	1.222	3.12	3.81	76	d	//
	7.5	78	19.0	1.222	3.12	3.81	76	d	//
	10.7	78	22.0	1.222	3.62	4.42	88	d	//
BH3/47R	6.2	78	24.0	1.222	3.94	4.82	96	d	//
BH3/48R	1.6	78	22.0	1.222	3.62	4.42	88	d	//
	10.0	78	26.0	1.222	4.27	5.22	104	d	//
	15.0	78	10.0	1.222	1.64	2.01	40	d	//
BH3/52R	9.5	78	18.0	1.222	2.96	3.61	72	d	//
	12.5	78	25.0	1.222	4.11	5.02	100	d	//
BH3/53R	8.0	78	21.0	1.222	3.45	4.22	84	d	//
	10.5	78	26.0	1.222	4.27	5.22	104	d	//
BH3/54R	7.1	78	28.0	1.222	4.60	5.62	112	d	//
	9.0	78	14.0	1.222	2.30	2.81	56	d	//

Statistical Summary Data	Is(50)	UCS*
Number of Samples Tested	14	14
Minimum	1.81	36
Average	4.06	81
Maximum	5.62	112
Standard Dev.	1.18	24
Upper 95% Confidence Limit	6.37	127.39
Lower 95% Confidence Limit	1.75	34.95

Comments:
*UCS taken as k x Point Load Is(50): k= 20

*UCS Normal Distribution Curve



Abbreviations	
i	irregular
a	axial
b	block
d	diametral

approx. orientation to planes of weakness/bedding

U	unknown
P	perpendicular
//	parallel

Uniaxial Compression Test Report Sheet

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

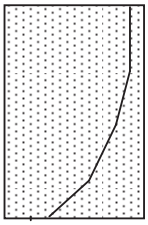
Sample Measurements

Length	211	
Diameter (Ø)	78	mm

Testing

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

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{294000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

= 61.53 (Mpa)

Bulk Density = 2.64 (Mg/m^3)

Moisture Content = 0.09 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

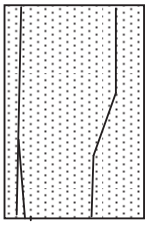
Sample Measurements

Length	201	
Diameter (Ø)	78.1	mm

Testing

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

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{400000}{4788.19385}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 83.50 (Mpa)

Bulk Density $=$ 2.61 (Mg/m^3)

Moisture Content $=$ 0.11 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

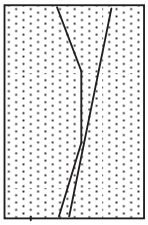
Sample Measurements

Length	176	
Diameter (Ø)	70	mm

Testing

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

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{287000}{3846.5}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 74.58 (Mpa)

Bulk Density $=$ 2.61 (Mg/m^3)

Moisture Content $=$ 0.14 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

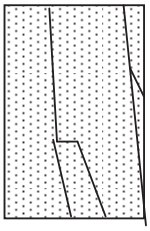
Sample Measurements

Length	196	
Diameter (Ø)	78	mm

Testing

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

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{344000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 71.99 (Mpa)

Bulk Density $=$ 2.60 (Mg/m^3)

Moisture Content $=$ 0.17 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

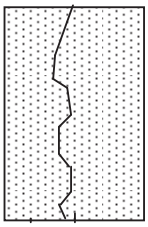
Weathering Grade Criteria

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

Length	204	
Diameter (Ø)	78	mm

Sketch of Failure Surfaces



Testing

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

Strength Calculations

Uniaxial Compressive Strength $= \dfrac{254000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 53.16 (Mpa)

Bulk Density $=$ 2.61 (Mg/m^3)

Moisture Content $=$ 0.22 (%)

Notes:

Uniaxial Compression Test Report Sheet | *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

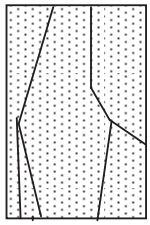
Sample Measurements

Length	170	
Diameter (Ø)	61	mm

Testing

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

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength = $\frac{108000}{2920.985}$

$= \frac{1000 \times P}{\prod \times (Ø/2)^2}$

= 36.96 (Mpa)

Bulk Density = 2.60 (Mg/m^3)

Moisture Content = 0.15 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

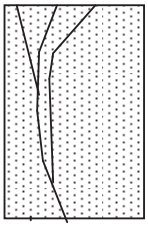
Weathering Grade Criteria

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

Length	212	
Diameter (Ø)	78.1	mm

Sketch of Failure Surfaces



Testing

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

Strength Calculations

Uniaxial Compressive Strength $= \dfrac{364000}{4788.19385}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

= 75.98 (Mpa)

Bulk Density = 2.61 (Mg/m^3)

Moisture Content = 0.08 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

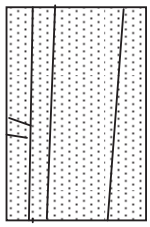
Sample Measurements

Length	198	
Diameter (Ø)	78	mm

Testing

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

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{313000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 65.50 (Mpa)

Bulk Density $=$ 2.61 (Mg/m^3)

Moisture Content $=$ 0.17 (%)

Notes:

Uniaxial Compression Test Report Sheet | *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

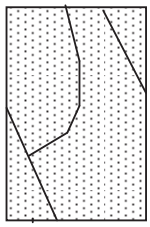
Weathering Grade Criteria

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

Length	208	
Diameter (Ø)	78	mm

Sketch of Failure Surfaces



Testing

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

Strength Calculations

Uniaxial Compressive Strength $= \dfrac{112000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 23.44 (Mpa)

Bulk Density $=$ 2.61 (Mg/m^3)

Moisture Content $=$ 0.09 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

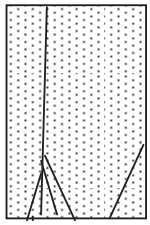
Sample Measurements

Length	206	
Diameter (Ø)	78	mm

Testing

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

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength = $\frac{196000}{4775.94}$

$= \frac{1000 \times P}{\prod \times (Ø/2)^2}$

= 41.02 (Mpa)

Bulk Density = 2.60 (Mg/m^3)

Moisture Content = 0.16 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

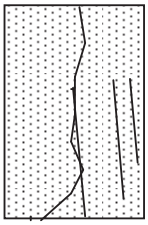
Sample Measurements

Length	152	
Diameter (Ø)	61	mm

Testing

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

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{258000}{2920.985}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 88.28 (Mpa)

Bulk Density $=$ 2.61 (Mg/m^3)

Moisture Content $=$ 0.11 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

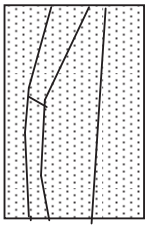
Sample Measurements

Length	170	
Diameter (Ø)	61	mm

Testing

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

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{231000}{2920.985}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 79.04 (Mpa)

Bulk Density $=$ 2.60 (Mg/m^3)

Moisture Content $=$ 0.08 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

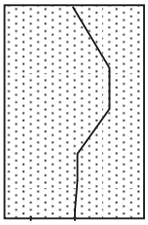
Sample Measurements

Length	211	
Diameter (Ø)	78	mm

Testing

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

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{262000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

= 54.83 (Mpa)

Bulk Density = 2.62 (Mg/m^3)

Moisture Content = 0.14 (%)

Notes:

Uniaxial Compression Test Report Sheet | *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

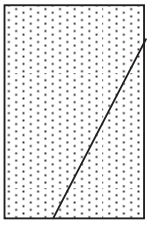
Sample Measurements

Length	202	
Diameter (Ø)	78	mm

Testing

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

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{202000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 42.27 (Mpa)

Bulk Density $=$ 2.60 (Mg/m^3)

Moisture Content $=$ 0.11 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

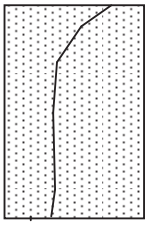
Sample Measurements

Length	174	
Diameter (Ø)	70	mm

Testing

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

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{296000}{3846.5}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 76.91 (Mpa)

Bulk Density $=$ 2.62 (Mg/m^3)

Moisture Content $=$ 0.13 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

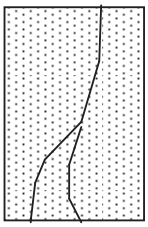
Sample Measurements

Length	172	
Diameter (Ø)	78	mm

Testing

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

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{157000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 32.86 (Mpa)

Bulk Density $=$ 2.58 (Mg/m^3)

Moisture Content $=$ 0.18 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

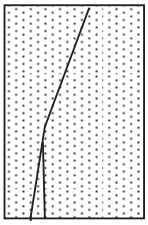
Sample Measurements

Length	202	
Diameter (Ø)	61	mm

Testing

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

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{374000}{2920.985}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$= 127.97$ (Mpa)

Bulk Density $= 2.59$ (Mg/m^3)

Moisture Content $= 0.14$ (%)

Notes:

Uniaxial Compression Test Report Sheet

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

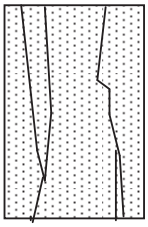
Weathering Grade Criteria

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

Length	198	
Diameter (Ø)	78	mm

Sketch of Failure Surfaces



Testing

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

Strength Calculations

Uniaxial Compressive Strength $= \dfrac{215000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 44.99 (Mpa)

Bulk Density $=$ 2.60 (Mg/m^3)

Moisture Content $=$ 0.18 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

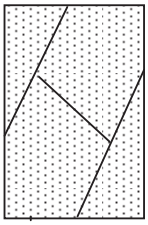
Weathering Grade Criteria

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

Length	171	
Diameter (Ø)	61	mm

Sketch of Failure Surfaces



Testing

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

Strength Calculations

Uniaxial Compressive Strength $= \dfrac{102000}{2920.985}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 34.90 (Mpa)

Bulk Density $=$ 2.59 (Mg/m^3)

Moisture Content $=$ 0.19 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

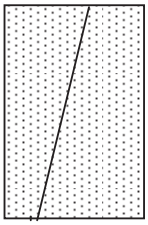
Weathering Grade Criteria

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

Length	191	
Diameter (Ø)	78	mm

Sketch of Failure Surfaces



Testing

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

Strength Calculations

Uniaxial Compressive Strength $= \dfrac{272000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 56.92 (Mpa)

Bulk Density $=$ 2.62 (Mg/m^3)

Moisture Content $=$ 0.10 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

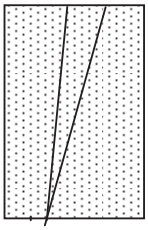
Weathering Grade Criteria

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

Length	208	
Diameter (Ø)	78.1	mm

Sketch of Failure Surfaces



Testing

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

Strength Calculations

Uniaxial Compressive Strength $= \dfrac{162000}{4788.19385}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 33.82 (Mpa)

Bulk Density $=$ 2.61 (Mg/m^3)

Moisture Content $=$ 0.08 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

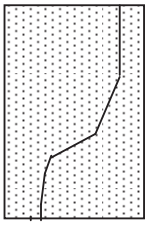
Sample Measurements

Length	198	
Diameter (Ø)	78	mm

Testing

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

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{176000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 36.83 (Mpa)

Bulk Density $=$ 2.62 (Mg/m^3)

Moisture Content $=$ 0.13 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

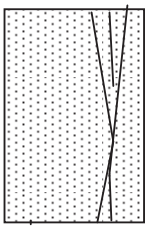
Sample Measurements

Length	209	
Diameter (Ø)	78	mm

Testing

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

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{172000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 36.00 (Mpa)

Bulk Density $=$ 2.61 (Mg/m^3)

Moisture Content $=$ 0.11 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

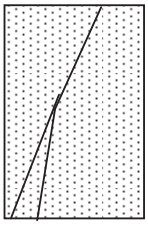
Weathering Grade Criteria

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

Length	172	
Diameter (Ø)	61	mm

Sketch of Failure Surfaces



Testing

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

Strength Calculations

Uniaxial Compressive Strength $= \dfrac{252000}{2920.985}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 86.23 (Mpa)

Bulk Density $=$ 2.63 (Mg/m^3)

Moisture Content $=$ 0.18 (%)

Notes:

Uniaxial Compression Test Report Sheet | *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

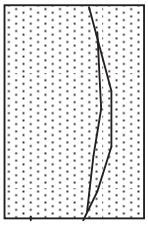
Sample Measurements

Length	202	
Diameter (Ø)	78	mm

Testing

Load Rate	3.3	kN/min
Load at Failure (P)	349	kN

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{349000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 73.04 (Mpa)

Bulk Density $=$ 2.67 (Mg/m^3)

Moisture Content $=$ 0.20 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

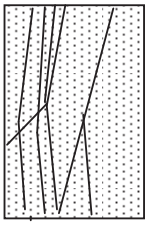
Sample Measurements

Length	201	
Diameter (Ø)	78	mm

Testing

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

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{262000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

= 54.83 (Mpa)

Bulk Density = 2.67 (Mg/m^3)

Moisture Content = 0.15 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

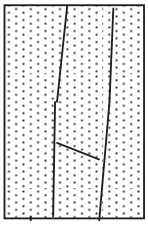
Sample Measurements

Length	201	
Diameter (Ø)	78	mm

Testing

Load Rate	3.3	kN/min
Load at Failure (P)	472	kN

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{472000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 98.78 (Mpa)

Bulk Density $=$ 2.66 (Mg/m^3)

Moisture Content $=$ 0.19 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

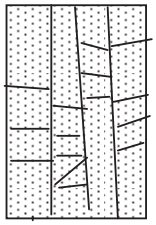
Sample Measurements

Length	204	
Diameter (Ø)	78	mm

Testing

Load Rate	3.3	kN/min
Load at Failure (P)	223	kN

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{223000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 46.67 (Mpa)

Bulk Density $=$ 2.67 (Mg/m^3)

Moisture Content $=$ 0.20 (%)

Notes:

Uniaxial Compression Test Report Sheet | *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

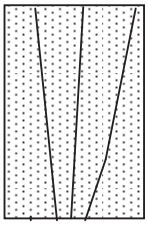
Weathering Grade Criteria

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

Length	204	
Diameter (Ø)	78	mm

Sketch of Failure Surfaces



Testing

Load Rate	3.3	kN/min
Load at Failure (P)	168	kN

Strength Calculations

Uniaxial Compressive Strength $= \dfrac{168000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 35.16 (Mpa)

Bulk Density $=$ 2.67 (Mg/m^3)

Moisture Content $=$ 0.23 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

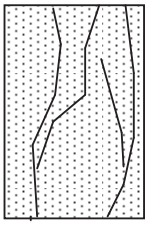
Sample Measurements

Length	204	
Diameter (Ø)	78	mm

Testing

Load Rate	3.3	kN/min
Load at Failure (P)	210	kN

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{210000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 43.95 (Mpa)

Bulk Density $=$ 2.65 (Mg/m^3)

Moisture Content $=$ 0.22 (%)

Notes:

Uniaxial Compression Test Report Sheet | *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

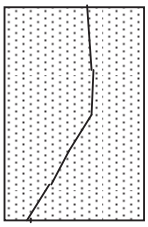
Weathering Grade Criteria

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

Length	194	
Diameter (Ø)	78	mm

Sketch of Failure Surfaces



Testing

Load Rate	3.3	kN/min
Load at Failure (P)	185	kN

Strength Calculations

Uniaxial Compressive Strength $= \dfrac{185000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 38.72 (Mpa)

Bulk Density $=$ 2.66 (Mg/m^3)

Moisture Content $=$ 0.27 (%)

Notes:

Uniaxial Compression Test Report Sheet | *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

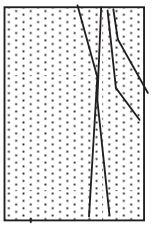
Weathering Grade Criteria

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

Length	207	
Diameter (Ø)	78	mm

Sketch of Failure Surfaces



Testing

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

Strength Calculations

Uniaxial Compressive Strength $= \dfrac{231000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 48.34 (Mpa)

Bulk Density $=$ 2.67 (Mg/m^3)

Moisture Content $=$ 0.24 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

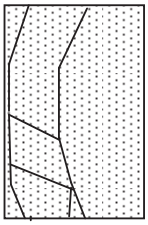
Sample Measurements

Length	200	
Diameter (Ø)	78	mm

Testing

Load Rate	3.3	kN/min
Load at Failure (P)	83	kN

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{83000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

= 17.37 (Mpa)

Bulk Density = 2.65 (Mg/m^3)

Moisture Content = 0.27 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

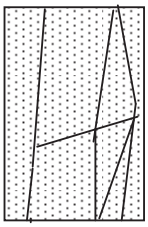
Sample Measurements

Length	204	
Diameter (Ø)	78	mm

Testing

Load Rate	3.3	kN/min
Load at Failure (P)	243	kN

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{243000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

= 50.85 (Mpa)

Bulk Density = 2.66 (Mg/m^3)

Moisture Content = 0.19 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

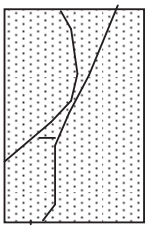
Sample Measurements

Length	207	
Diameter (Ø)	78.1	mm

Testing

Load Rate	3.3	kN/min
Load at Failure (P)	170	kN

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{170000}{4788.19385}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 35.49 (Mpa)

Bulk Density $=$ 2.67 (Mg/m^3)

Moisture Content $=$ 0.25 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

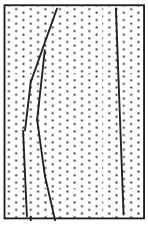
Sample Measurements

Length	202	
Diameter (Ø)	78.1	mm

Testing

Load Rate	3.3	kN/min
Load at Failure (P)	432	kN

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{432000}{4788.19385}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 90.18 (Mpa)

Bulk Density $=$ 2.66 (Mg/m^3)

Moisture Content $=$ 0.26 (%)

Notes:

Uniaxial Compression Test Report Sheet | *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

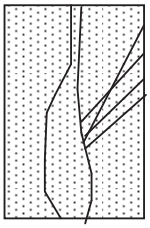
Weathering Grade Criteria

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

Length	198	
Diameter (Ø)	78	mm

Sketch of Failure Surfaces



Testing

Load Rate	3.3	kN/min
Load at Failure (P)	211	kN

Strength Calculations

Uniaxial Compressive Strength $= \dfrac{211000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 44.16 (Mpa)

Bulk Density $=$ 2.64 (Mg/m^3)

Moisture Content $=$ 0.28 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

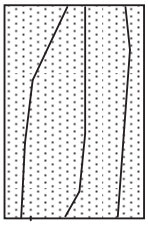
Sample Measurements

Length	200	
Diameter (Ø)	78	mm

Testing

Load Rate	3.3	kN/min
Load at Failure (P)	339	kN

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{339000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 70.94 (Mpa)

Bulk Density $=$ 2.66 (Mg/m^3)

Moisture Content $=$ 0.11 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

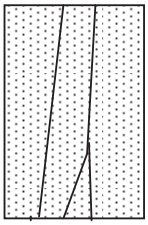
Sample Measurements

Length	202	
Diameter (Ø)	78.1	mm

Testing

Load Rate	3.3	kN/min
Load at Failure (P)	181	kN

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{181000}{4788.19385}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 37.78 (Mpa)

Bulk Density $=$ 2.66 (Mg/m^3)

Moisture Content $=$ 0.15 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

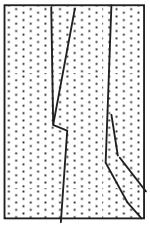
Weathering Grade Criteria

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

Length	201	
Diameter (Ø)	78	mm

Sketch of Failure Surfaces



Testing

Load Rate	3.3	kN/min
Load at Failure (P)	134	kN

Strength Calculations

Uniaxial Compressive Strength $= \dfrac{134000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 28.04 (Mpa)

Bulk Density $=$ 2.67 (Mg/m^3)

Moisture Content $=$ 0.17 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

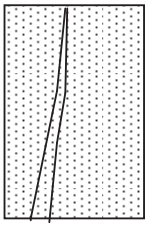
Weathering Grade Criteria

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

Length	204	
Diameter (Ø)	78	mm

Sketch of Failure Surfaces



Testing

Load Rate	3.3	kN/min
Load at Failure (P)	271	kN

Strength Calculations

Uniaxial Compressive Strength $= \dfrac{271000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 56.71 (Mpa)

Bulk Density $=$ 2.65 (Mg/m^3)

Moisture Content $=$ 0.23 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

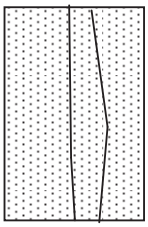
Sample Measurements

Length	209	
Diameter (Ø)	78.1	mm

Testing

Load Rate	3.3	kN/min
Load at Failure (P)	291	kN

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{291000}{4788.19385}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

= 60.74 (Mpa)

Bulk Density = 2.67 (Mg/m^3)

Moisture Content = 0.18 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

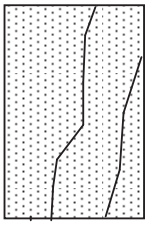
Sample Measurements

Length	199	
Diameter (Ø)	78	mm

Testing

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

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{344000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 71.99 (Mpa)

Bulk Density $=$ 2.66 (Mg/m^3)

Moisture Content $=$ 0.26 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

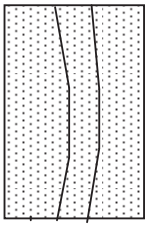
Sample Measurements

Length	210	
Diameter (Ø)	78	mm

Testing

Load Rate	3.3	kN/min
Load at Failure (P)	122	kN

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{122000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

= 25.53 (Mpa)

Bulk Density = 2.66 (Mg/m^3)

Moisture Content = 0.21 (%)

Notes:

Uniaxial Compression Test Report Sheet | *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

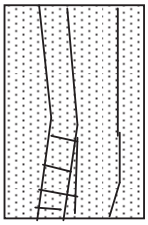
Sample Measurements

Length	199	
Diameter (Ø)	78.1	mm

Testing

Load Rate	3.3	kN/min
Load at Failure (P)	248	kN

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength = $\frac{248000}{4788.19385}$

$= \frac{1000 \times P}{\prod \times (Ø/2)^2}$

= 51.77 (Mpa)

Bulk Density = 2.67 (Mg/m^3)

Moisture Content = 0.23 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

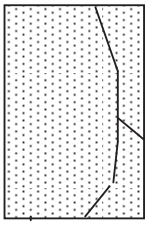
Weathering Grade Criteria

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

Length	201	
Diameter (Ø)	78	mm

Sketch of Failure Surfaces



Testing

Load Rate	3.3	kN/min
Load at Failure (P)	237	kN

Strength Calculations

Uniaxial Compressive Strength $= \dfrac{237000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 49.60 (Mpa)

Bulk Density $=$ 2.66 (Mg/m^3)

Moisture Content $=$ 0.24 (%)

Notes:

Uniaxial Compression Test Report Sheet | *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

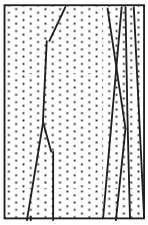
Weathering Grade Criteria

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

Length	212	
Diameter (Ø)	78	mm

Sketch of Failure Surfaces



Testing

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

Strength Calculations

Uniaxial Compressive Strength $= \dfrac{294000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 61.53 (Mpa)

Bulk Density $=$ 2.67 (Mg/m^3)

Moisture Content $=$ 0.21 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

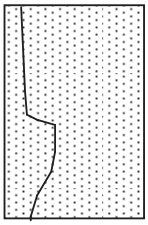
Sample Measurements

Length	206	
Diameter (Ø)	78.1	mm

Testing

Load Rate	3.3	kN/min
Load at Failure (P)	151	kN

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{151000}{4788.19385}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

= 31.52 (Mpa)

Bulk Density = 2.66 (Mg/m^3)

Moisture Content = 0.18 (%)

Notes:

Uniaxial Compression Test Report Sheet

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

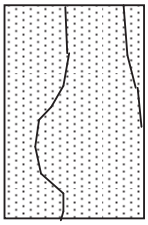
Sample Measurements

Length	202	
Diameter (Ø)	78	mm

Testing

Load Rate	3.3	kN/min
Load at Failure (P)	282	kN

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{282000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

= 59.02 (Mpa)

Bulk Density = 2.66 (Mg/m^3)

Moisture Content = 0.20 (%)

Notes:

IGSL Ltd
Unit J5, Materials Laboratory
M7 Business Park
Naas
Co. Kildare
045-899324

Test Report

Resistance to Fragmentation - Los Angeles Test

Tested in accordance with BS EN1097-2:2010

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1331

Report No.		**R73037**
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)

IGSL Materials Laboratory	Approved by	Date	Page
	H Byrne	29-06-16	1 of 1

IGSL Ltd
Unit J5, Materials Laboratory
M7 Business Park
Naas
Co. Kildare
045-899324

Test Report

Resistance to Fragmentation - Los Angeles Test

Tested in accordance with BS EN1097-2:2010

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1331

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
	H Byrne	29-06-16	1 of 1

IGSL Ltd
Unit J5, Materials Laboratory
M7 Business Park
Naas
Co. Kildare
045-899324

Test Report

Resistance to Fragmentation - Los Angeles Test

Tested in accordance with BS EN1097-2:2010

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 1331

Report No.		**R73039**
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)

IGSL Materials Laboratory	Approved by	Date	Page
	H Byrne	29-06-16	1 of 1

IGSL Ltd
Unit J5, Materials Laboratory
M7 Business Park
Naas
Co. Kildare
045-899324

Test Report

Resistance to Fragmentation - Los Angeles Test

Tested in accordance with BS EN1097-2:2010

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 1331

Report No.		**R73990**
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)

IGSL Materials Laboratory	Approved by	Date	Page
	H Byrne	29-06-16	1 of 1

IGSL Ltd
Unit J5, Materials Laboratory
M7 Business Park
Naas
Co. Kildare
045-899324

Test Report

Resistance to Fragmentation - Los Angeles Test

Tested in accordance with BS EN1097-2:2010

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1331

Report No.		**R73991**
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)

IGSL Materials Laboratory	Approved by	Date	Page
	H Byrne	29-06-16	1 of 1

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Slake Durability

Tested in accordance with ISRM Part 2 (1981)

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

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)

IGSL Materials Laboratory	Approved by	Date	Page
	H Byrne	29-06-16	1 of 1

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Slake Durability

Tested in accordance with ISRM Part 2 (1981)

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

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)

IGSL Materials Laboratory	Approved by	Date	Page
	H Byrne	29-06-16	1 of 1

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Slake Durability

Tested in accordance with ISRM Part 2 (1981)

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

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)

IGSL Materials Laboratory	Approved by	Date	Page
	H Byrne	29-06-16	1 of 1

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

Slake Durability

Tested in accordance with ISRM Part 2 (1981)

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

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)

IGSL Materials Laboratory	Approved by	Date	Page
	H Byrne	29-06-16	1 of 1

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Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Slake Durability

Tested in accordance with ISRM Part 2 (1981)

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

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)

IGSL Materials Laboratory	Approved by	Date	Page
	H Byrne	29-06-16	1 of 1

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Materials Laboratory
Unit J5, M7 Business Park
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Co. Kildare
045 846176

Test Report

Slake Durability

Tested in accordance with ISRM Part 2 (1981)

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

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)

IGSL Materials Laboratory	Approved by	Date	Page
	H Byrne	29-06-16	1 of 1

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Slake Durability

Tested in accordance with ISRM Part 2 (1981)

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

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)

IGSL Materials Laboratory	Approved by	Date	Page
	H Byrne	29-06-16	1 of 1

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Slake Durability

Tested in accordance with ISRM Part 2 (1981)

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

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)

IGSL Materials Laboratory	Approved by	Date	Page
	H Byrne	29-06-16	1 of 1

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Ten per cent Fines Value

Tested in accordance with BS812:Part 111:1990

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

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)

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Ten per cent Fines Value

Tested in accordance with BS812:Part 111:1990

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

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)

IGSL Materials Laboratory	Approved by	Date	Page
	H Byrne	29-06-16	1 of 1

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Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Ten per cent Fines Value

Tested in accordance with BS812:Part 111:1990

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

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)

IGSL Materials Laboratory	Approved by	Date	Page
	H Byrne	29-06-16	1 of 1

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Ten per cent Fines Value

Tested in accordance with BS812:Part 111:1990

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

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)

IGSL Materials Laboratory	Approved by	Date	Page
	H Byrne	29-06-16	1 of 1

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Ten per cent Fines Value

Tested in accordance with BS812:Part 111:1990

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

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.

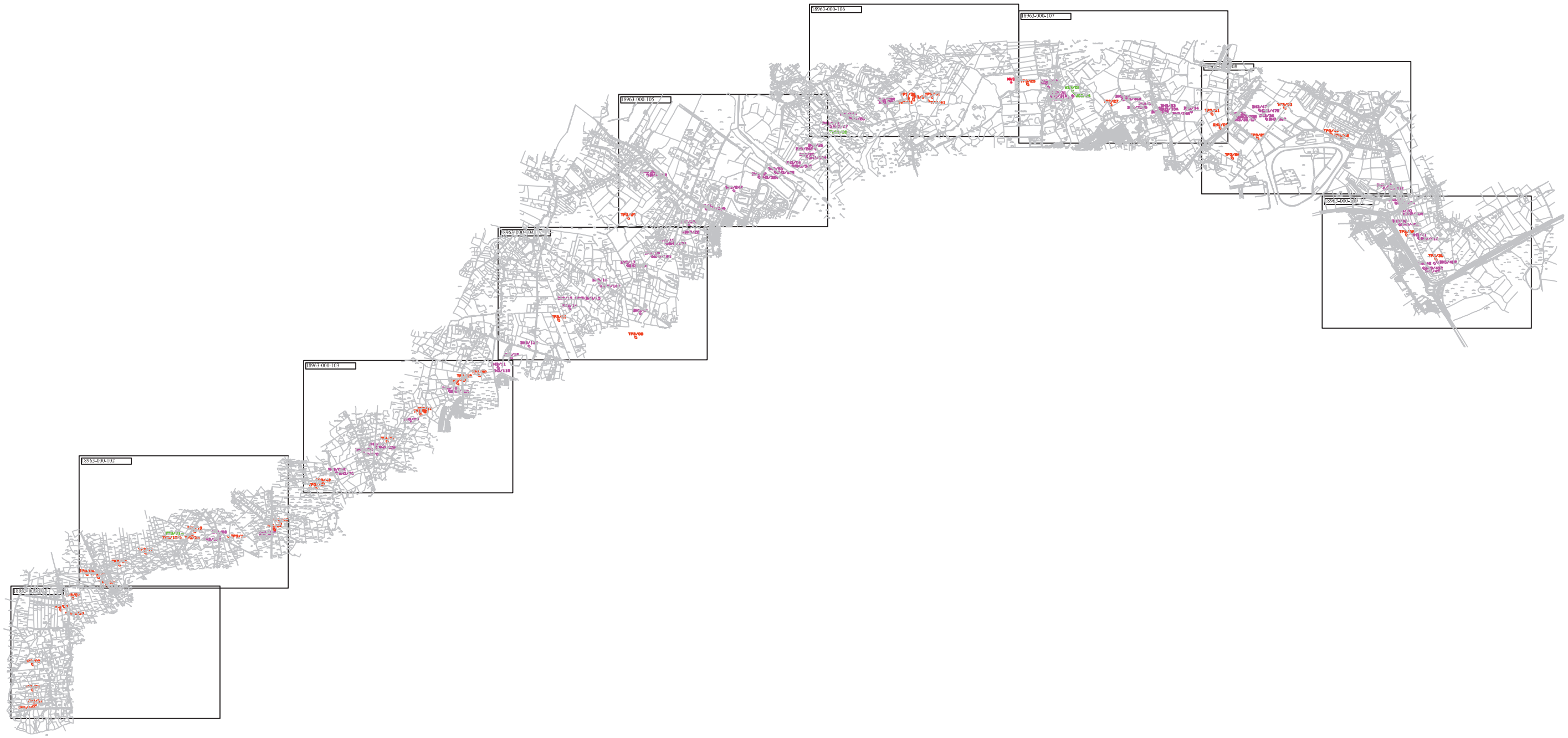
Approved signatories

H Byrne (Laboratory Manager)

IGSL Materials Laboratory	Approved by	Date	Page
	H Byrne	29-06-16	1 of 1

Appendix 17

Exploratory Hole Location Plan



North

Site Location

Datum: - Malin
Grid System: - ITM

Trial Pit Location

Monitoring Well Location

IGSL Borehole Location

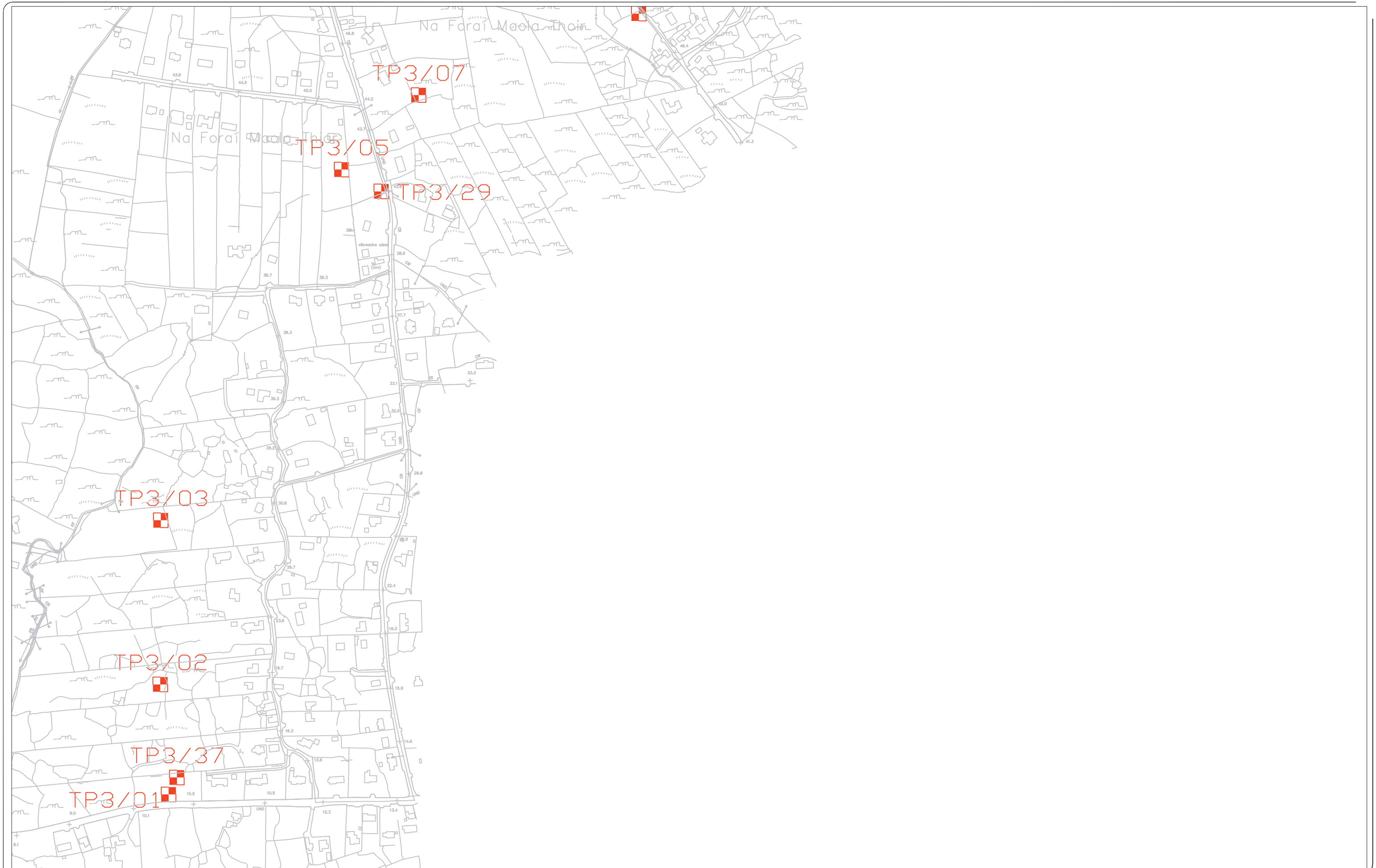
IGSL Window Sample Location

IGSL Limited
Unit F M7 Business Park, Naas, Co.Kildare
Tel: 045 846176 Fax: 045 846187
E-mail: info@igsl.ie

SITE INVESTIGATION
&
GEOTECHNICAL SPECIALISTS

Rev	By	Date	Description
0	CK	22/06	Location Plan

Project:	N6 Galway City Transport Project - Phase 3				
Component:	Ground Investigation Contract 1				
Title:	Overview Plan				
Designed: CK	Date: 22/06	File Name: 18963	Drawing No:		
Drawn: CK	Date: 22/06	Original Scale: 1:40,000 @A3	18963-000-001		
Checked: JL	Date: 22/06	Date: 22/06/2017			



North

Datum: - Malin
Grid system: - ITM

Site Location

Trial Pit Location

Monitoring Well Location

IGSL Borehole Location

IGSL Window Sample Location

IGSL Limited
Unit F M7 Business Park, Naas, Co Kildare
Tel: 045 846 176 Fax: 045 846 187
E-mail: info@igsl.ie

SITE INVESTIGATION
&
GEOTECHNICAL SPECIALISTS

Rev	By	Date	Description
0	CK	22/06	Location Plan

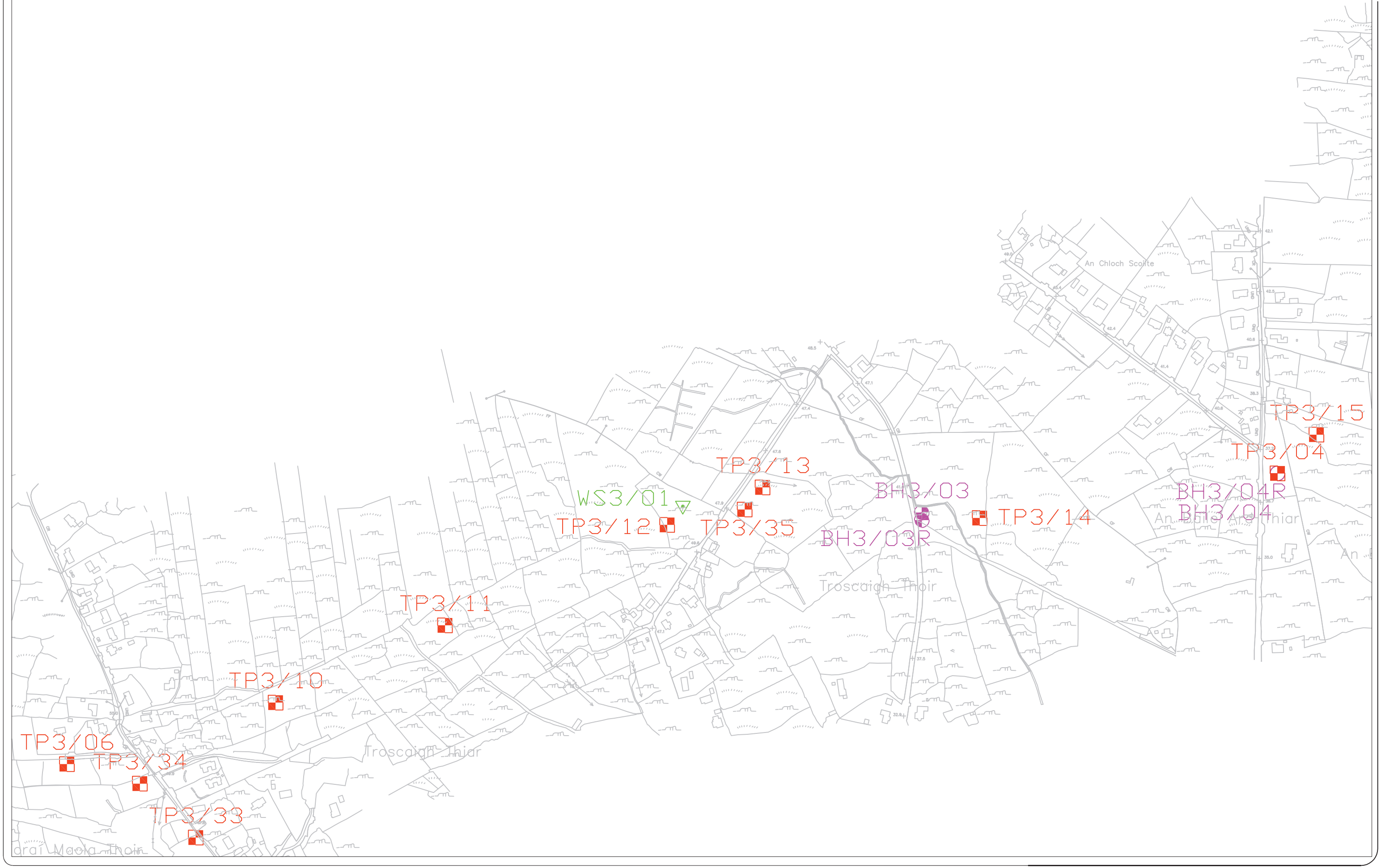
Project: **N6 Galway City Transport Project - Phase 3**

Component: **Ground Investigation Contract 1**

Title: **Location Plan 1 of 9**

Designed:	CK	Date:	22/06	File Name:	18963
Drawn:	CK	Date:	22/06	Original Scale:	1:5000 @A3
Checked:	JL	Date:	22/06	Date:	22/06/2017

Drawing No: **18963-000-101**



North

Site Location

Trial Pit Location

Monitoring Well Location

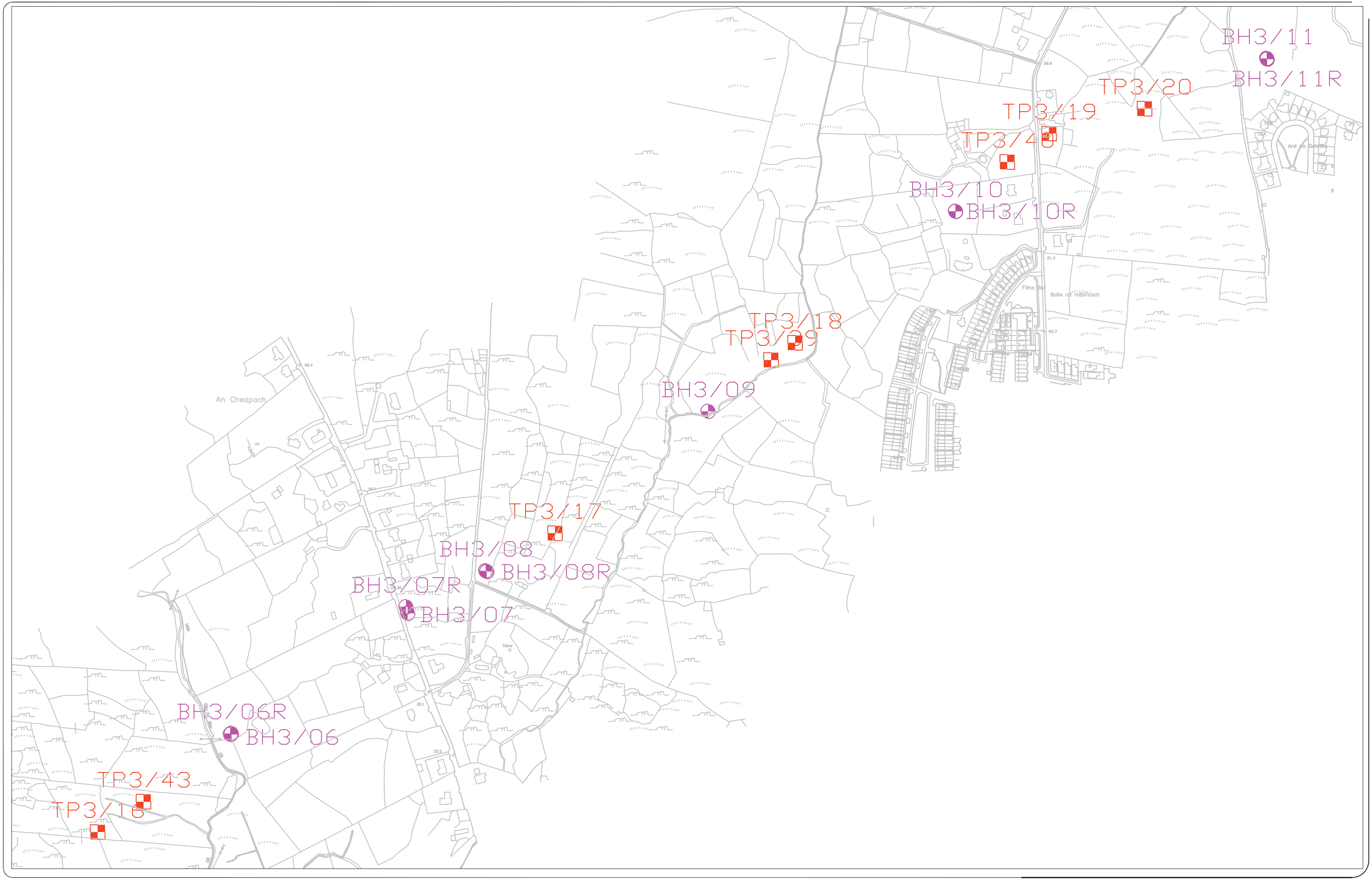
IGSL Borehole Location

IGSL Window Sample Location

IGSL Limited
Unit F M7 Business Park, Naas, Co.Kildare
Tel: 045 846176 Fax: 045 846187
E-mail: info@igsl.ie
SITE INVESTIGATION & GEOTECHNICAL SPECIALISTS

Rev	By	Date	Description
0	CK	22/06	Location Plan

Project:	N6 Galway City Transport Project - Phase 3				
Component:	Ground Investigation Contract 1				
Title:	Location Plan 2 of 9				
Designed:	CK	Date: 22/06	File Name: 18963	Drawing No:	
Drawn:	CK	Date: 22/06	Original Scale: 1:5000 @A3	18963-000-102	
Checked:	JL	Date: 22/06	Date: 22/06/2017		



North

Site Location

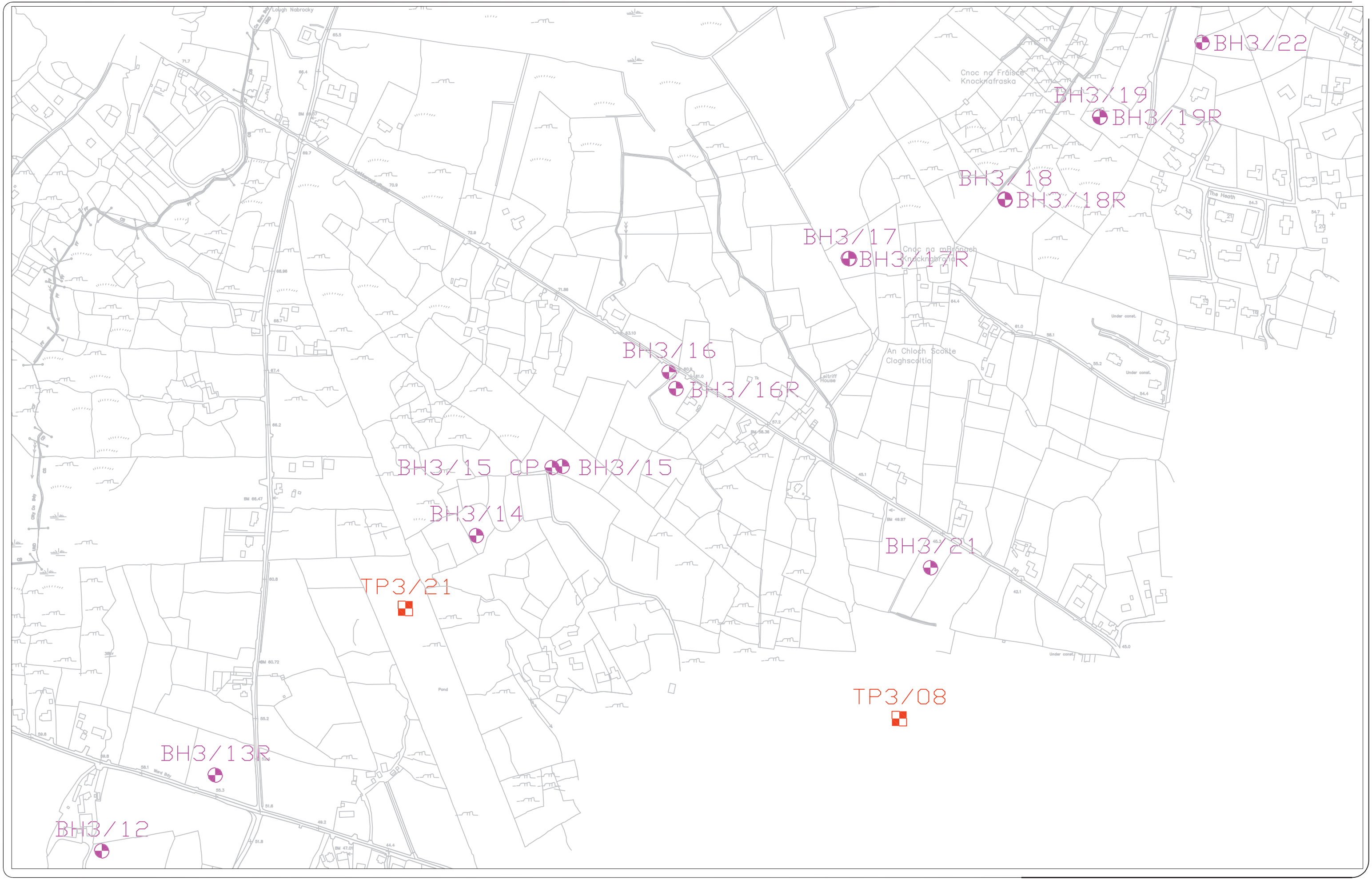
- Datum: - Malin
- Grid Units: - ITM

Trial Pit Location	Monitoring Well Location
IGSL Borehole Location	
IGSL Window Sample Location	

IGSL Limited
Unit F M7 Business Park, Naas, Co.Kildare
Tel: 045 846 176 Fax: 045 846 187
E-mail: info@igsl.ie
SITE INVESTIGATION & GEOTECHNICAL SPECIALISTS

Rev	By	Date	Description
0	CK	22/06	Location Plan

Project:	N6 Galway City Transport Project - Phase 3				
Component:	Ground Investigation Contract 1				
Title:	Location Plan 3 of 9				
Designed:	CK	Date: 22/06	File Name: 18963	Drawing No:	
Drawn:	CK	Date: 22/06	Original Scale: 1:5000 @A3		18963-000-103
Checked:	JL	Date: 22/06	Date: 22/06/2017		



North

Site Location

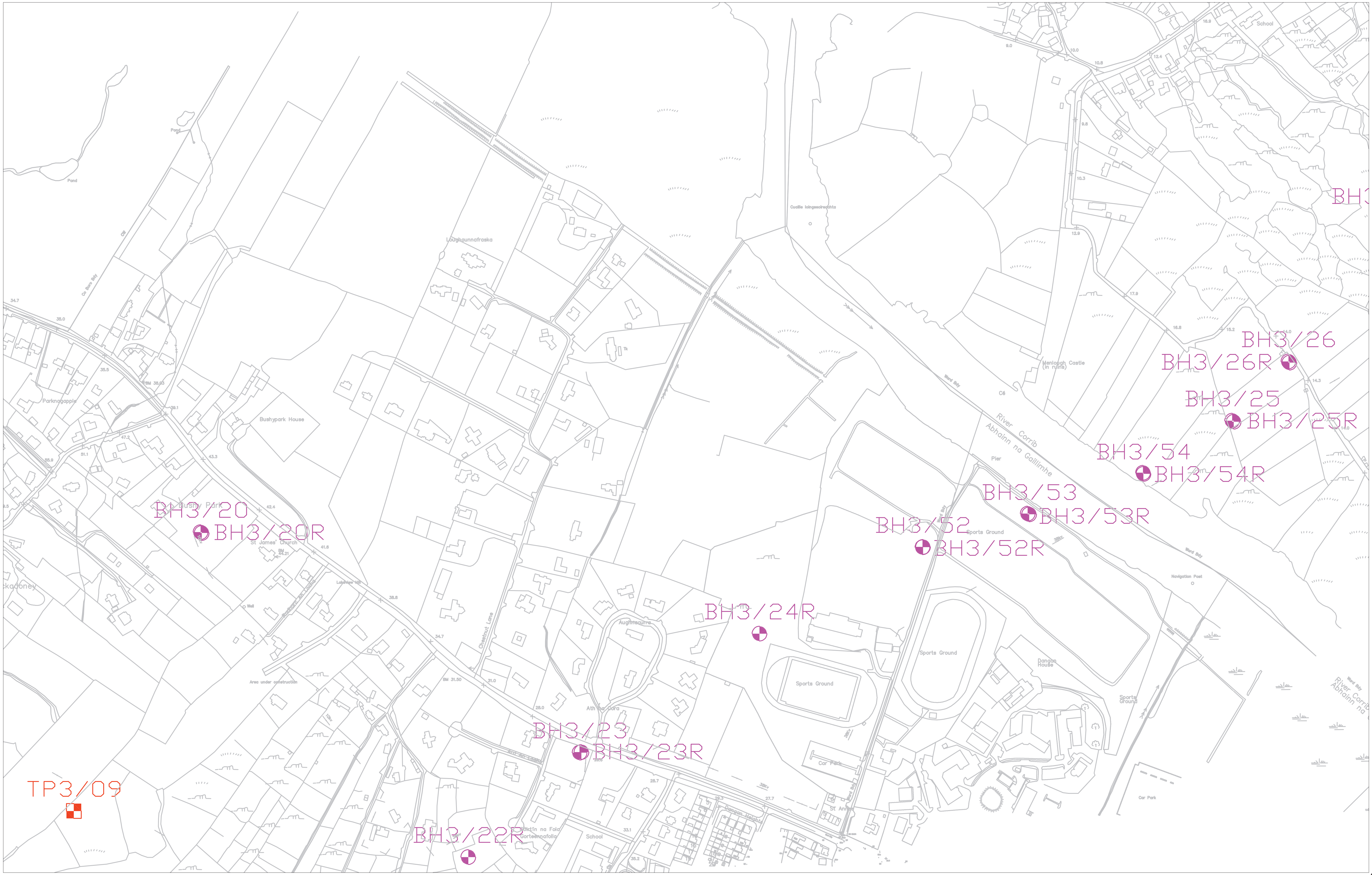
Datum: - Malin
Grid System: - ITM

- Trial Pit Location
- IGSL Borehole Location
- IGSL Window Sample Location
- Monitoring Well Location

IGSL Limited
Unit F M7 Business Park, Naas, Co.Kildare
Tel: 045 846176 Fax: 045 846187
E-mail: info@igsl.ie
SITE INVESTIGATION
&
GEOTECHNICAL SPECIALISTS

Rev	By	Date	Description
0	CK	22/06	Location Plan

Project:	N6 Galway City Transport Project - Phase 3				
Component:	Ground Investigation Contract 1				
Title:	Location Plan 4 of 9				
Designed:	CK	Date: 22/06	File Name: 18963	Drawing No:	
Drawn:	CK	Date: 22/06	Original Scale: 1:5000 @A3		18963-000-104
Checked:	JL	Date: 22/06	Date: 22/06/2017		



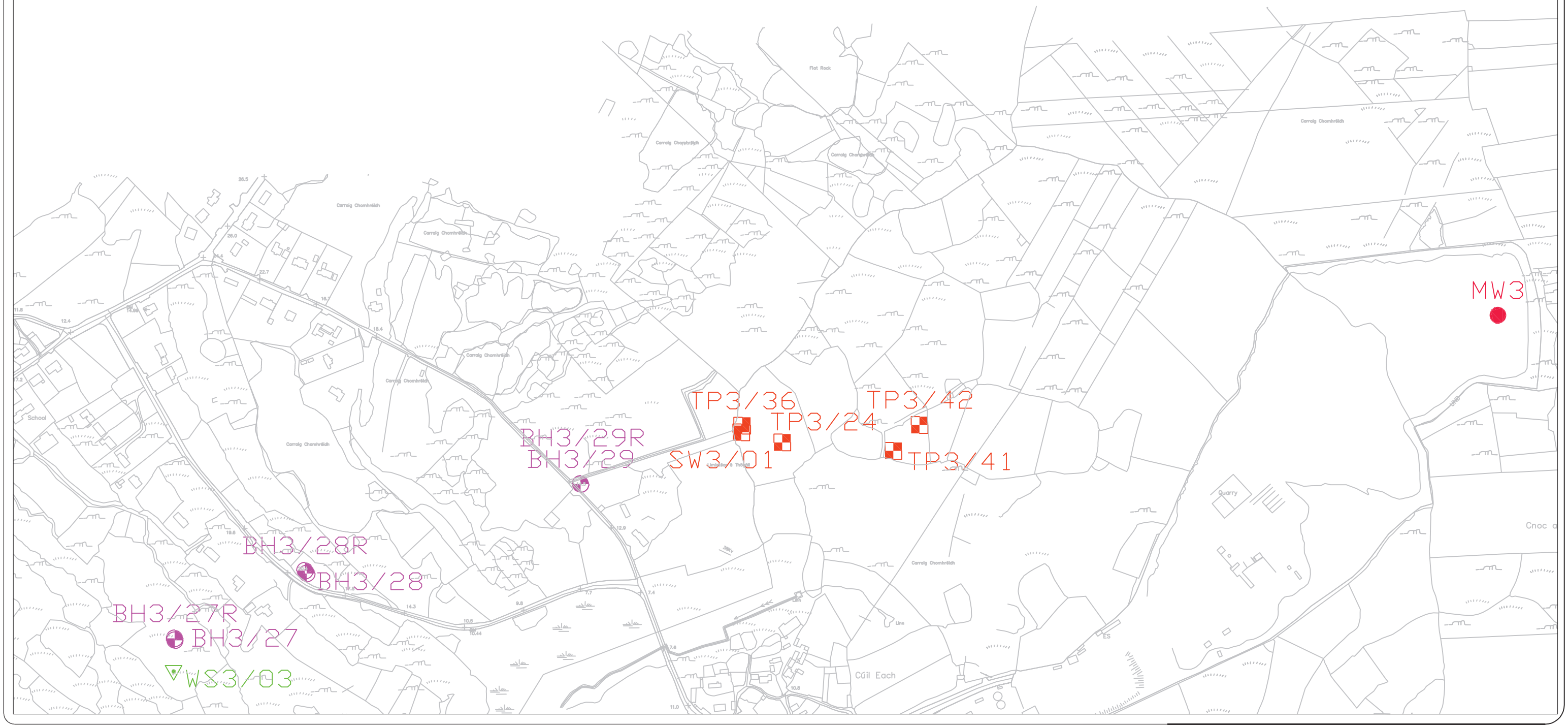
North	DATUM: - Malin	GRID SYSTEM: - ITM
Site Location		

Trial Pit Location	Monitoring Well Location
IGSL Borehole Location	
IGSL Window Sample Location	

IGSL Limited
Unit F M7 Business Park, Naas, Co.Kildare
Tel: 045 846176 Fax: 045 846187
E-mail: info@igsl.ie
SITE INVESTIGATION & GEOTECHNICAL SPECIALISTS

Rev	By	Date	Description
0	CK	22/06	Location Plan

Project:	N6 Galway City Transport Project - Phase 3		
Component:	Ground Investigation Contract 1		
Title:	Location Plan 5 of 9		
Designed: CK	Date: 22/06	File Name: 18963	Drawing No:
Drawn: CK	Date: 22/06	Original Scale: 1:5000 @A3	18963-000-105
Checked: JL	Date: 22/06	Date: 22/06/2017	



North

Site Location

DATUM: - Malin
GRID SYSTEM: - ITM

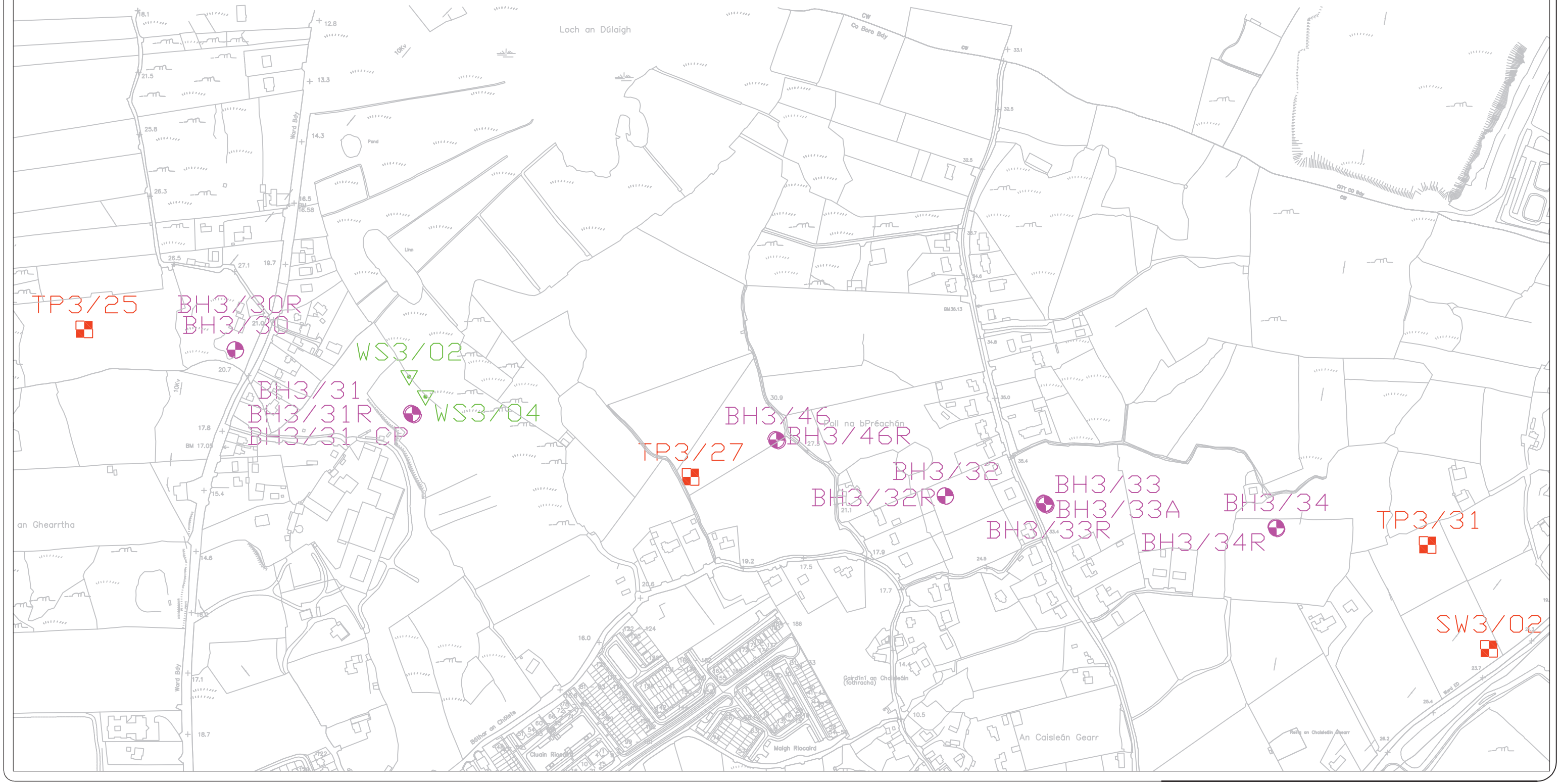
Trial Pit Location
IGSL Borehole Location
IGSL Window Sample Location
Monitoring Well Location

IGSL Limited
Unit F M7 Business Park, Naas, Co.Kildare
Tel: 045 846176 Fax 045 846187
E-mail: info@igsl.ie

SITE INVESTIGATION
&
GEOTECHNICAL SPECIALISTS

Rev	By	Date	Description
0	CK	22/06	Location Plan

Project:	N6 Galway City Transport Project - Phase 3				
Component:	Ground Investigation Contract 1				
Title:	Location Plan 6 of 9				
Designed:	CK	Date: 22/06	File Name: 18963	Drawing No:	
Drawn:	CK	Date: 22/06	Original Scale: 1:5000 @A3		18963-000-106
Checked:	JL	Date: 22/06	Date: 22/06/2017		



North

Site Location

Datum:
- Malin

Grid System:
- ITM

Trial Pit Location

Monitoring Well Location

IGSL Borehole Location

IGSL Window Sample Location

IGSL Limited
Unit F M7 Business Park, Naas, Co.Kildare
Tel: 045 846176 Fax: 045 846187
E-mail: info@igsl.ie

SITE INVESTIGATION & GEOTECHNICAL SPECIALISTS

Rev	By	Date	Description
0	CK	22/06	Location Plan

Project:	N6 Galway City Transport Project - Phase 3				
Component:	Ground Investigation Contract 1				
Title:	Location Plan 7 of 9				
Designed:	CK	Date:	22/06	File Name:	18963
Drawn:	CK	Date:	22/06	Original Scale:	1:5000 @A3
Checked:	JL	Date:	22/06	Date:	22/06/2017

Drawing No: 18963-000-107

North

Site Location

Trial Pit Location

Monitoring Well Location

IGSL Borehole Location

IGSL Window Sample Location

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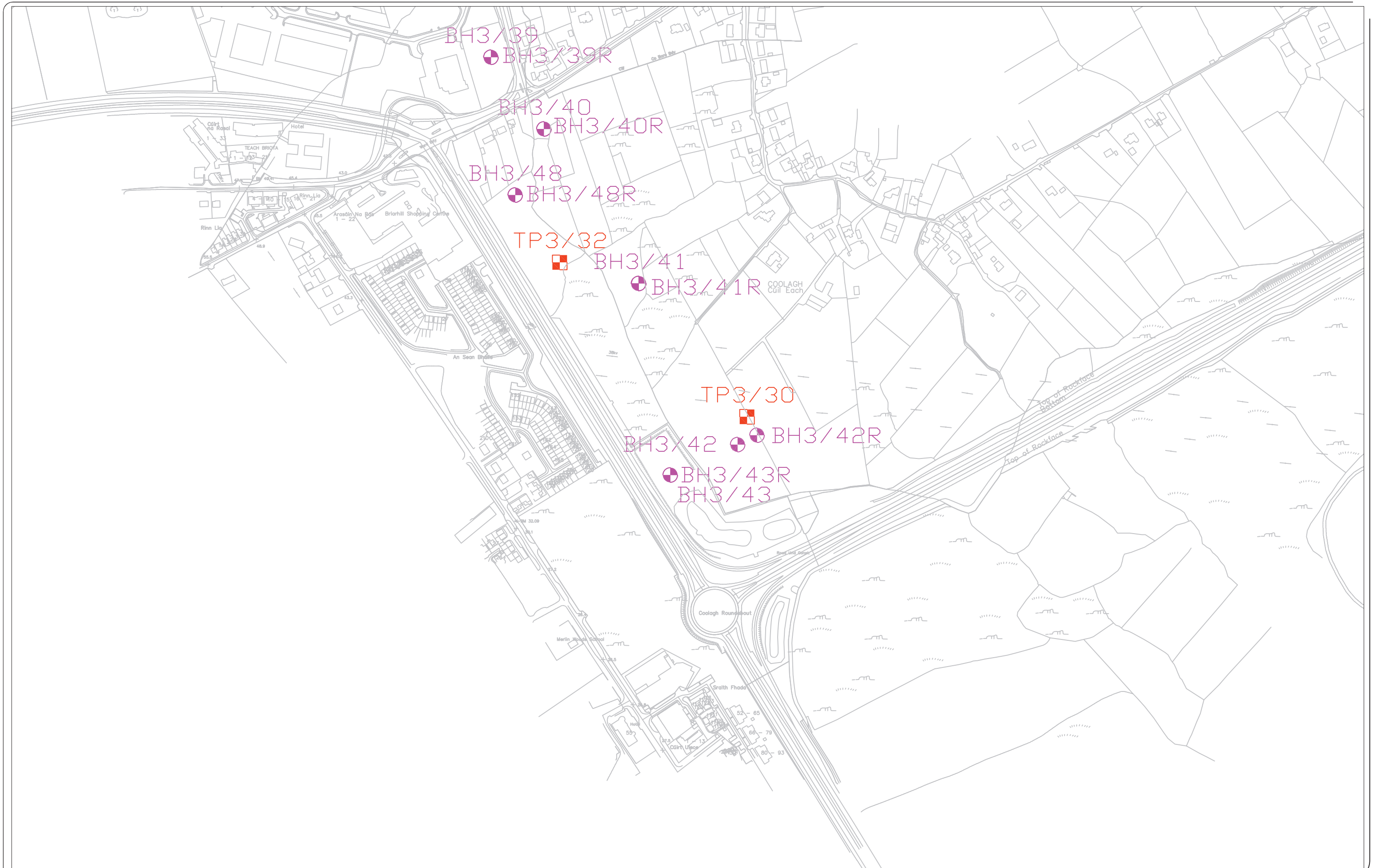
Project:	N6 Galway City Transport Project - Phase 3				
Component:	Ground Investigation Contract 1				
Title:	Location Plan 8 of 9				
Designed:	CK	Date: 22/06	File Name: 18963	Drawing No:	
Drawn:	CK	Date: 22/06	Original Scale: 1:5000 @A3		18963-000-108
Checked:	JL	Date: 22/06	Date: 22/06/2017		



North

Site Location

Datum:
- Malin
Grid System:
- ITM

Trial Pit Location
Monitoring Well Location
IGSL Borehole Location
IGSL Window Sample Location

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&
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Project:	N6 Galway City Transport Project - Phase 3				
Component:	Ground Investigation Contract 1				
Title:	Location Plan 9 of 9				
Designed: CK	Date: 22/06	File Name: 18963	Drawing No:		
Drawn: CK	Date: 22/06	Original Scale: 1:5000 @A3	18963-000-109		
Checked: JL	Date: 22/06	Date: 22/06/2017			